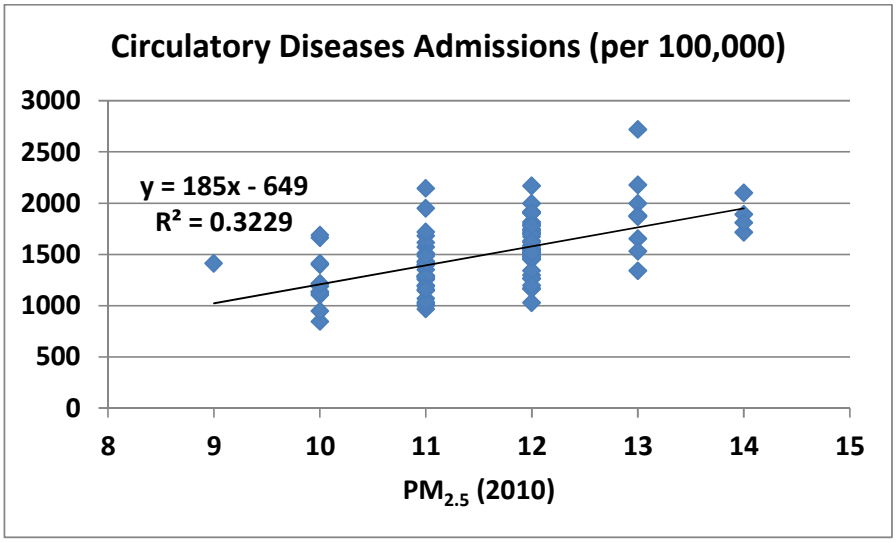
Report Appendix A - List of Steering Group Participants

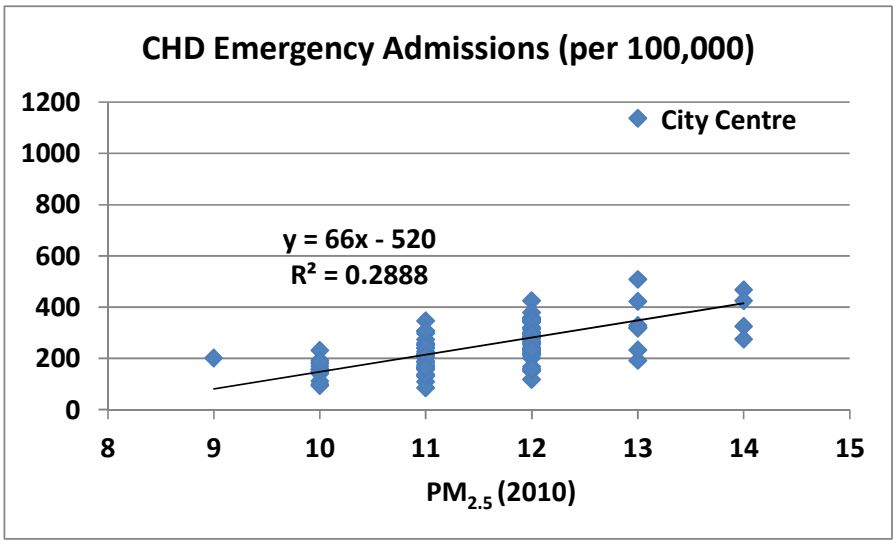
NAME	ORGANISATION/POSITION
Andy Bolton	Barnsley Metropolitan Borough Council (BMBC)
Chris Shields	Barnsley Metropolitan Borough Council (BMBC)
Howard Myers	Barnsley Metropolitan Borough Council (BMBC)
Lisa Croft	Doncaster Metropolitan Borough Council (DMBC)
Steve King	Doncaster Metropolitan Borough Council (DMBC)
Jon Eardley	FirstGroup
Paul Flanagan	FirstGroup
Malcolm Bingham	Freight Transport Association (FTA)
Dr James Tate	Institute for Transport Studies (ITS) Leeds
David Connolly	MVA Consultancy
James Blythe	MVA Consultancy
Sophie O'Connor	MVA Consultancy
Jack Semple	Road Haulage Association (RHA)
Phil Snowden	Road Haulage Association (RHA)
Julie Kent	Rotherham Metropolitan Borough Council (RMBC)
Steve Brown	Rotherham Metropolitan Borough Council (RMBC)
Paul Lizzi	Sheffield City Council (SCC)
Adam Swift	Sheffield City Council (SCC) – *Air Quality*
Ogo Osammor	Sheffield City Council (SCC) – *Air Quality*
Rachel Wileman	Sheffield City Council (SCC) – *Forward and Area Planning*
John Bann	Sheffield City Council (SCC) – *Head of TTAPS*
Brent Collier	Sheffield City Council (SCC) – *ITS Development*
Julie Meese	Sheffield City Council (SCC) – Project Manager / Chair
Andy McKie	Sheffield City Council (SCC) – Project Sponsor
Jason Horsley	Sheffield City Council (SCC) – *Public Health*
Jill Lancaster	Sheffield City Council (SCC) – *Public Health*
Ruth Granger	Sheffield City Council (SCC) – *Public Health*
Sheila Paul	Sheffield City Council (SCC) – *Public Health*
Andy Nolan	Sheffield City Council (SCC) – *Sustainable Cities Programme*
Mark Daly	Sheffield City Council (SCC) – *Sustainable Development*

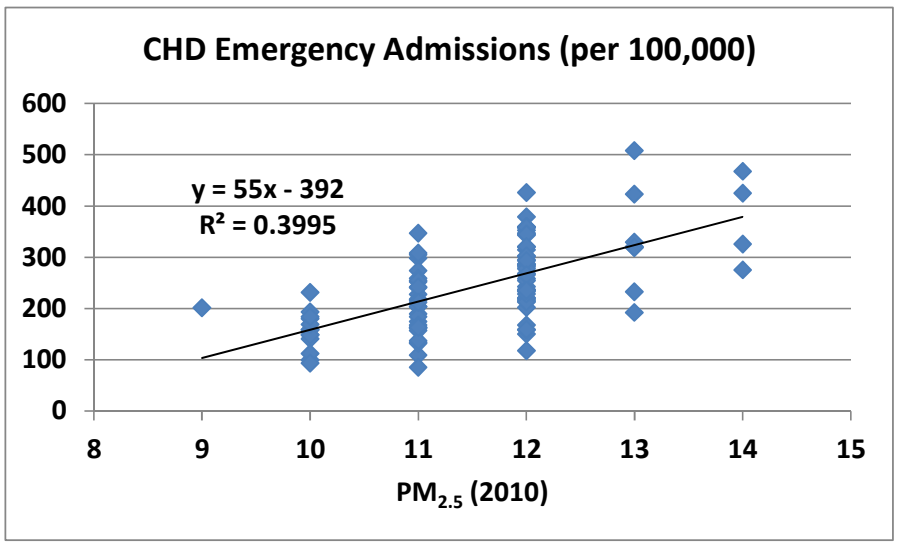
NAME	ORGANISATION/POSITION
Clive Stephenson	Sheffield City Council (SCC) – *Taxi Licensing*
Kathy Stockdale	Sheffield City Council (SCC) – *Taxi Licensing*
Steve Lonnia	Sheffield City Council (SCC) – *Taxi Licensing*
Chris Galloway	Sheffield City Council (SCC) – *Traffic Management*
Simon Botterill	Sheffield City Council (SCC) – *Traffic Management*
Cate Jockel	Sheffield City Council (SCC) – *Transport Vision / Strategy*
Dick Proctor	Sheffield City Council (SCC) – *Transport Vision / Strategy*
Greg Challis	Sheffield City Council (SCC) – *Transport Vision / Strategy*
Andrew Kemp	South Yorkshire Local Transport Plan (SYLTP) Partnership
Chloe Shepherd	South Yorkshire Passenger Transport Executive (SYPTE)
Gavin Bland	South Yorkshire Passenger Transport Executive (SYPTE)
Mike Nuttall	South Yorkshire Passenger Transport Executive (SYPTE)
Roy Mitchell	South Yorkshire Passenger Transport Executive (SYPTE)
John Young	Stagecoach
Rupert Cox	Stagecoach
Gordon Telling	Sustainable Freight Solutions (SFS)
Paul Hopkinson	TM Travel

Report Appendix B – Health Data Analysis

The estimate of annual average concentrations of particulate matter ($PM_{2.5}$) in each Sheffield neighbourhood in 2010 was plotted against the number of hospital admissions per 100,000 population from these neighbourhoods for a) circulatory diseases and b) coronary heart disease emergencies. The results and the corresponding best-fitting trends are illustrated in the figures below.



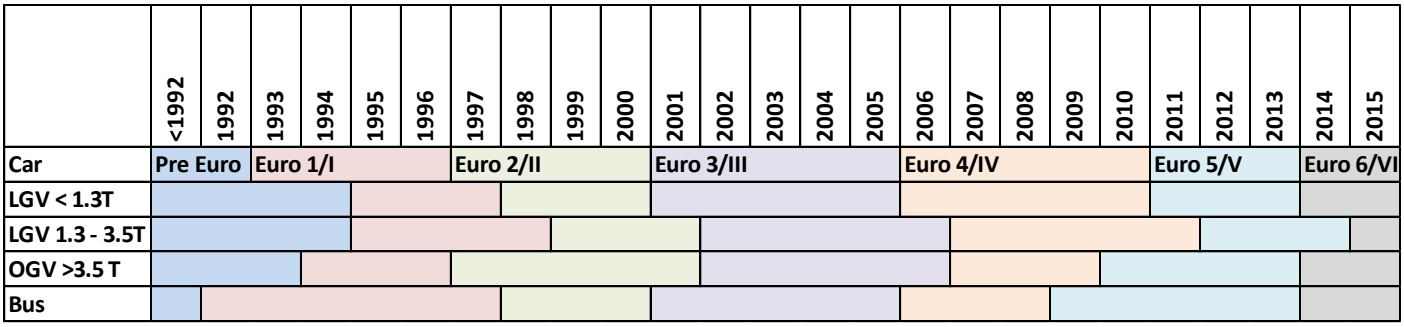




Note the one outlier for a City Centre area in the second chart has been removed in the third chart as it has twice the rate of CHD admissions than the other areas.

Report Appendix C - European Emissions Standards

VEHICLE TYPE	WEIGHT (IF APPLICABLE)	EURO CLASS	START DATE	END DATE
Car		Pre-Euro	01-Jan-00	30-Dec-92
		Euro 1	31-Dec-92	01-Jan-97
		Euro 2	01-Jan-97	01-Jan-01
		Euro 3	01-Jan-01	01-Jan-06
		Euro 4	01-Jan-06	01-Jan-11
		Euro 5	01-Jan-11	01-Sep-14
		Euro 6	01-Sep-14	
Light Goods Vehicles	< 1.3T	Pre-Euro	01-Jan-00	30-Sep-94
		Euro 1	01-Oct-94	01-Oct-97
		Euro 2	01-Oct-97	01-Jan-01
		Euro 3	01-Jan-01	01-Jan-06
		Euro 4	01-Jan-06	01-Jan-11
		Euro 5	01-Jan-11	01-Sep-14
		Euro 6	01-Sep-14	
	1.3 - 3.5T	Pre-Euro	01-Jan-00	30-Sep-94
		Euro 1	01-Oct-94	01-Oct-98
		Euro 2	01-Oct-98	01-Jan-02
		Euro 3	01-Jan-02	01-Jan-07
		Euro 4	01-Jan-07	01-Jan-12
		Euro 5	01-Jan-12	01-Sep-15
		Euro 6	01-Sep-15	
Other Goods	> 3.5T	Pre-Euro	01-Jan-00	09-Oct-93
		Euro I	10-Oct-93	01-Oct-96
		Euro II	01-Oct-96	01-Oct-01
		Euro III	01-Oct-01	01-Oct-06
		Euro IV	01-Oct-06	01-Oct-09
		Euro V	01-Oct-09	31-Dec-13
		Euro VI	31-Dec-13	
Bus		Pre-Euro		01-Jan-92
		Euro I	01-Jan-92	01-Oct-97
		Euro II	01-Oct-97	01-Oct-00
		Euro III	01-Oct-00	01-Oct-05
		Euro IV	01-Oct-05	01-Oct-08
		Euro V	01-Oct-08	31-Dec-13
		Euro VI	31-Dec-13	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2014
2015
Car
Pre Euro
Euro 1/I
Euro 2/II
Euro 3/III
Euro 4/IV
Euro 5/V
Euro 6/VI
LGV < 1.3T
LGV 1.3 - 3.5T
OGV >3.5 T
Bus

Report Appendix D - Sites with Air Quality Problems 2010-2012 and %Reduction Required

Site	2010	2011	2012	2013 Predicted	Reduction Required (All Sectors)	Road Traffic proportion of total NO_2 Emissions	Reduction Required (If Transport Only)
463 Queens Road	52	57	57	56	29%	45%	65%
Chesterfield Road / Meersbrook Park Road	57	53	55	54	27%	44%	61%
Fitzalan Square	60	51	55	54	26%	59%	44%
Whitham Road / Crookes	53	51	54	53	25%	50%	51%
London Road / Sark Road	52	51	54	53	25%	45%	56%
Waingate	59	53	52	52	22%	59%	38%
Penistone Road	45	54	52	52	22%	51%	44%
London Road / Ponsfords	52	51	51	51	21%	55%	38%
Queens Road / G Casino	50	48	50	50	19%	52%	37%
University Roundabout	47	50	49	49	18%	69%	26%
82 Bawtry Road	48	43	49	48	17%	15%	116%
Barnsley Road / Fir Vale	53	45	49	48	17%	48%	36%
La Scala	43	50	48	48	16%	44%	36%
Whitham Road / Moor Oaks Road	50	52	48	48	16%	59%	27%
47 Bawtry Road	51	51	47	47	15%	15%	101%
Ladys Bridge	40	45	47	47	14%	59%	24%
Western Bank / Clarkson Road	48	49	47	47	14%	69%	20%
West Street / Leopold Street.	45	49	47	47	14%	59%	24%
Chesterfield Road / Olivet Road	48	47	47	47	14%	76%	18%
Tinsley Junior School Field	44	49	45	45	10%	15%	69%
Catchbar Lane Traffic Light	46	49	45	45	10%	35%	29%
98 Bawtry Road	47	45	44	44	8%	15%	56%
Town Street / Tinsley	43	49	44	44	8%	82%	10%
Chippendale	45	47	44	44	8%	53%	16%
West Street / Regent Street	44	40	44	44	8%	69%	12%
7 Bawtry Gate	46	45	44	43	8%	82%	9%
Ecclesall Road / Pear Street	50	43	43	43	7%	69%	10%
Ecclesfield Road / Low Wincobank	47	47	43	43	7%	90%	7%
73 Burngreave Road	38	43	43	43	6%	61%	10%
879 Abbeydale Road	40	46	43	43	6%	53%	12%
Manchester Road / Sale Road	42	42	43	43	6%	50%	12%
Shoreham Street	49	43	43	42	6%	52%	11%
109 Bawtry Road	42	43	43	42	5%	15%	34%
Sheffield Parkway / Broad Lane duplicate	42	40	42	42	4%	10%	39%
Wicker	38	42	42	42	4%	61%	6%
Queens Road / Netto	40	40	42	42	4%	45%	9%
Attercliffe Road / Meadowhall Retail Park	47	42	42	42	4%	35%	10%
Tinsley Junior School Building	40	44	41	41	2%	15%	10%
Western Bank / Northumberland Road	39	39	41	41	2%	59%	3%
Tinsley GH22	36	44	41	41	2%	80%	2%
Upper Hanover Street	47	38	41	41	1%	69%	2%
Chesterfield Road / Woodseats	46	38	40	40	0%	53%	0%
Duke Street	45	43	40	40	0%	10%	0%
Fielding Road	43	42	39	39	0%	35%	0%
Abbeydale Rd / Carter Knowle	42	39	39	39	0%	44%	0%
Upwell Street	45	36	39	39	0%	64%	0%
Shop Front Parkway R/A	41	39	39	39	0%	30%	0%
Seimens Close	40	44	38	38	0%	15%	0%
Queens Road / Edmund Road	41	36	37	37	0%	45%	0%
Loxley New Road	46	35	36	36	0%	73%	0%
Netherthorpe School	42	37	35	34	0%	69%	0%

Report Appendix E – Data from Observed Emissions Collection

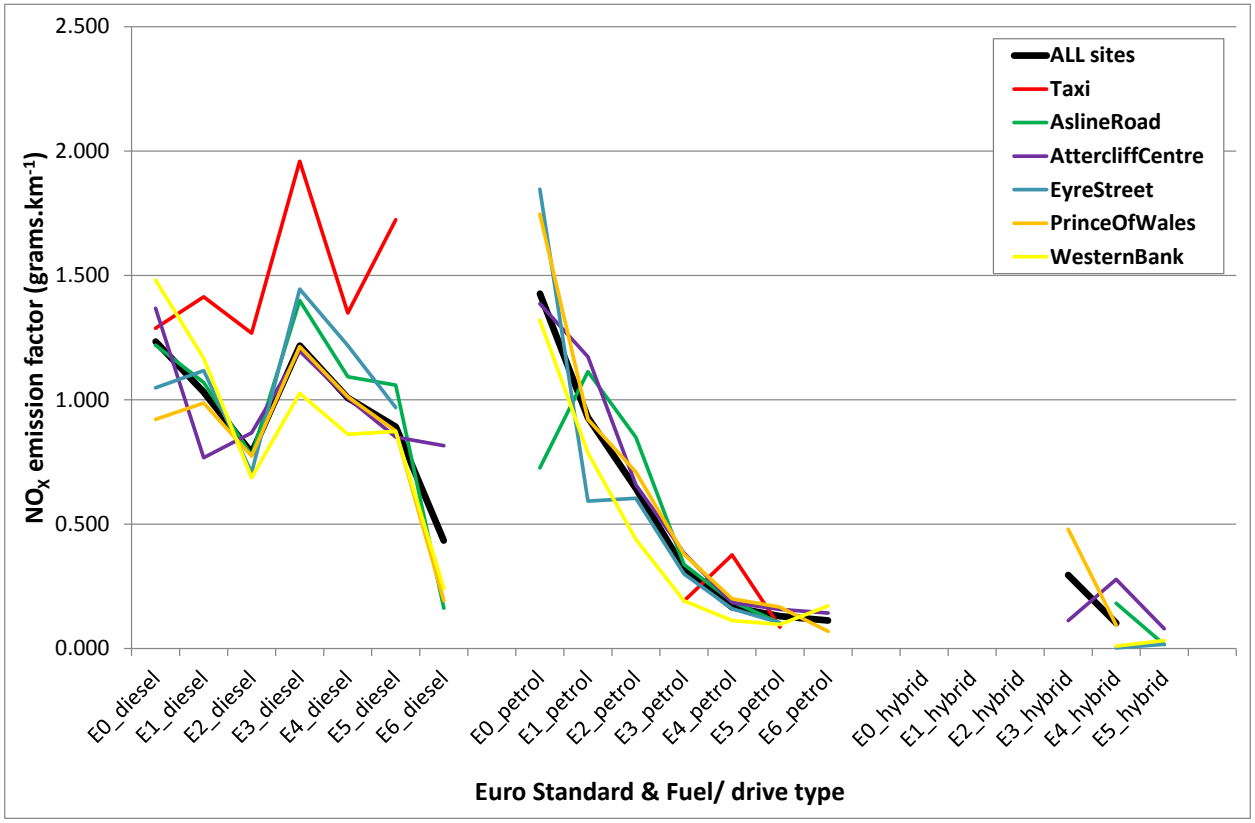
Observed emissions factors - Car

	count	%	co2_final	co_grkm	hc_grkm	no_grkm	no2_grkm	nox_grkm	pm_indexkm
		ALL sites	ALL sites	ALL sites	ALL sites	ALL sites	ALL sites	ALL sites	ALL sites
E0_diesel	86	0.408	219.754	0.146	0.253	1.055	0.179	1.234	64.426
E1_diesel	40	0.190	234.912	0.184	0.242	0.882	0.150	1.032	66.060
E2_diesel	188	0.893	186.229	0.328	0.246	0.633	0.153	0.786	50.281
E3_diesel	2040	9.687	187.820	0.329	0.180	0.593	0.624	1.217	44.290
E4_diesel	3913	18.581	185.920	0.169	0.110	0.411	0.596	1.008	22.664
E5_diesel	2943	13.975	170.074	0.104	0.056	0.422	0.470	0.891	4.542
E6_diesel	8	0.038	184.275	0.124	0.058	0.216	0.218	0.434	3.083
E0_petrol	58	0.275	208.353	8.831	2.414	1.293	0.133	1.426	40.397
E1_petrol	96	0.456	207.638	4.568	1.026	0.842	0.087	0.929	14.494
E2_petrol	1180	5.603	197.554	2.402	0.564	0.583	0.060	0.643	10.609
E3_petrol	4358	20.694	192.752	1.243	0.196	0.293	0.030	0.323	5.946
E4_petrol	4182	19.858	184.778	0.591	0.075	0.151	0.015	0.166	3.855
E5_petrol	1857	8.818	171.393	0.246	0.035	0.118	0.012	0.130	2.875
E6_petrol	4	0.019	171.360	0.102	0.035	0.102	0.011	0.113	0.947
E0_hybrid	0	0.000							
E1_hybrid	0	0.000							
E2_hybrid	0	0.000							
E3_hybrid	2	0.009	127.600	0.048	0.001	0.268	0.028	0.296	2.469
E4_hybrid	16	0.076	186.393	0.134	0.261	0.093	0.010	0.102	7.298
E5_hybrid	88	0.418							
Total	21059								

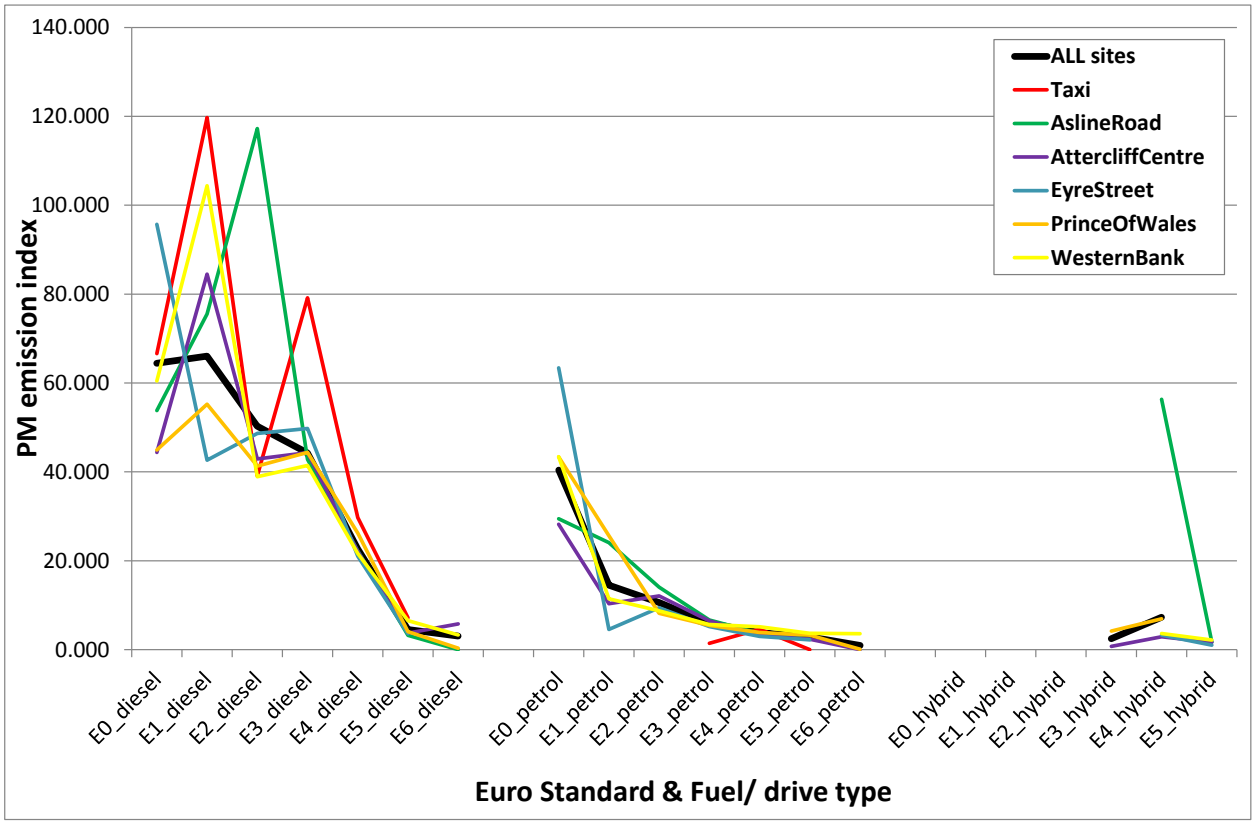
Observed emissions factors - Taxi

	count	%	co2_final	co_grkm	hc_grkm	no_grkm	no2_grkm	nox_grkm	pm_indexkm
		Taxi	Taxi	Taxi	Taxi	Taxi	Taxi	Taxi	Taxi
E0_diesel	79	7.397	217.910	0.140	0.252	1.100	0.187	1.288	66.601
E1_diesel	9	0.843	264.062	0.113	0.398	1.209	0.205	1.414	119.717
E2_diesel	6	0.562	302.867	0.241	0.152	1.021	0.247	1.268	39.124
E3_diesel	279	26.124	227.557	0.331	0.307	0.954	1.005	1.959	79.146
E4_diesel	616	57.678	181.551	0.213	0.156	0.550	0.799	1.349	29.748
E5_diesel	50	4.682	174.716	0.226	0.077	0.815	0.908	1.724	7.191
E6_diesel	0	0.000							
E0_petrol	0	0.000							
E1_petrol	0	0.000							
E2_petrol	0	0.000							
E3_petrol	4	0.375	210.455	1.281	0.092	0.173	0.018	0.191	1.449
E4_petrol	23	2.154	196.441	1.121	0.190	0.341	0.035	0.376	4.617
E5_petrol	1	0.094	205.840	0.353	0.031	0.078	0.008	0.086	0.000
E6_petrol	0	0.000							
E0_hybrid	0	0.000							
E1_hybrid	0	0.000							
E2_hybrid	0	0.000							
E3_hybrid	0	0.000							
E4_hybrid	0	0.000							
E5_hybrid	1	0.094	118.560	0.080	0.000	0.026	0.003	0.029	1.755
Total	1068								

Observed NO_x emissions factors - Car



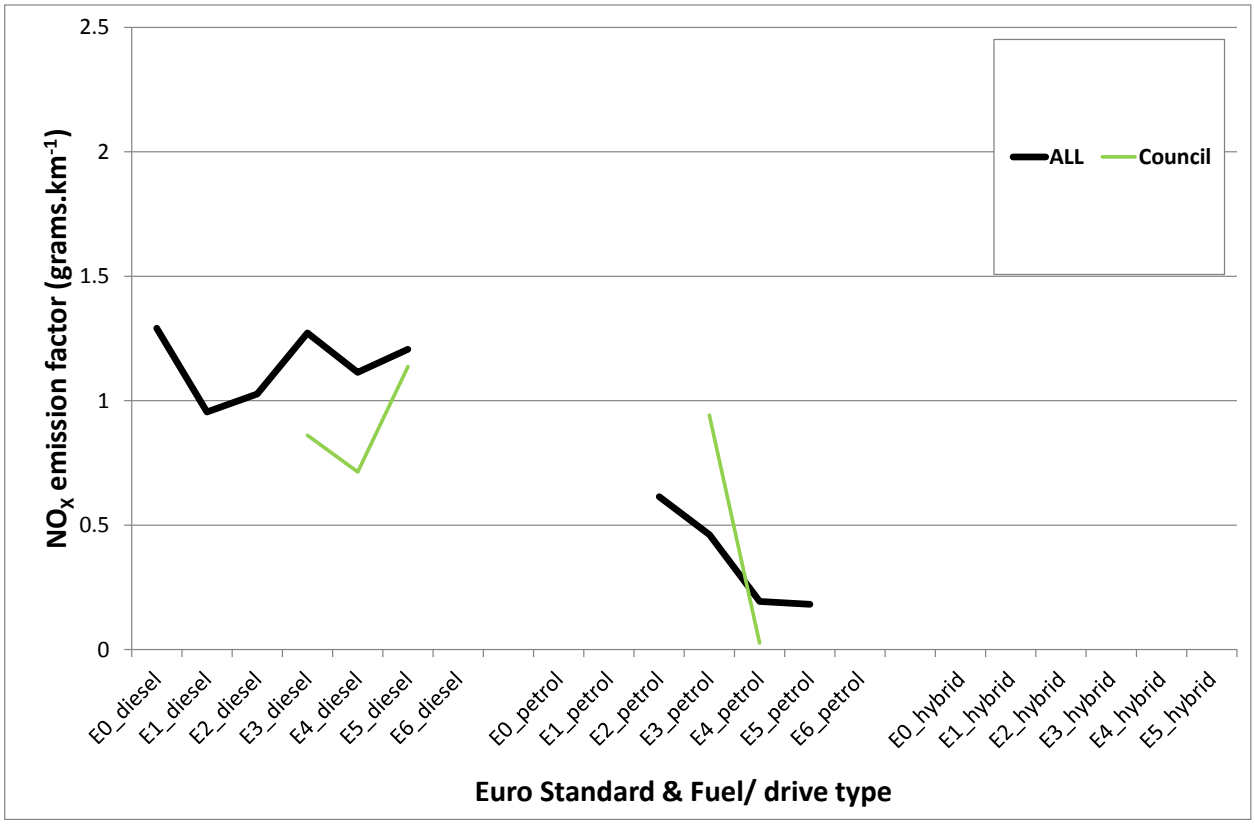
Observed PM emission index - Car



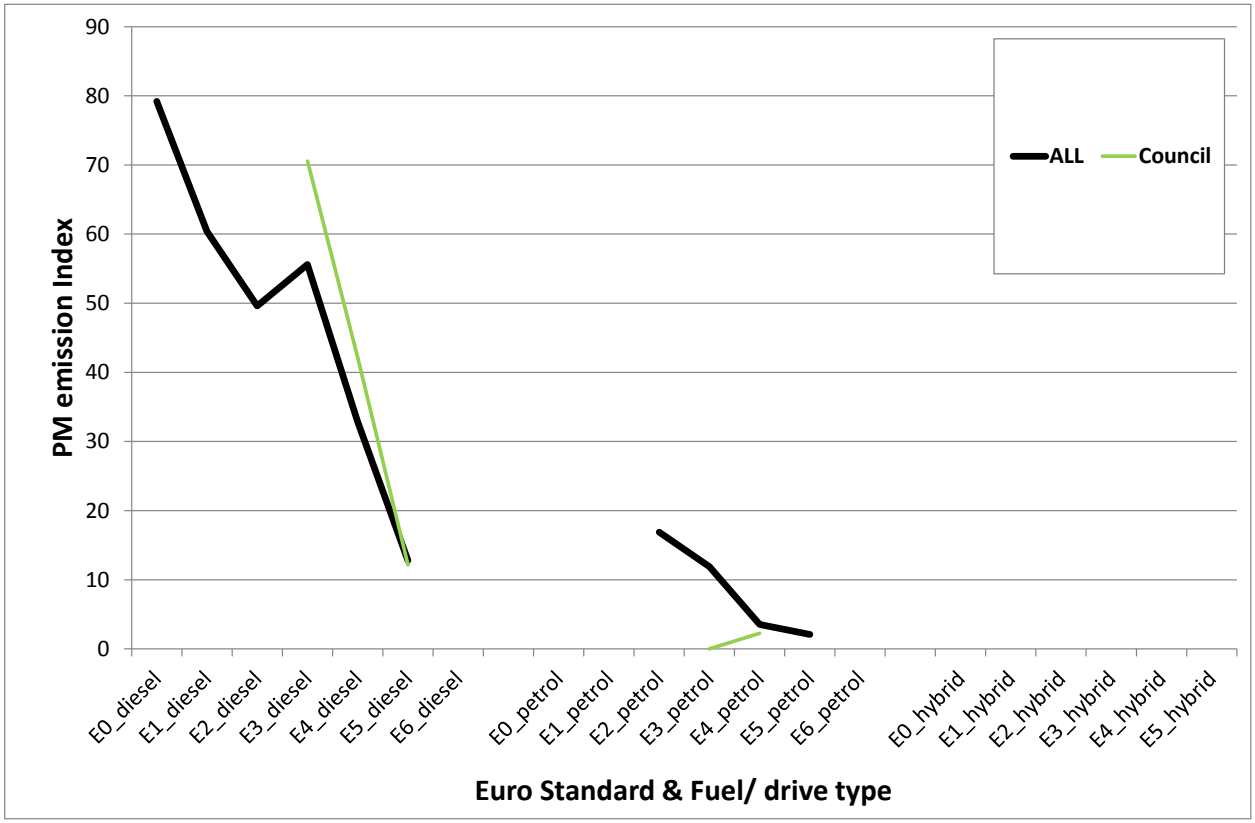
Observed emissions factors -Van

	count	%	co2_final	co_grkm	hc_grkm	no_grkm	no2_grkm	nox_grkm	pm_indexkm
		ALL	ALL	ALL	ALL	ALL	ALL	ALL	ALL
E0_diesel	6	0.125	241.920	0.262	1.374	1.103	0.188	1.291	79.184
E1_diesel	39	0.811	218.742	0.329	0.331	0.816	0.139	0.955	60.396
E2_diesel	134	2.786	201.953	0.517	0.297	0.827	0.200	1.027	49.593
E3_diesel	1178	24.496	188.950	0.323	0.237	0.620	0.652	1.272	55.602
E4_diesel	1956	40.674	194.996	0.143	0.198	0.428	0.685	1.114	32.863
E5_diesel	1430	29.736	220.151	0.153	0.219	0.588	0.619	1.207	12.810
E6_diesel	0	0.000							
E0_petrol	8	0.166	241.920	5.646	2.606	3.214	0.331	3.545	53.274
E1_petrol	0	0.000							
E2_petrol	9	0.187	192.489	0.973	0.379	0.557	0.057	0.614	16.883
E3_petrol	30	0.624	199.169	2.437	0.294	0.419	0.043	0.462	11.901
E4_petrol	12	0.250	184.303	0.784	0.020	0.175	0.018	0.193	3.528
E5_petrol	7	0.146	176.161	0.789	0.025	0.165	0.017	0.182	2.084
E6_petrol	0	0							

Observed NO_x emissions factors - Van



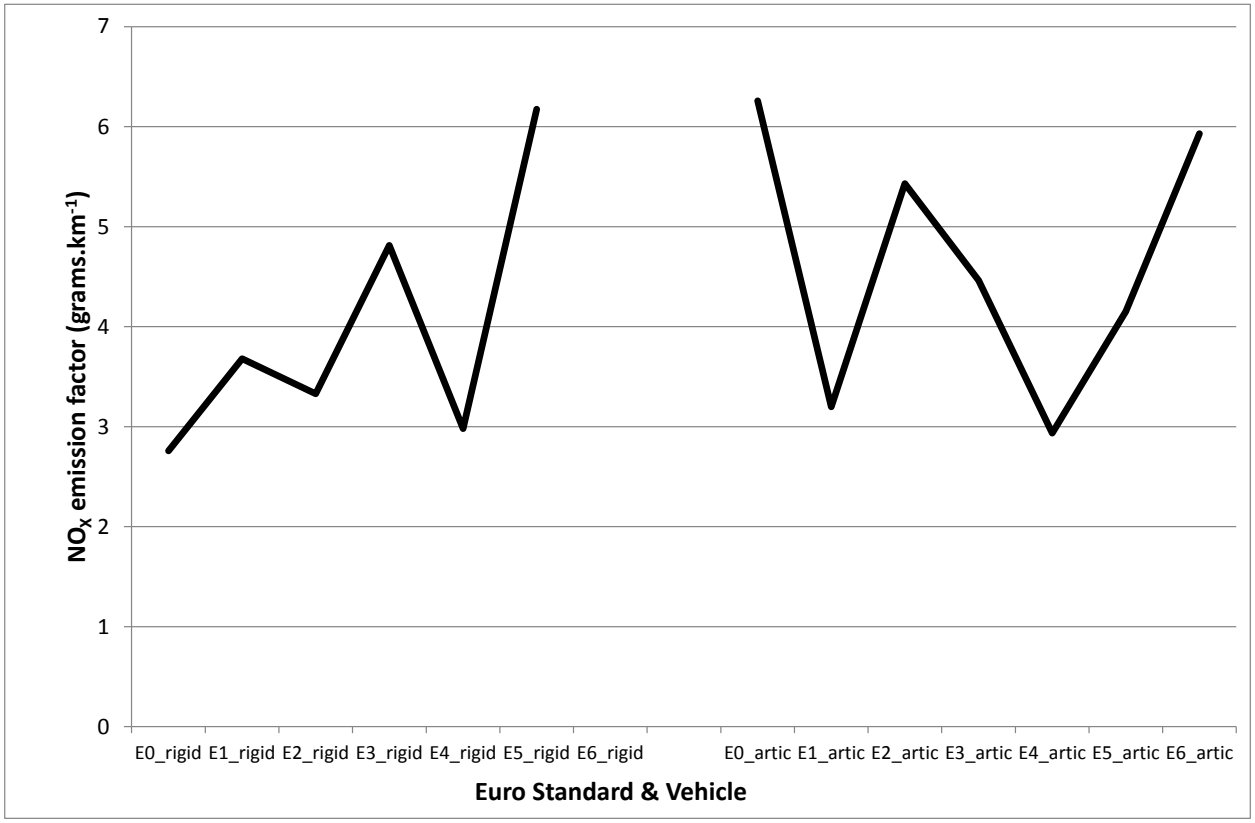
Observed PM emission index – Van



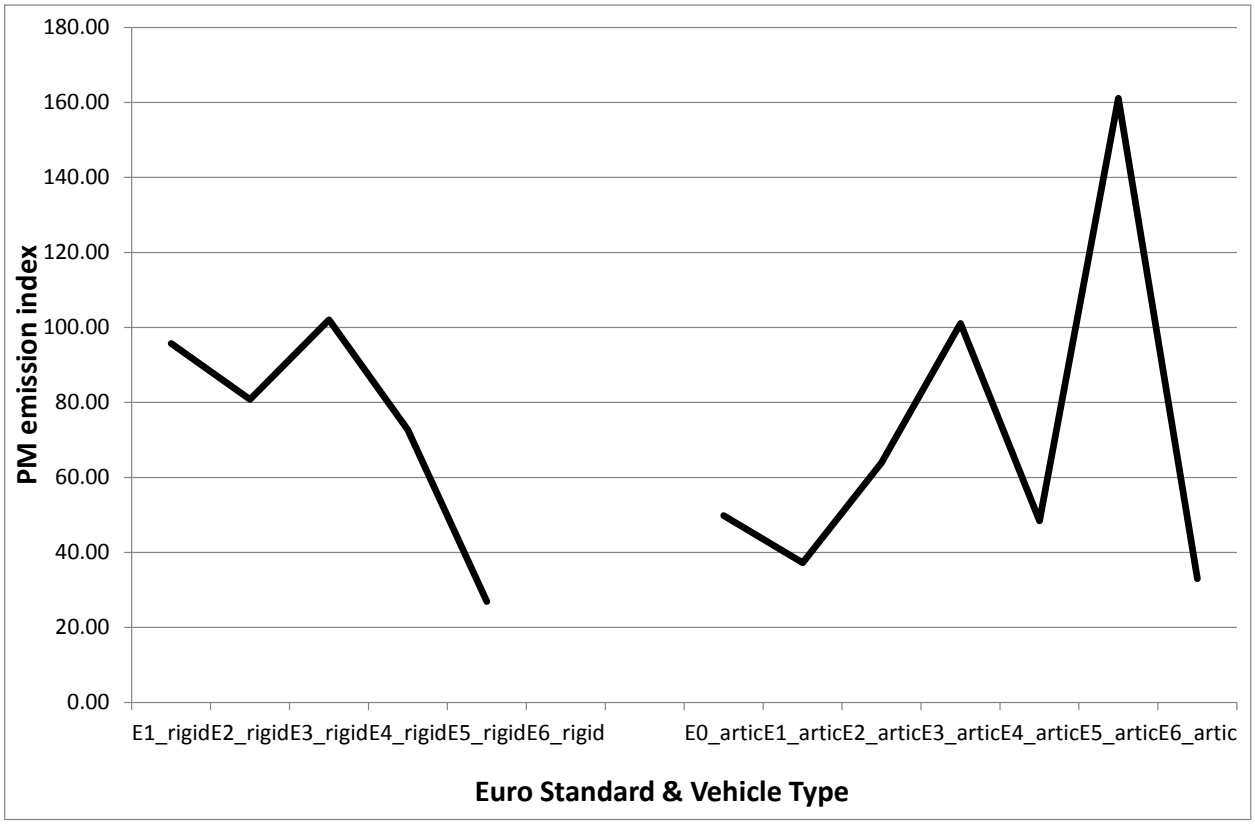
Observed emissions factors -OGV

	count	%	co2_final	co_grkm	hc_grkm	no_grkm	no2_grkm	nox_grkm	pm_indexkm
E0_rigid	1	0.14	539.00	0.52	1.01	2.67	0.09	2.76	94.11
E1_rigid	19	2.75	470.00	1.44	1.10	3.56	0.12	3.68	95.70
E2_rigid	55	7.96	494.00	1.65	1.28	3.16	0.17	3.33	80.83
E3_rigid	185	26.77	630.53	2.28	0.85	4.21	0.60	4.81	102.03
E4_rigid	159	23.01	514.77	0.57	0.40	2.40	0.58	2.98	72.69
E5_rigid	157	22.72	753.00	0.85	0.82	5.34	0.83	6.17	26.92
E6_rigid	0	0.00							
E0_artic	1	0.14	539.00	0.95	2.52	6.05	0.20	6.26	49.80
E1_artic	5	0.72	470.00	0.39	0.12	3.09	0.10	3.20	37.22
E2_artic	6	0.87	494.00	1.80	0.56	5.15	0.28	5.43	63.95
E3_artic	39	5.64	648.59	1.56	0.73	3.91	0.56	4.46	101.07
E4_artic	25	3.62	521.00	1.15	0.33	2.36	0.57	2.93	48.39
E5_artic	37	5.35	753.00	1.24	1.14	3.59	0.56	4.15	161.10
E6_artic	2	0.29	753.00	0.18	0.15	5.13	0.80	5.93	32.98

Observed NO_x emissions factors - OGV



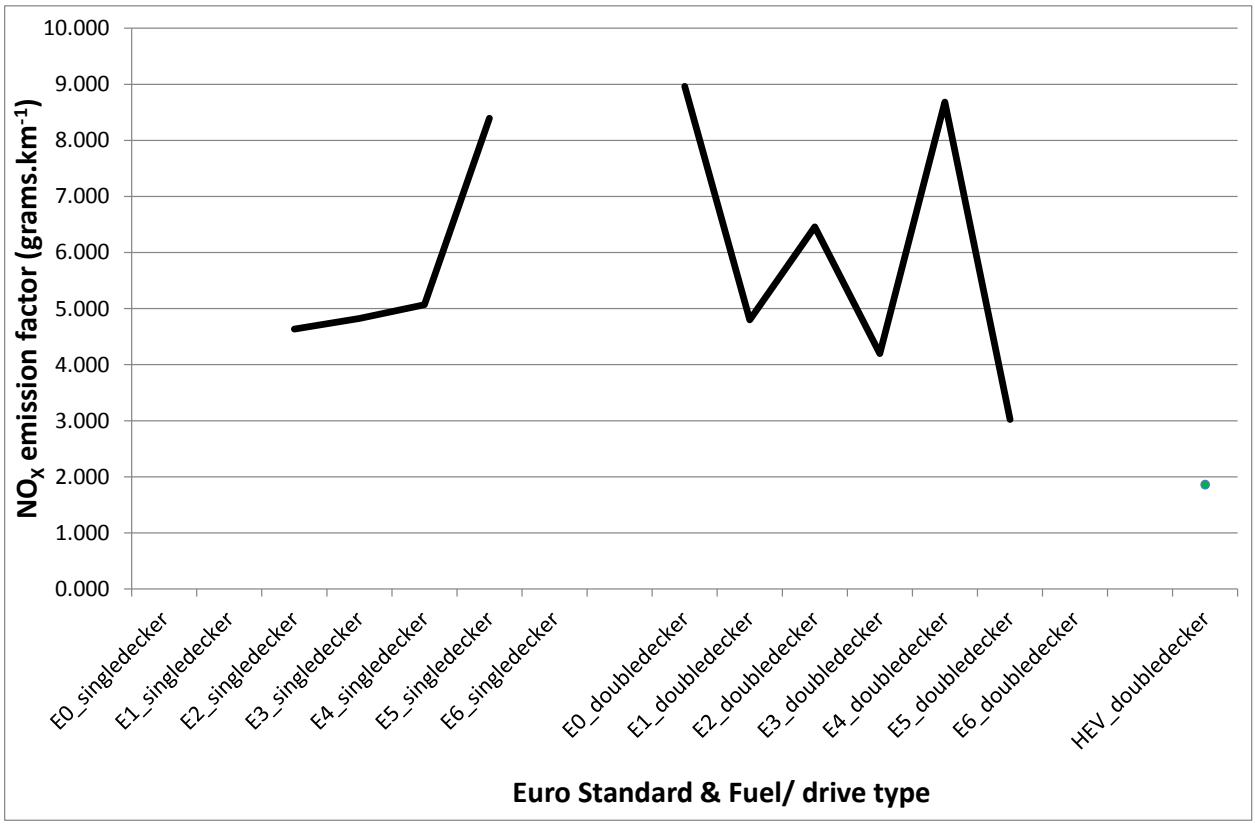
Observed PM emission index – OGV



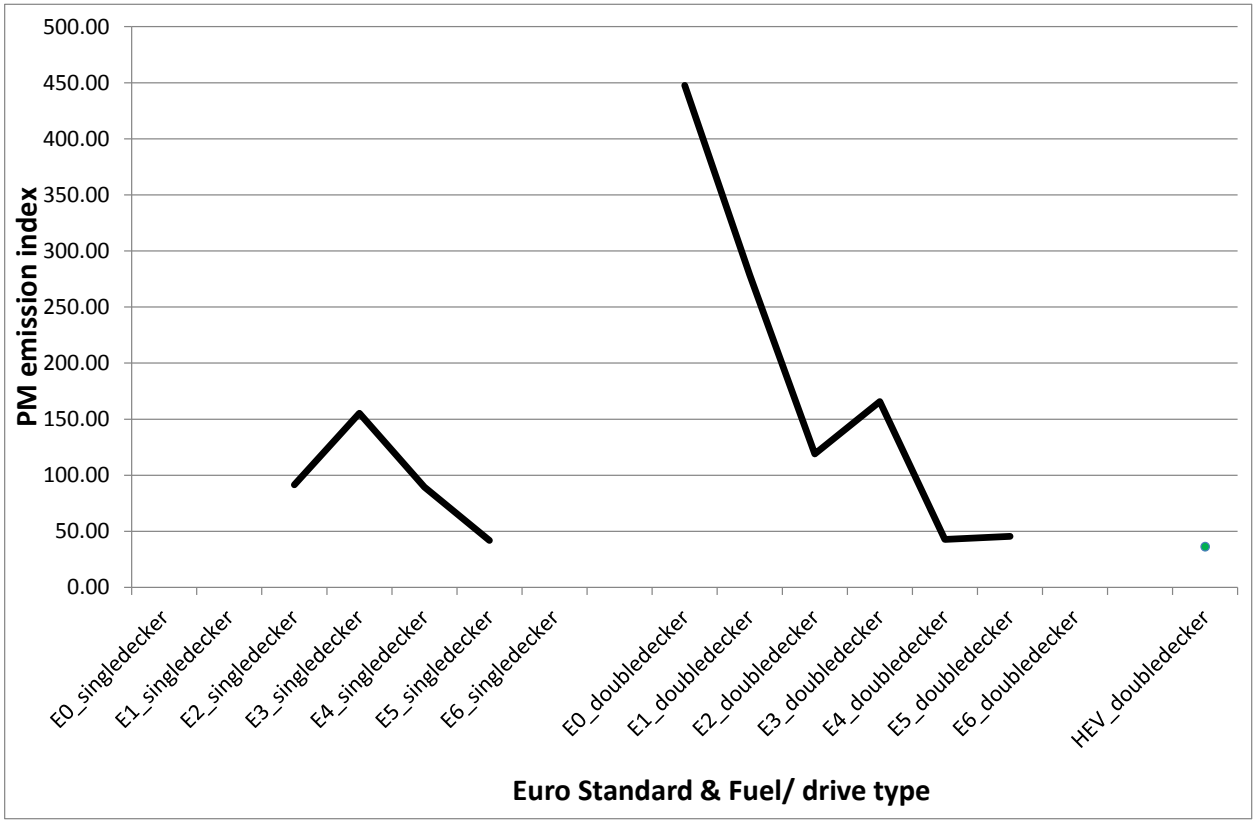
Observed emissions factors -Bus

	count	%	co2_final	co_grkm	hc_grkm	no_grkm	no2_grkm	nox_grkm	pm_indexkm
E0_singledecker	0	0.000							
E1_singledecker	0	0.000							
E2_singledecker	454	27.316	737.000	0.657	0.556	4.353	0.281	4.634	91.396
E3_singledecker	164	9.868	819.000	1.604	0.608	4.237	0.585	4.823	155.217
E4_singledecker	204	12.274	806.000	0.626	0.510	4.289	0.779	5.068	89.476
E5_singledecker	169	10.168	843.000	1.055	0.118	7.317	1.077	8.394	41.798
E6_singledecker	0	0.000							
E0_doubledecker	2	0.120	922.000	1.451	3.025	8.484	0.478	8.962	447.723
E1_doubledecker	3	0.181	730.000	0.747	2.392	4.544	0.256	4.800	278.495
E2_doubledecker	42	2.527	737.000	1.281	0.547	6.065	0.392	6.457	118.996
E3_doubledecker	229	13.779	819.000	1.294	0.715	3.687	0.509	4.196	165.765
E4_doubledecker	175	10.529	806.000	1.675	0.277	7.348	1.334	8.683	42.868
E5_doubledecker	118	7.100	843.000	0.402	0.410	2.635	0.388	3.023	45.569
E6_doubledecker	0	0.000							
HEV_doubledecker	102	6.137	591.000	0.256	0.317	1.622	0.239	1.860	36.323
	1662								

Observed NO_x emissions factors - Bus



Observed PM emission index – Bus



Report Appendix F – ANPR Sites and Summary Fleet Data

ANPR Sites

Site Ref	ANPR Site and direction		Site Ref	ANPR Site and direction
S1	S1 Halifax Rd In - Salt Box La		S8	S8 London Rd In - Broadfield Rd
S1	S1 Halifax Rd Out - Salt Box La DUAL1		S9	S9 Abbeydale Rd Out - Woodseats Rd DUAL
S10	S10 Ecclesall Rd Out - From Hunters Bar Rbt DUAL		S1	S1 Penistone Rd In - Parkside Rd NS
S10	S10 Ecclesall Rd South In - Abbey La		S1	S1 Penistone Rd Out - Parkside Rd DUAL
S10	S10 Moore St Out - From Rbt DUAL		S10	S10 Ecclesall Rd In - From Hunters Bar Rbt DUAL
S10A	S10A Glossop Rd In - Hounsfield La		S10	S10 Ecclesall Rd South Out - Abbey La DUAL
S10A	S10A Glossop Rd Out - Fitzwilliam St		S10	S10 Moore St In - From Rbt
S10B	S10B Rustlings Rd In - Oakbrook Rd		S10A	S10A Brocco Bank In - From Hunters Bar Rbt
S11	S11 Broad La Out (Uphill) - Mappin St		S10B	S10B Rustlings Rd Out - Oakbrook Rd
S11	S11 Fulwood Rd Out - Manchester Rd		S11	S11 Broad La In - Beet St
S11	S11 Manchester Rd In - Sandygate Rd		S11	S11 Fulwood Rd In - Manchester Rd
S11	S11 Regent St Out - Portobello St		S11	S11 Western Bank Out - Clarkson St NS
S11	S11 Western Bank In - Clarkson St NS		S11	S11 Western Bank Out - Clarkson St OS
S11B	S11B Corporation St In - To West Bar Rbt		S11A	S11A Bolsover St In - To Brook Hill Rbt DUAL
S12	S12 Holme La Out - Malinbridge		S11A	S11A Bolsover St Out - From Brook Hill Rbt
S13	S13 Langsett Rd In - Bradfield Rd		S11A	S11A Crookes Valley Rd In & Out - Crookesmoor Rd DUAL
S13	S13 Langsett Rd Out - Bradfield Rd		S11B	S11B Corporation St Out - From West Bar Rbt
S13	S13 Middlewood Rd In - Harris Rd		S13	S13 Middlewood Rd Out - Harris Rd
S14	S14 Bochum Parkway - From Mhead Rbt DUAL		S14	S14 Greenhill Parkway - From Mhead Rbt DUAL
S14	S14 Herries Rd - Penistone Rd		S15	S15 St Marys Gate - From Bramall La Rbt DUAL
S14	S14 Herries Rd - Penistone Rd		S15	S15 St Marys Gate - From Moore St Rbt DUAL
S15	S15 Derek Dooley Way - To Cutlers Gate DUAL		S2A	S2A Pitsmoor Rd In - Mowbray St
S15	S15 Hanover Way - From Moore St Rbt NS		S2B	S2B Cross Hill In & Out - High St DUAL
S15	S15 Hoyle St - Doncaster St NS		S2B	S2B Ecclesfield Rd In & Out - Ecclesfield Rd DUAL
S15	S15 Shalesmoor - From Shalesmoor Rbt DUAL		S2B	S2B Green Ln In & Out - Butterthwaite Ln DUAL
S2	S2 Spital Hill In - Carlisle St DUAL		S3	S3 Meadow Hall Rd In - From M1 J34(N) DUAL
S2A	S2A Chatham St Out - Mowbray St		S3	S3 Savile St In - Spital Hill NS
S2A	S2A Mowbray St In - Pitsmoor Rd DUAL		S3	S3 Savile St In - Spital Hill OS
S2A	S2A Mowbray St Out - Pitsmoor Rd		S4	S4 Furnival Rd In - Derek Dooley Way
S3	S3 Brightside La In - Upwell St NS		S4	S4 Furnival Rd Out - Derek Dooley Way
S3	S3 Brightside La Out - Upwell St		S4	S4 Sheffield Rd In - Centenary Way DUAL
S3	S3 Meadow Hall Rd Out - To M1 J34(N) DUAL		S4	S4 Sheffield Rd In - From M1 J34(S) DUAL
S3	S3 Savile St Out - Spital Hill DUAL		S4	S4 Sheffield Rd Out - Centenary Way DUAL
S4	S4 Attercliffe Common In - Broughton La DUAL		S4	S4 Sheffield Rd Out - To M1 J34(S) DUAL
S4	S4 Attercliffe Common In - Broughton La NS		S5	S5 Rotherway Out - To West Bawtry Rd NS
S4	S4 Attercliffe Common Out - Broughton La DUAL		S5	S5 Sheffield Parkway In - To Park Sq NS
S5	S5 M1 J33 Out - Southbound Slip NS		S8	S8 London Rd Out - Broadfield Rd
S5	S5 Sheffield Parkway In - From M1 J33 NS		S9	S9 Abbeydale Rd In - Woodseats Rd DUAL
S5	S5 Sheffield Parkway In - Markets NS			
S5	S5 Sheffield Parkway In - To Derek Dooley Wy NS			
S5	S5 Sheffield Parkway Out - Markets NS			

ANPR Fleet Summary Data – Sheffield AQMA

City Wide

Total Fleet Split

Main Vehicle Type	Vehicle Subclass	Petrol <=E2	Petrol E3	Petrol E4	Petrol >=E5	Diesel <=E2	Diesel E3	Diesel E4	Diesel >=E5	CNG or equiv	Hybrid Electric	Full Electric	Unclassified	Total
Car	Private Car	6.1%	18.8%	16.2%	5.5%	1.0%	8.2%	14.2%	8.7%	0.1%	0.4%	0.0%	0.0%	79.2%
	Taxi_All	0.0%	0.0%	0.1%	0.0%	0.5%	1.5%	2.8%	0.1%	0.0%	0.0%	0.0%	0.0%	5.0%
	Taxi_Hackney	0.0%	0.0%	0.0%	0.0%	0.6%	1.3%	0.8%	0.1%	0.0%	0.0%	0.0%	0.0%	2.8%
	Taxi_Other	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%	1.8%	0.1%	0.0%	0.0%	0.0%	0.0%	2.2%
LGV	LGV	0.0%	0.1%	0.0%	0.0%	0.5%	3.2%	5.6%	1.9%	0.0%	0.0%	0.0%	0.1%	11.6%
OGV	OGV					0.2%	0.6%	0.5%	0.7%	0.0%	0.0%	0.0%	0.0%	2.0%
Bus	Bus_All					0.3%	0.8%	0.5%	0.1%	0.0%	0.2%	0.0%	0.0%	1.8%
	Bus_SingleD					*0.25%*	*0.24%*	*0.16%*	*0.02%*	*0.00%*	*0.00%*	*0.0%*	*0.0%*	0.7%
	Bus_DoubleD					*0.06%*	*0.52%*	*0.30%*	*0.09%*	*0.00%*	*0.17%*	*0.0%*	*0.0%*	1.1%
Other	Other	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%	0.3%
Total		6.1%	18.9%	16.3%	5.5%	2.5%	14.2%	23.6%	11.6%	0.1%	0.6%	0.0%	0.4%	100.0%

Vehicle Subclass Propulsion Split

Main Vehicle Type	Vehicle Subclass	Petrol <=E2	Petrol E3	Petrol E4	Petrol >=E5	Diesel <=E2	Diesel E3	Diesel E4	Diesel >=E5	CNG or equiv	Hybrid Electric	Full Electric	Unclassified	Total
Car	Private Car	7.7%	23.7%	20.4%	6.9%	1.3%	10.3%	17.9%	11.0%	0.1%	0.6%	0.0%	0.0%	100.0%
	Taxi_All	0.1%	0.2%	1.1%	0.1%	10.2%	29.1%	56.3%	2.7%	0.0%	0.2%	0.0%	0.0%	100.0%
	Taxi_Hackney	0.2%	0.0%	0.0%	0.0%	21.5%	47.0%	28.9%	2.4%	0.0%	0.0%	0.0%	0.0%	100.0%
	Taxi_Other	0.0%	0.3%	2.0%	0.3%	0.0%	13.0%	81.0%	3.1%	0.0%	0.4%	0.0%	0.0%	100.0%
LGV	LGV	0.3%	0.6%	0.3%	0.0%	4.3%	28.1%	48.6%	16.5%	0.2%	0.0%	0.0%	1.0%	100.0%
OGV	OGV					8.5%	30.0%	26.4%	34.9%	0.2%	0.0%	0.0%	0.0%	100.0%
Bus	Bus_All					17.2%	41.9%	25.7%	5.9%	0.0%	9.3%	0.0%	0.0%	100.0%
	Bus_SingleD					*37.9%*	*35.3%*	*23.9%*	*2.9%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*	100.0%
	Bus_DoubleD					*4.9%*	*45.8%*	*26.8%*	*7.7%*	*0.0%*	*14.8%*	*0.0%*	*0.0%*	100.0%
Other	Other	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%	0.0%	0.4%	99.4%	100.0%

Report Appendix G – Transport Modelling Updates

2008 to 2012 Growth Factors

	AM	IP	PM
Car	1.02	1.00	0.96
LGV <3.5T	1.00	0.96	0.89
OGV >3.5T	0.79	0.81	0.85

2012 Values of Time (PPM and PPK Values)

	PPM (AM)	PPM (IP)	PPM (PM)	PPK
Car – Employer's Business	46.47	48.03	46.47	12.44
Car – Low Income	7.56	9.45	8.53	6.72
Car –Medium Income	10.30	12.07	11.24	6.72
Car – High Income	13.67	14.73	14.20	6.72
LGV <3.5T	18.81	18.90	18.81	13.93
OGV >3.5T	15.67	16.28	15.67	42.57

Report Appendix H – Detailed Strategy Component Results (LESAT)

Option	Strategy Component Description	Effectiveness (Total NO_x Reduction)	% Total Fleet Affected	Efficiency (NO_x) higher = more efficient	Cost per fleet of 1000 vehicles (in total fleet) £m	Cost Effectiveness (% NO_x reduction per £m for fleet upgrade)
Option 0 - Do Minimum 2015	Accounts for fleet renewal from 2013 to Strategy Year	7%	0%			
Option 0 - Do Minimum 2020	Illustrates the year in which reduction in NOx of 30% would occur through fleet renewal alone	35%	0%			
Option 1a - Bus Taxi EuroA	Bus and Taxi Euroclass strategy (low achievement) - Taxi E5+ - Bus E5+	8%	5%	Very Low	Low	Very Low
Option 1b - Bus Taxi EuroB	Bus and Taxi Euroclass strategy (medium achievement) - Taxi E6 - Bus E6	19%	6%	High	Low	Low
Option 1c - Bus Taxi ERA	Bus and Taxi Emission rate (medium achievement) - proportion of each fleet type affected - 30-40%	12%	2%	High	Very Low	High
Option 1d - Bus Taxi ERB	Bus and Taxi Emission rate (medium achievement) - proportion of each fleet type affected - 60-70%	16%	4%	High	Low	Medium
Option 1e - Bus Taxi ERC	Bus and Taxi Emission rate (medium achievement) - proportion of each fleet type affected - 75-85%	18%	5%	High	Low	Low
Option 1f - Bus ERCb	*Bus Emission rate (medium achievement separated)* *- proportion of fleet type affected - 75-85%*	*12%*	*1%*	High	Low	Low
Option 1g - Taxi ERCt	*Taxi Emission rate (medium achievement separated)* *- proportion of fleet type affected - 75-85%*	*13%*	*4%*	High	Very Low	Medium
Option 2a - Bus Taxi GVs EuroA	Bus, Taxi, Goods Vehicles Euroclass strategy (very low achievement) - Taxi E5+ - Bus E5+ - Goods E5+	5%	13%	Very Low	Medium	
Option 2b - Bus Taxi GVs EuroB	Bus, Taxi, Goods Vehicles Euroclass strategy (excessive achievement) - Taxi E6 - Bus E6 - Goods E6	40%	19%	Low	High	Low
Option 2c - Bus Taxi GVs ERA	Bus, Taxi, Goods Vehicles Emission rate (medium achievement) - proportion of each fleet type affected - 10-25%	14%	4%	Medium	Very Low	High
Option 2d - Bus Taxi GVs ERB	Bus, Taxi, Goods Vehicles Emission rate (high achievement) - proportion of each fleet type affected - 35-45%	22%	8%	Medium	Low	Medium
Option 2e - Bus Taxi GVs ERC	Bus, Taxi, Goods Vehicles Emission rate (high achievement) - proportion of each fleet type affected - 50-65%	27%	11%	Medium	Medium	Low
** Results can be pro-rated by % Vehicles Switching Option 3a - Dies-Pet only	100% Diesel Vehicles Switch to Petrol - affecting Car, LGV, Taxi PHV	45%	46%	Very Low		
** Results can be pro-rated by % Vehicles Switching Option 3b - Dies-Pet_CNG	100% Diesel Vehicles Switch to Petrol or CNG/equivalent - Petrol for Car, LGV, Taxi PHV - CNG for Taxi Hackney, OGV, Bus	63%	52%	Low	High	Low
** Results can be pro-rated by % Vehicles Switching Option 4a - Diesel Car switch	100% Diesel Cars Switch to Petrol	33%	32%	Very Low		
** Results can be pro-rated by % Vehicles Removed Option 4b - Diesel Car remove	100% Diesel cars removed and not replaced	41%	32%	Low		

Strategy Achievement	Achievement Description
Very Low	0-5% NOx emission reduction
Low	5-10% NOx emission reduction
Medium	10-20% NOx emission reduction
High	20-30% NOx emission reduction
Excessive	30%+ NOx emission reduction

Cost Indicator	Cost per 1000 vehicle fleet
Very Low	<£1m
Low	1-5
Medium	5-10
High	10+

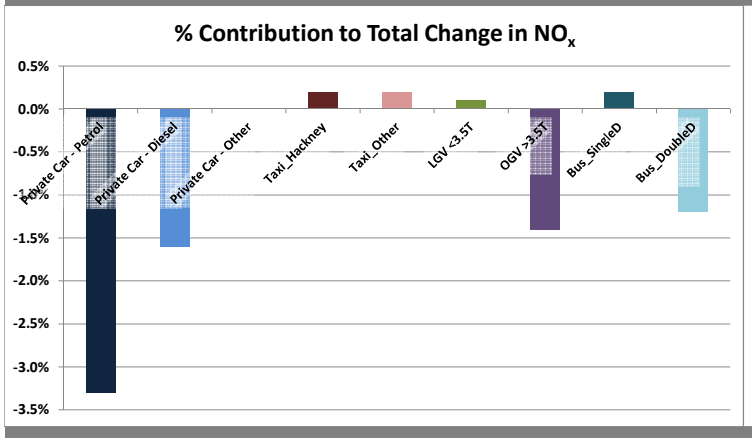
Strategy Year	2015

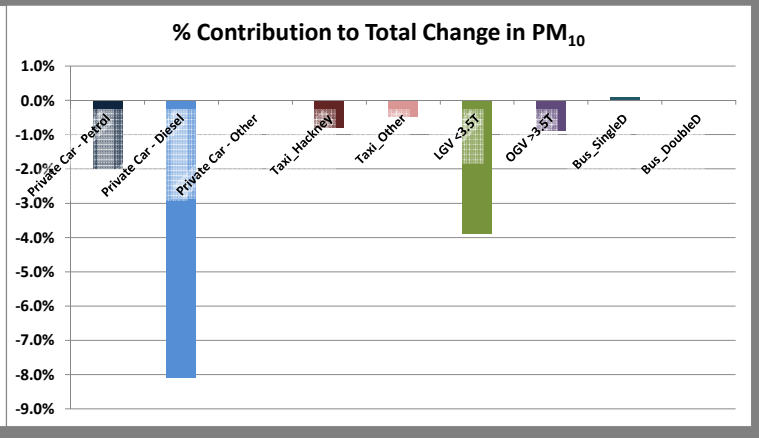
Description Do Min 2015 Accounts for fleet renewal from 2013 to Strategy Year

Fleet Characteristics		Do Minimum NO_x Emission Rates (g/km)			Do Minimum PM_{10} Emission Rates (index/km)			ERROR COMMENT	Strategy Setting: By Emission Rate		By Euroclass	Fleet Change	
Main Vehicle Type	Vehicle Subclass	Existing minimum	Existing mean	Existing maximum	Existing minimum	Existing mean	Existing maximum		Target Maximum NO_x Emission Rate	Target Maximum PM_{10} Emission Rate	Minimum permitted Euroclass	Switch Petrol/ Diesel %	Remove %
Car	Private Car - Petrol	0.10	0.37	8.00	5	9	400		None	None	None	0	0
	Private Car - Diesel	0.10	1.07	7.00	5	27	1100		None	None	None		0
	Private Car - Other	0.10	0.14	0.70	5	6	60		None	None	None	-	0
	Taxi_Hackney	0.10	1.98	20.00	5	73	1100		None	None	None	-	0
	Taxi_Other	0.10	1.46	8.00	5	34	1100		None	None	None	0	0
LGV <3.5T	LGV <3.5T	0.10	1.29	9.00	5	42	700		None	None	None	0	0
OGV >3.5T	OGV >3.5T	0.10	4.94	24.00	5	82	4000		None	None	None	-	0
Bus	Bus_SingleD	0.10	5.39	20.00	5	126	1300		None	None	None	-	0
	Bus_DoubleD	0.10	5.55	29.00	5	113	1800		None	None	None	-	0
Total													

Impact of Strategy		Do Minimum		Strategy		Do Minimum		Strategy				Average Cost per affected vehicle
Main Vehicle Type	Vehicle Subclass	% Change in NO_x	% Contribution to Total Change in NO_x	% Change in NO_x	% Contribution to Total Change in NO_x	% Change in PM_{10}	% Contribution to Total Change in PM_{10}	% Change in PM_{10}	% Contribution to Total Change in PM_{10}	Proportion of fleet affected		
Car	Private Car - Petrol	-18.3%	-3.3%	-18.3%	-3.3%	-10.9%	-2.0%	-10.9%	-2.0%	0%		£ -
	Private Car - Diesel	-4.3%	-1.6%	-4.3%	-1.6%	-23.0%	-8.1%	-23.0%	-8.1%	0%		£ -
	Private Car - Other	0.1%	0.0%	0.1%	0.0%	0.1%	0.0%	0.1%	0.0%	0%		£ -
	Taxi_Hackney	2.6%	0.2%	2.6%	0.2%	-9.8%	-0.8%	-9.8%	-0.8%	0%		£ -
	Taxi_Other	6.3%	0.2%	6.3%	0.2%	-15.9%	-0.5%	-15.9%	-0.5%	0%		£ -
LGV <3.5T	LGV <3.5T	0.8%	0.1%	0.8%	0.1%	-19.7%	-3.9%	-19.7%	-3.9%	0%		£ -
OGV >3.5T	OGV >3.5T	-13.3%	-1.4%	-13.3%	-1.4%	-13.0%	-0.9%	-13.0%	-0.9%	0%		£ -
	Bus_SingleD	4.2%	0.2%	4.2%	0.2%	3.1%	0.1%	3.1%	0.1%	0%		£ -
Bus	Bus_DoubleD	-18.1%	-1.2%	-18.1%	-1.2%	-0.7%	0.0%	-0.7%	0.0%	0%		£ -
Total		-6.8%	-6.8%	-6.8%	-6.8%	-16.1%	-16.1%	-16.1%	-16.1%	0%	Cost per fleet of 1000 vehicles (£m)	0.00
Strategy Effectiveness				Efficiency	Cost Effectiveness			Efficiency	Cost Effectiveness			

Mode	Vehicle Multiplier (based to car)
Private Car	1.0
Private Car	1.0
Private Car	1.0
Taxi_Hackney	5.4
Taxi_Other	4.2
LGV <3.5T	1.1
OGV >3.5T	1.0
BUS	4.3
BUS	4.3

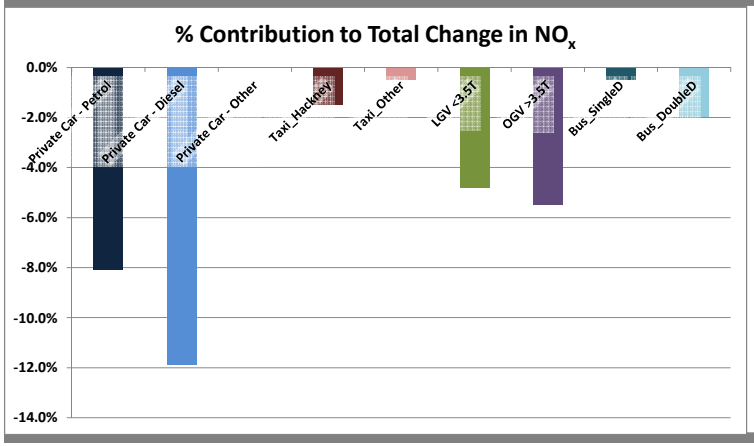


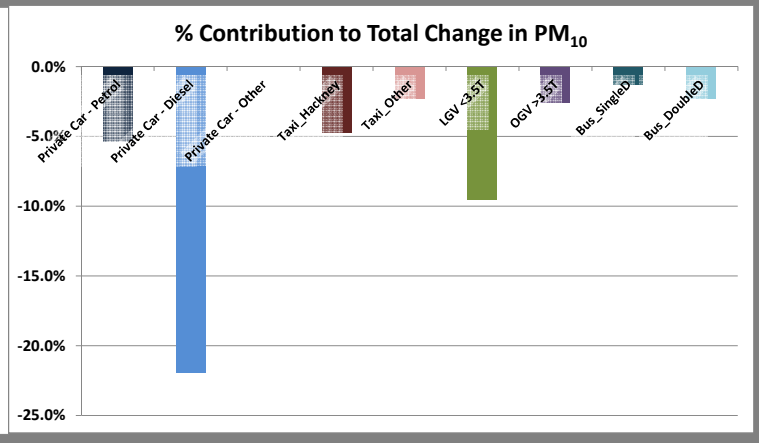


Strategy Year	2020	Description	Do Min 2020	Illustrates the year in which reduction in NOx of 30% would occur through fleet renewal alone

Fleet Characteristics		Do Minimum NO_x Emission Rates (g/km)			Do Minimum PM_{10} Emission Rates (index/km)			ERROR COMMENT	Strategy Setting: By Emission Rate		By Euroclass	Fleet Change	
Main Vehicle Type	Vehicle Subclass	Existing minimum	Existing mean	Existing maximum	Existing minimum	Existing mean	Existing maximum		Target Maximum NO_x Emission Rate	Target Maximum PM_{10} Emission Rate	Minimum permitted Euroclass	Switch Petrol/ Diesel %	Remove %
Car	Private Car - Petrol	0.10	0.37	8.00	5	9	400		None	None	None	0	0
	Private Car - Diesel	0.10	1.07	7.00	5	27	1100		None	None	None		0
	Private Car - Other	0.10	0.14	0.70	5	6	60		None	None	None	-	0
	Taxi_Hackney	0.10	1.98	20.00	5	73	1100		None	None	None	-	0
	Taxi_Other	0.10	1.46	8.00	5	34	1100		None	None	None	0	0
LGV <3.5T	LGV <3.5T	0.10	1.29	9.00	5	42	700		None	None	None	0	0
OGV >3.5T	OGV >3.5T	0.10	4.94	24.00	5	82	4000		None	None	None	-	0
Bus	Bus_SingleD	0.10	5.39	20.00	5	126	1300		None	None	None	-	0
	Bus_DoubleD	0.10	5.55	29.00	5	113	1800		None	None	None	-	0
Total													

Impact of Strategy		Do Minimum		Strategy		Do Minimum		Strategy				Mode	Vehicle Multiplier (based to car)
Main Vehicle Type	Vehicle Subclass	% Change in NO_x	% Contribution to Total Change in NO_x	% Change in NO_x	% Contribution to Total Change in NO_x	% Change in PM_{10}	% Contribution to Total Change in PM_{10}	% Change in PM_{10}	% Contribution to Total Change in PM_{10}	Proportion of fleet affected		Average Cost per affected vehicle	
Car	Private Car - Petrol	-44.8%	-8.1%	-44.8%	-8.1%	-30.2%	-5.4%	-30.2%	-5.4%	0%		£ -	Private Car 1.0
	Private Car - Diesel	-33.1%	-11.9%	-33.1%	-11.9%	-61.9%	-21.9%	-61.9%	-21.9%	0%		£ -	Private Car 1.0
	Private Car - Other	0.1%	0.0%	0.1%	0.0%	0.1%	0.0%	0.1%	0.0%	0%		£ -	Private Car 1.0
	Taxi_Hackney	-25.6%	-1.5%	-25.6%	-1.5%	-56.5%	-4.7%	-56.5%	-4.7%	0%		£ -	Taxi_Hackney 5.4
	Taxi_Other	-14.8%	-0.5%	-14.8%	-0.5%	-73.9%	-2.3%	-73.9%	-2.3%	0%		£ -	Taxi_Other 4.2
LGV <3.5T	LGV <3.5T	-31.0%	-4.8%	-31.0%	-4.8%	-48.4%	-9.5%	-48.4%	-9.5%	0%		£ -	LGV <3.5T 1.1
OGV >3.5T	OGV >3.5T	-51.5%	-5.5%	-51.5%	-5.5%	-37.5%	-2.6%	-37.5%	-2.6%	0%		£ -	OGV >3.5T 1.0
	Bus_SingleD	-14.3%	-0.5%	-14.3%	-0.5%	-39.3%	-1.3%	-39.3%	-1.3%	0%		£ -	BUS 4.3
Bus	Bus_DoubleD	-30.7%	-2.0%	-30.7%	-2.0%	-44.2%	-2.3%	-44.2%	-2.3%	0%		£ -	BUS 4.3
Total		-34.9%	-34.8%	-34.9%	-34.8%	-50.0%	-50.0%	-50.0%	-50.0%	0%	Cost per fleet of 1000 vehicles (£m)	0.00	
Strategy Effectiveness				Efficiency	Cost Effectiveness			Efficiency	Cost Effectiveness				



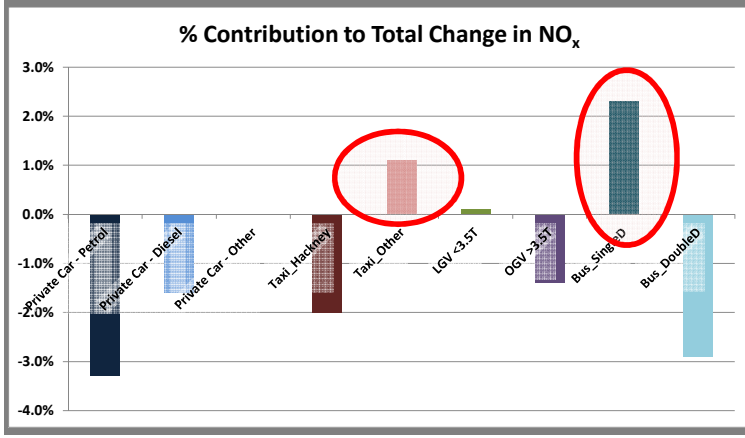


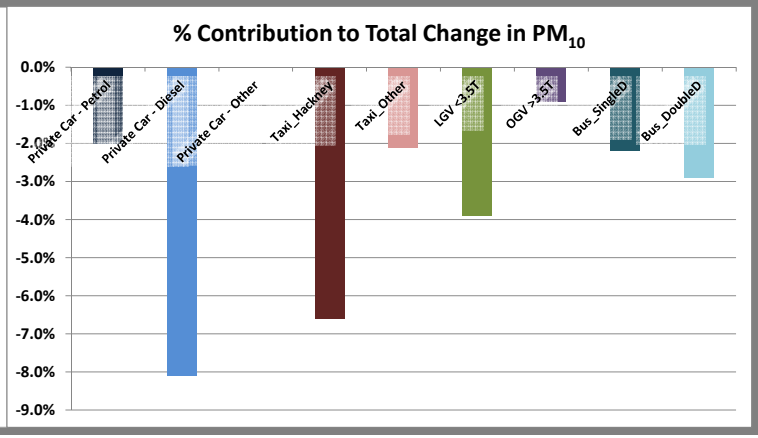
Strategy Year	2015	Description	Option 1a	Bus and Taxi Euroclass strategy (low achievement) - Taxi E5+ - Bus E5+

Fleet Characteristics		Do Minimum NO_x Emission Rates (g/km)			Do Minimum PM_{10} Emission Rates (index/km)			ERROR COMMENT	Strategy Setting: By Emission Rate		By Euroclass	Fleet Change	
Main Vehicle Type	Vehicle Subclass	Existing minimum	Existing mean	Existing maximum	Existing minimum	Existing mean	Existing maximum		Target Maximum NO_x Emission Rate	Target Maximum PM_{10} Emission Rate	Minimum permitted Euroclass	Switch Petrol/ Diesel %	Remove %
Car	Private Car - Petrol	0.10	0.37	8.00	5	9	400		None	None	None	0	0
	Private Car - Diesel	0.10	1.07	7.00	5	27	1100		None	None	None		0
	Private Car - Other	0.10	0.14	0.70	5	6	60		None	None	None	-	0
	Taxi_Hackney	0.10	1.98	20.00	5	73	1100		None	None	E5	-	0
	Taxi_Other	0.10	1.46	8.00	5	34	1100		None	None	E5	0	0
LGV <3.5T	LGV <3.5T	0.10	1.29	9.00	5	42	700		None	None	None	0	0
OGV >3.5T	OGV >3.5T	0.10	4.94	24.00	5	82	4000		None	None	None	-	0
Bus	Bus_SingleD	0.10	5.39	20.00	5	126	1300		None	None	E5	-	0
	Bus_DoubleD	0.10	5.55	29.00	5	113	1800		None	None	E5	-	0
Total													

Impact of Strategy		Do Minimum		Strategy		Do Minimum		Strategy					
Main Vehicle Type	Vehicle Subclass	% Change in NO_x	% Contribution to Total Change in NO_x	% Change in NO_x	% Contribution to Total Change in NO_x	% Change in PM_{10}	% Contribution to Total Change in PM_{10}	% Change in PM_{10}	% Contribution to Total Change in PM_{10}	Proportion of fleet affected		Average Cost per affected vehicle	
Car	Private Car - Petrol	-18.3%	-3.3%	-18.3%	-3.3%	-10.9%	-2.0%	-10.9%	-2.0%	0%		£	-
	Private Car - Diesel	-4.3%	-1.6%	-4.3%	-1.6%	-23.0%	-8.1%	-23.0%	-8.1%	0%		£	-
	Private Car - Other	0.1%	0.0%	0.1%	0.0%	0.1%	0.0%	0.1%	0.0%	0%		£	-
	Taxi_Hackney	2.6%	0.2%	-34.5%	-2.0%	-9.8%	-0.8%	-79.6%	-6.6%	91%		£	9,000
	Taxi_Other	6.3%	0.2%	32.9%	1.1%	-15.9%	-0.5%	-68.3%	-2.1%	82%		£	7,000
LGV <3.5T	LGV <3.5T	0.8%	0.1%	0.8%	0.1%	-19.7%	-3.9%	-19.7%	-3.9%	0%		£	-
OGV >3.5T	OGV >3.5T	-13.3%	-1.4%	-13.3%	-1.4%	-13.0%	-0.9%	-13.0%	-0.9%	0%		£	-
	Bus_SingleD	4.2%	0.2%	60.7%	2.3%	3.1%	0.1%	-63.1%	-2.2%	84%		£	25,000
Bus	Bus_DoubleD	-18.1%	-1.2%	-43.6%	-2.9%	-0.7%	0.0%	-55.4%	-2.9%	60%		£	57,000
Total		-6.8%	-6.8%	-7.6%	-7.7%	-16.1%	-16.1%	-28.7%	-28.7%	5%	Cost per fleet of 1000 vehicles (£m)		1.97
Strategy Effectiveness				Efficiency	Cost Effectiveness			Efficiency	Cost Effectiveness				
				7.5	0.5			105.3	6.4				

Mode	Vehicle Multiplier (based to car)
Private Car	1.0
Private Car	1.0
Private Car	1.0
Taxi_Hackney	5.4
Taxi_Other	4.2
LGV <3.5T	1.1
OGV >3.5T	1.0
BUS	4.3
BUS	4.3



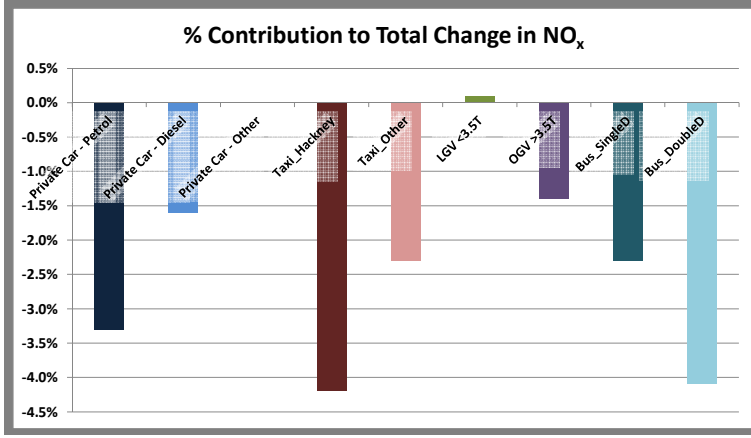


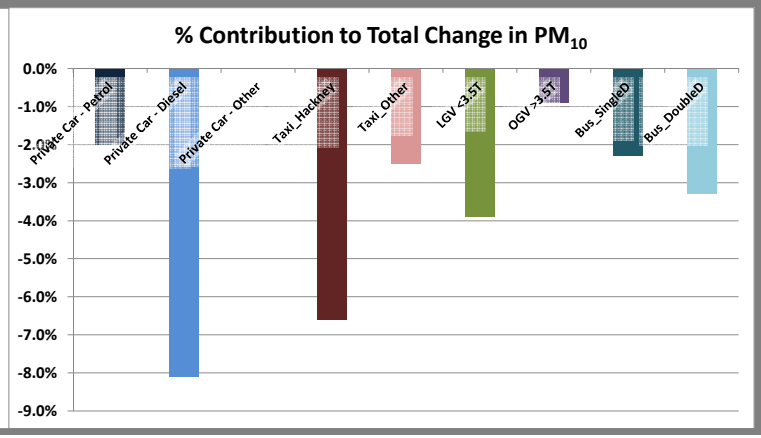
Strategy Year	2015	Description	option 1b	Bus and Taxi Euroclass strategy (medium achievement) - Taxi E6 - Bus E6

Fleet Characteristics		Do Minimum NO_x Emission Rates (g/km)			Do Minimum PM_{10} Emission Rates (index/km)			ERROR COMMENT	Strategy Setting: By Emission Rate		By Euroclass	Fleet Change	
Main Vehicle Type	Vehicle Subclass	Existing minimum	Existing mean	Existing maximum	Existing minimum	Existing mean	Existing maximum		Target Maximum NO_x Emission Rate	Target Maximum PM_{10} Emission Rate	Minimum permitted Euroclass	Switch Petrol/ Diesel %	Remove %
Car	Private Car - Petrol	0.10	0.37	8.00	5	9	400		None	None	None	0	0
	Private Car - Diesel	0.10	1.07	7.00	5	27	1100		None	None	None		0
	Private Car - Other	0.10	0.14	0.70	5	6	60		None	None	None	-	0
	Taxi_Hackney	0.10	1.98	20.00	5	73	1100		None	None	E6	-	0
	Taxi_Other	0.10	1.46	8.00	5	34	1100		None	None	E6	0	0
LGV <3.5T	LGV <3.5T	0.10	1.29	9.00	5	42	700		None	None	None	0	0
OGV >3.5T	OGV >3.5T	0.10	4.94	24.00	5	82	4000		None	None	None	-	0
Bus	Bus_SingleD	0.10	5.39	20.00	5	126	1300		None	None	E6	-	0
	Bus_DoubleD	0.10	5.55	29.00	5	113	1800		None	None	E6	-	0
Total													

Impact of Strategy		Do Minimum		Strategy		Do Minimum		Strategy				Average Cost per affected vehicle
Main Vehicle Type	Vehicle Subclass	% Change in NO_x	% Contribution to Total Change in NO_x	% Change in NO_x	% Contribution to Total Change in NO_x	% Change in PM_{10}	% Contribution to Total Change in PM_{10}	% Change in PM_{10}	% Contribution to Total Change in PM_{10}	Proportion of fleet affected		
Car	Private Car - Petrol	-18.3%	-3.3%	-18.3%	-3.3%	-10.9%	-2.0%	-10.9%	-2.0%	0%		£ -
	Private Car - Diesel	-4.3%	-1.6%	-4.3%	-1.6%	-23.0%	-8.1%	-23.0%	-8.1%	0%		£ -
	Private Car - Other	0.1%	0.0%	0.1%	0.0%	0.1%	0.0%	0.1%	0.0%	0%		£ -
	Taxi_Hackney	2.6%	0.2%	-72.2%	-4.2%	-9.8%	-0.8%	-79.6%	-6.6%	100%		£ 12,000
	Taxi_Other	6.3%	0.2%	-68.1%	-2.3%	-15.9%	-0.5%	-80.2%	-2.5%	100%		£ 11,000
LGV <3.5T	LGV <3.5T	0.8%	0.1%	0.8%	0.1%	-19.7%	-3.9%	-19.7%	-3.9%	0%		£ -
OGV >3.5T	OGV >3.5T	-13.3%	-1.4%	-13.3%	-1.4%	-13.0%	-0.9%	-13.0%	-0.9%	0%		£ -
	Bus_SingleD	4.2%	0.2%	-61.4%	-2.3%	3.1%	0.1%	-66.7%	-2.3%	97%		£ 29,500
Bus	Bus_DoubleD	-18.1%	-1.2%	-62.6%	-4.1%	-0.7%	0.0%	-63.1%	-3.3%	85%		£ 67,000
Total		-6.8%	-6.8%	-19.1%	-19.1%	-16.1%	-16.1%	-29.6%	-29.6%	6%	Cost per fleet of 1000 vehicles (£m)	3.14
Strategy Effectiveness				Efficiency	Cost Effectiveness			Efficiency	Cost Effectiveness			
				86.9	3.9			95.3	4.3			

Mode	Vehicle Multiplier (based to car)
Private Car	1.0
Private Car	1.0
Private Car	1.0
Taxi_Hackney	5.4
Taxi_Other	4.2
LGV <3.5T	1.1
OGV >3.5T	1.0
BUS	4.3
BUS	4.3



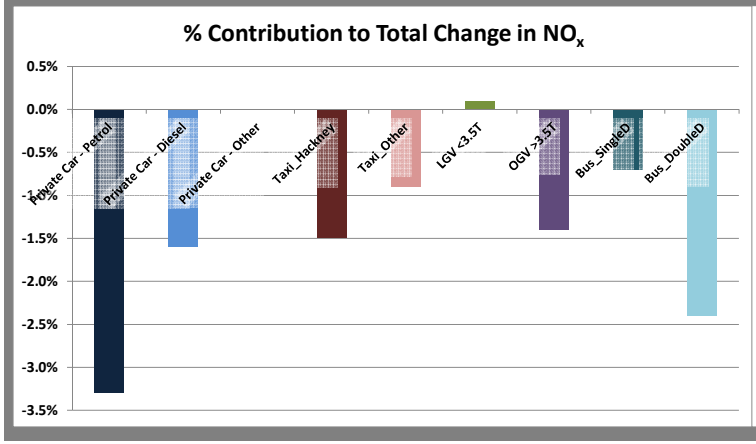


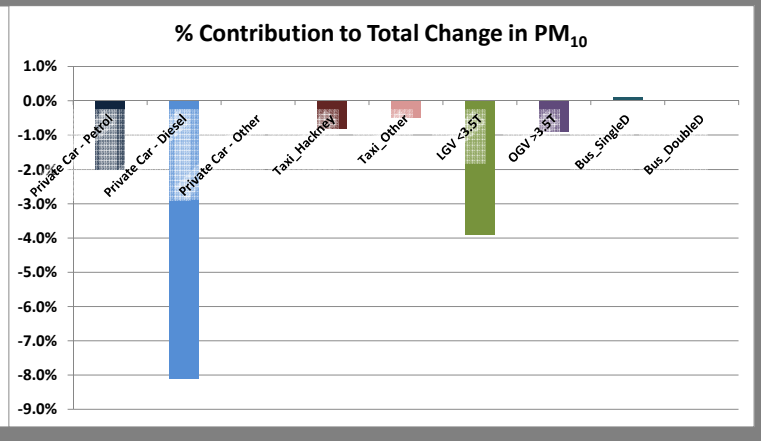
Strategy Year	2015	Description	Option 1c	Bus and Taxi Emission rate (medium achievement) - proportion of each fleet type affected - 30-40%

Fleet Characteristics		Do Minimum NO_x Emission Rates (g/km)			Do Minimum PM_{10} Emission Rates (index/km)			ERROR COMMENT	Strategy Setting: By Emission Rate		By Euroclass	Fleet Change	
Main Vehicle Type	Vehicle Subclass	Existing minimum	Existing mean	Existing maximum	Existing minimum	Existing mean	Existing maximum		Target Maximum NO_x Emission Rate	Target Maximum PM_{10} Emission Rate	Minimum permitted Euroclass	Switch Petrol/ Diesel %	Remove %
Car	Private Car - Petrol	0.10	0.37	8.00	5	9	400		None	None	None	0	0
	Private Car - Diesel	0.10	1.07	7.00	5	27	1100		None	None	None		0
	Private Car - Other	0.10	0.14	0.70	5	6	60		None	None	None	-	0
	Taxi_Hackney	0.10	1.98	20.00	5	73	1100		2.00	None	None	-	0
	Taxi_Other	0.10	1.46	8.00	5	34	1100		1.50	None	None	0	0
LGV <3.5T	LGV <3.5T	0.10	1.29	9.00	5	42	700		None	None	None	0	0
OGV >3.5T	OGV >3.5T	0.10	4.94	24.00	5	82	4000		None	None	None	-	0
Bus	Bus_SingleD	0.10	5.39	20.00	5	126	1300		5.00	None	None	-	0
	Bus_DoubleD	0.10	5.55	29.00	5	113	1800		5.00	None	None	-	0
Total													

Impact of Strategy		Do Minimum		Strategy		Do Minimum		Strategy					
Main Vehicle Type	Vehicle Subclass	% Change in NO_x	% Contribution to Total Change in NO_x	% Change in NO_x	% Contribution to Total Change in NO_x	% Change in PM_{10}	% Contribution to Total Change in PM_{10}	% Change in PM_{10}	% Contribution to Total Change in PM_{10}	Proportion of fleet affected		Average Cost per affected vehicle	
Car	Private Car - Petrol	-18.3%	-3.3%	-18.3%	-3.3%	-10.9%	-2.0%	-10.9%	-2.0%	0%		£	-
	Private Car - Diesel	-4.3%	-1.6%	-4.3%	-1.6%	-23.0%	-8.1%	-23.0%	-8.1%	0%		£	-
	Private Car - Other	0.1%	0.0%	0.1%	0.0%	0.1%	0.0%	0.1%	0.0%	0%		£	-
	Taxi_Hackney	2.6%	0.2%	-25.7%	-1.5%	-9.8%	-0.8%	-9.8%	-0.8%	39%		£	6,200
	Taxi_Other	6.3%	0.2%	-27.0%	-0.9%	-15.9%	-0.5%	-15.9%	-0.5%	39%		£	1,500
LGV <3.5T	LGV <3.5T	0.8%	0.1%	0.8%	0.1%	-19.7%	-3.9%	-19.7%	-3.9%	0%		£	-
OGV >3.5T	OGV >3.5T	-13.3%	-1.4%	-13.3%	-1.4%	-13.0%	-0.9%	-13.0%	-0.9%	0%		£	-
	Bus_SingleD	4.2%	0.2%	-19.3%	-0.7%	3.1%	0.1%	3.1%	0.1%	39%		£	19,000
Bus	Bus_DoubleD	-18.1%	-1.2%	-35.6%	-2.4%	-0.7%	0.0%	-0.7%	0.0%	30%		£	4,500
Total		-6.8%	-6.8%	-11.6%	-11.7%	-16.1%	-16.1%	-16.1%	-16.1%	2%	Cost per fleet of 1000 vehicles (£m)		0.30
Strategy Effectiveness				Efficiency	Cost Effectiveness			Efficiency	Cost Effectiveness				
				89.7	16.3			0.0	0.0				

Mode	Vehicle Multiplier (based to car)
Private Car	1.0
Private Car	1.0
Private Car	1.0
Taxi_Hackney	5.4
Taxi_Other	4.2
LGV <3.5T	1.1
OGV >3.5T	1.0
BUS	4.3
BUS	4.3



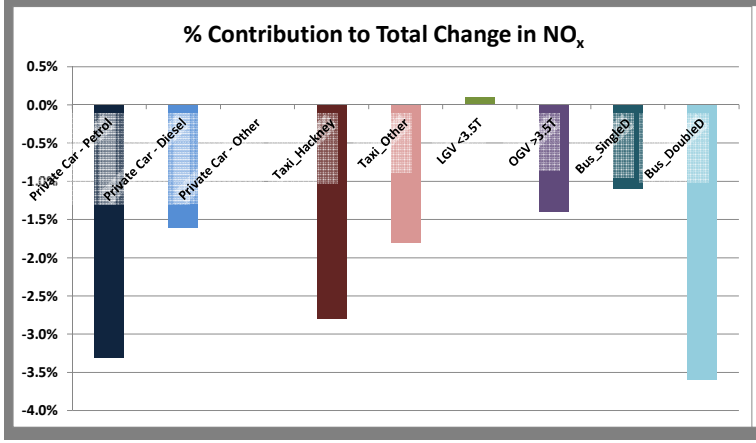


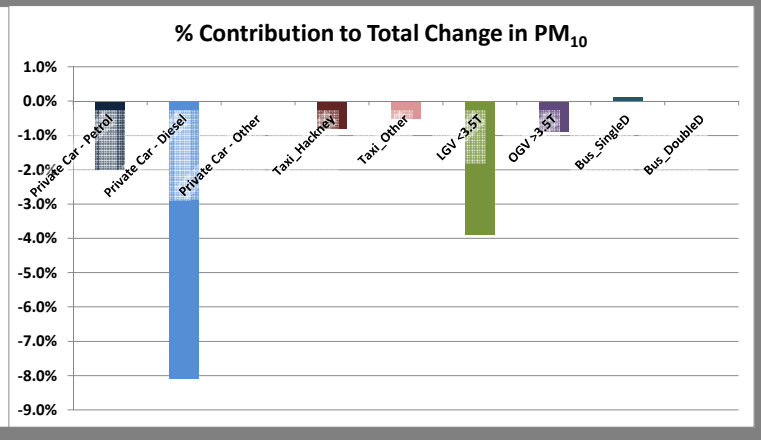
Strategy Year	2015	Description	Option 1d	Bus and Taxi Emission rate (medium achievement) - proportion of each fleet type affected - 60-70%

Fleet Characteristics		Do Minimum NO_x Emission Rates (g/km)			Do Minimum PM_{10} Emission Rates (index/km)			ERROR COMMENT	Strategy Setting: By Emission Rate		By Euroclass	Fleet Change	
Main Vehicle Type	Vehicle Subclass	Existing minimum	Existing mean	Existing maximum	Existing minimum	Existing mean	Existing maximum		Target Maximum NO_x Emission Rate	Target Maximum PM_{10} Emission Rate	Minimum permitted Euroclass	Switch Petrol/ Diesel %	Remove %
Car	Private Car - Petrol	0.10	0.37	8.00	5	9	400		None	None	None	0	0
	Private Car - Diesel	0.10	1.07	7.00	5	27	1100		None	None	None		0
	Private Car - Other	0.10	0.14	0.70	5	6	60		None	None	None	-	0
	Taxi_Hackney	0.10	1.98	20.00	5	73	1100		1.20	None	None	-	0
	Taxi_Other	0.10	1.46	8.00	5	34	1100		0.80	None	None	0	0
LGV <3.5T	LGV <3.5T	0.10	1.29	9.00	5	42	700		None	None	None	0	0
OGV >3.5T	OGV >3.5T	0.10	4.94	24.00	5	82	4000		None	None	None	-	0
Bus	Bus_SingleD	0.10	5.39	20.00	5	126	1300		4.00	None	None	-	0
	Bus_DoubleD	0.10	5.55	29.00	5	113	1800		3.50	None	None	-	0
Total													

Impact of Strategy		Do Minimum		Strategy		Do Minimum		Strategy				Average Cost per affected vehicle
Main Vehicle Type	Vehicle Subclass	% Change in NO_x	% Contribution to Total Change in NO_x	% Change in NO_x	% Contribution to Total Change in NO_x	% Change in PM_{10}	% Contribution to Total Change in PM_{10}	% Change in PM_{10}	% Contribution to Total Change in PM_{10}	Proportion of fleet affected		
Car	Private Car - Petrol	-18.3%	-3.3%	-18.3%	-3.3%	-10.9%	-2.0%	-10.9%	-2.0%	0%		£ -
	Private Car - Diesel	-4.3%	-1.6%	-4.3%	-1.6%	-23.0%	-8.1%	-23.0%	-8.1%	0%		£ -
	Private Car - Other	0.1%	0.0%	0.1%	0.0%	0.1%	0.0%	0.1%	0.0%	0%		£ -
	Taxi_Hackney	2.6%	0.2%	-47.7%	-2.8%	-9.8%	-0.8%	-9.8%	-0.8%	64%		£ 9,000
	Taxi_Other	6.3%	0.2%	-52.5%	-1.8%	-15.9%	-0.5%	-15.9%	-0.5%	65%		£ 11,000
LGV <3.5T	LGV <3.5T	0.8%	0.1%	0.8%	0.1%	-19.7%	-3.9%	-19.7%	-3.9%	0%		£ -
OGV >3.5T	OGV >3.5T	-13.3%	-1.4%	-13.3%	-1.4%	-13.0%	-0.9%	-13.0%	-0.9%	0%		£ -
	Bus_SingleD	4.2%	0.2%	-30.3%	-1.1%	3.1%	0.1%	3.1%	0.1%	59%		£ 57,000
Bus	Bus_DoubleD	-18.1%	-1.2%	-54.5%	-3.6%	-0.7%	0.0%	-0.7%	0.0%	61%		£ 29,500
Total		-6.8%	-6.8%	-15.5%	-15.5%	-16.1%	-16.1%	-16.1%	-16.1%	4%	Cost per fleet of 1000 vehicles (£m)	1.68
Strategy Effectiveness				Efficiency	Cost Effectiveness			Efficiency	Cost Effectiveness			
				93.7	5.2			0.0	0.0			

Mode	Vehicle Multiplier (based to car)
Private Car	1.0
Private Car	1.0
Private Car	1.0
Taxi_Hackney	5.4
Taxi_Other	4.2
LGV <3.5T	1.1
OGV >3.5T	1.0
BUS	4.3
BUS	4.3



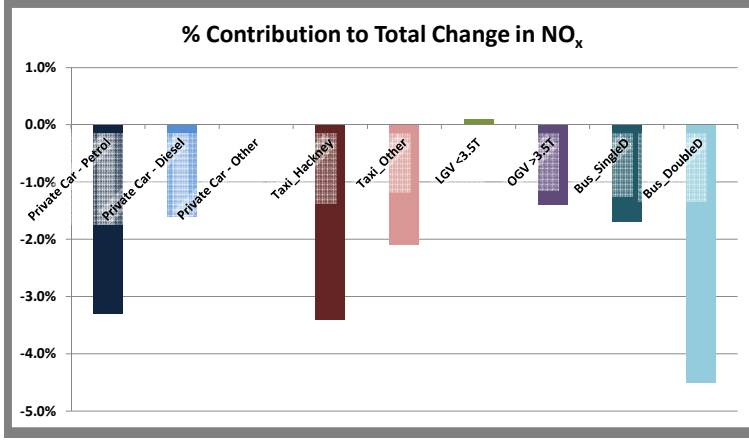


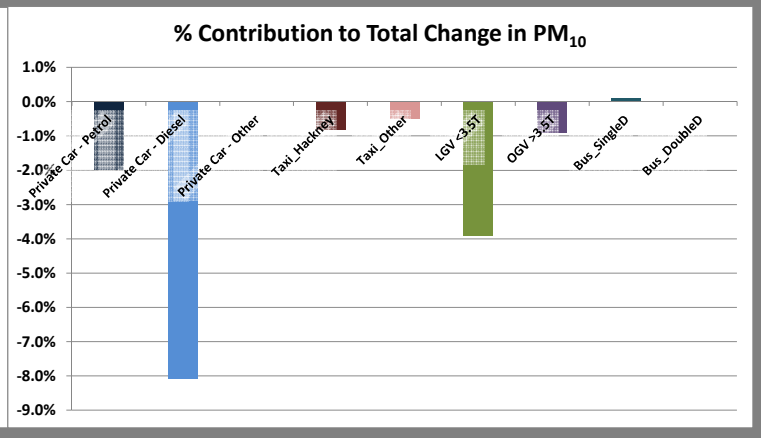
Strategy Year	2015	Description	Option 1e	Bus and Taxi Emission rate (medium achievement) - proportion of each fleet type affected - 75-85%

Fleet Characteristics		Do Minimum NO_x Emission Rates (g/km)			Do Minimum PM_{10} Emission Rates (index/km)			ERROR COMMENT	Strategy Setting: By Emission Rate		By Euroclass	Fleet Change	
Main Vehicle Type	Vehicle Subclass	Existing minimum	Existing mean	Existing maximum	Existing minimum	Existing mean	Existing maximum		Target Maximum NO_x Emission Rate	Target Maximum PM_{10} Emission Rate	Minimum permitted Euroclass	Switch Petrol/ Diesel %	Remove %
Car	Private Car - Petrol	0.10	0.37	8.00	5	9	400		None	None	None	0	0
	Private Car - Diesel	0.10	1.07	7.00	5	27	1100		None	None	None		0
	Private Car - Other	0.10	0.14	0.70	5	6	60		None	None	None	-	0
	Taxi_Hackney	0.10	1.98	20.00	5	73	1100		0.90	None	None	-	0
	Taxi_Other	0.10	1.46	8.00	5	34	1100		0.60	None	None	0	0
LGV <3.5T	LGV <3.5T	0.10	1.29	9.00	5	42	700		None	None	None	0	0
OGV >3.5T	OGV >3.5T	0.10	4.94	24.00	5	82	4000		None	None	None	-	0
Bus	Bus_SingleD	0.10	5.39	20.00	5	126	1300		3.00	None	None	-	0
	Bus_DoubleD	0.10	5.55	29.00	5	113	1800		2.50	None	None	-	0
Total													

Impact of Strategy		Do Minimum		Strategy		Do Minimum		Strategy				Average Cost per affected vehicle
Main Vehicle Type	Vehicle Subclass	% Change in NO_x	% Contribution to Total Change in NO_x	% Change in NO_x	% Contribution to Total Change in NO_x	% Change in PM_{10}	% Contribution to Total Change in PM_{10}	% Change in PM_{10}	% Contribution to Total Change in PM_{10}	Proportion of fleet affected		
Car	Private Car - Petrol	-18.3%	-3.3%	-18.3%	-3.3%	-10.9%	-2.0%	-10.9%	-2.0%	0%		£ -
	Private Car - Diesel	-4.3%	-1.6%	-4.3%	-1.6%	-23.0%	-8.1%	-23.0%	-8.1%	0%		£ -
	Private Car - Other	0.1%	0.0%	0.1%	0.0%	0.1%	0.0%	0.1%	0.0%	0%		£ -
	Taxi_Hackney	2.6%	0.2%	-58.5%	-3.4%	-9.8%	-0.8%	-9.8%	-0.8%	77%		£ 12,000
	Taxi_Other	6.3%	0.2%	-62.4%	-2.1%	-15.9%	-0.5%	-15.9%	-0.5%	75%		£ 11,000
LGV <3.5T	LGV <3.5T	0.8%	0.1%	0.8%	0.1%	-19.7%	-3.9%	-19.7%	-3.9%	0%		£ -
OGV >3.5T	OGV >3.5T	-13.3%	-1.4%	-13.3%	-1.4%	-13.0%	-0.9%	-13.0%	-0.9%	0%		£ -
	Bus_SingleD	4.2%	0.2%	-45.9%	-1.7%	3.1%	0.1%	3.1%	0.1%	84%		£ 57,000
Bus	Bus_DoubleD	-18.1%	-1.2%	-68.0%	-4.5%	-0.7%	0.0%	-0.7%	0.0%	75%		£ 67,000
Total		-6.8%	-6.8%	-17.9%	-17.9%	-16.1%	-16.1%	-16.1%	-16.1%	5%	Cost per fleet of 1000 vehicles (£m)	2.99
Strategy Effectiveness				Efficiency	Cost Effectiveness			Efficiency	Cost Effectiveness			
				98.6	3.7			0.0	0.0			

Mode	Vehicle Multiplier (based to car)
Private Car	1.0
Private Car	1.0
Private Car	1.0
Taxi_Hackney	5.4
Taxi_Other	4.2
LGV <3.5T	1.1
OGV >3.5T	1.0
BUS	4.3
BUS	4.3

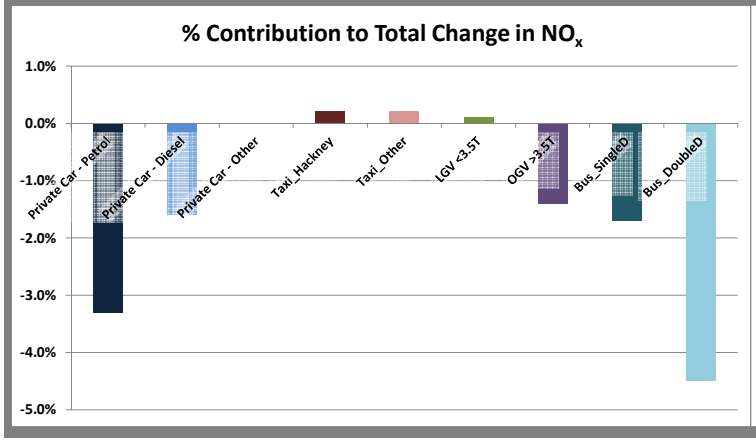


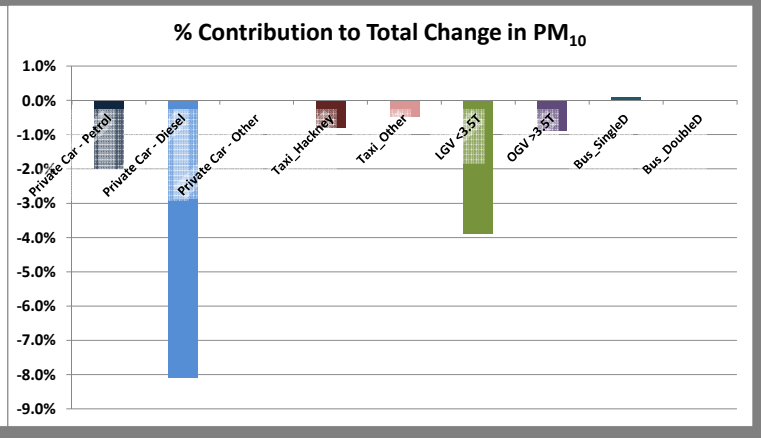


Strategy Year	2015	Description	Option 1f	Bus Emission rate (medium achievement separated) - proportion of fleet type affected - 75-85%

Fleet Characteristics		Do Minimum NO_x Emission Rates (g/km)			Do Minimum PM_{10} Emission Rates (index/km)			ERROR COMMENT	Strategy Setting: By Emission Rate		By Euroclass	Fleet Change	
Main Vehicle Type	Vehicle Subclass	Existing minimum	Existing mean	Existing maximum	Existing minimum	Existing mean	Existing maximum		Target Maximum NO_x Emission Rate	Target Maximum PM_{10} Emission Rate	Minimum permitted Euroclass	Switch Petrol/ Diesel %	Remove %
Car	Private Car - Petrol	0.10	0.37	8.00	5	9	400		None	None	None	0	0
	Private Car - Diesel	0.10	1.07	7.00	5	27	1100		None	None	None		0
	Private Car - Other	0.10	0.14	0.70	5	6	60		None	None	None	-	0
	Taxi_Hackney	0.10	1.98	20.00	5	73	1100		None	None	None	-	0
	Taxi_Other	0.10	1.46	8.00	5	34	1100		None	None	None	0	0
LGV <3.5T	LGV <3.5T	0.10	1.29	9.00	5	42	700		None	None	None	0	0
OGV >3.5T	OGV >3.5T	0.10	4.94	24.00	5	82	4000		None	None	None	-	0
Bus	Bus_SingleD	0.10	5.39	20.00	5	126	1300		3.00	None	None	-	0
	Bus_DoubleD	0.10	5.55	29.00	5	113	1800		2.50	None	None	-	0
Total													

Impact of Strategy		Do Minimum		Strategy		Do Minimum		Strategy				Average Cost per affected vehicle	Mode	Vehicle Multiplier (based to car)
Main Vehicle Type	Vehicle Subclass	% Change in NO_x	% Contribution to Total Change in NO_x	% Change in NO_x	% Contribution to Total Change in NO_x	% Change in PM_{10}	% Contribution to Total Change in PM_{10}	% Change in PM_{10}	% Contribution to Total Change in PM_{10}	Proportion of fleet affected				
Car	Private Car - Petrol	-18.3%	-3.3%	-18.3%	-3.3%	-10.9%	-2.0%	-10.9%	-2.0%	0%		£ -	Private Car	1.0
	Private Car - Diesel	-4.3%	-1.6%	-4.3%	-1.6%	-23.0%	-8.1%	-23.0%	-8.1%	0%		£ -	Private Car	1.0
	Private Car - Other	0.1%	0.0%	0.1%	0.0%	0.1%	0.0%	0.1%	0.0%	0%		£ -	Private Car	1.0
	Taxi_Hackney	2.6%	0.2%	2.6%	0.2%	-9.8%	-0.8%	-9.8%	-0.8%	0%		£ -	Taxi_Hackney	5.4
	Taxi_Other	6.3%	0.2%	6.3%	0.2%	-15.9%	-0.5%	-15.9%	-0.5%	0%		£ -	Taxi_Other	4.2
LGV <3.5T	LGV <3.5T	0.8%	0.1%	0.8%	0.1%	-19.7%	-3.9%	-19.7%	-3.9%	0%		£ -	LGV <3.5T	1.1
OGV >3.5T	OGV >3.5T	-13.3%	-1.4%	-13.3%	-1.4%	-13.0%	-0.9%	-13.0%	-0.9%	0%		£ -	OGV >3.5T	1.0
	Bus_SingleD	4.2%	0.2%	-45.9%	-1.7%	3.1%	0.1%	3.1%	0.1%	84%		£ 57,000	BUS	4.3
Bus	Bus_DoubleD	-18.1%	-1.2%	-68.0%	-4.5%	-0.7%	0.0%	-0.7%	0.0%	75%		£ 67,000	BUS	4.3
Total		-6.8%	-6.8%	-12.0%	-12.0%	-16.1%	-16.1%	-16.1%	-16.1%	1%	Cost per fleet of 1000 vehicles (£m)	2.07		
Strategy Effectiveness				Efficiency	Cost Effectiveness			Efficiency	Cost Effectiveness					
				158.1	2.5			0.0	0.0					



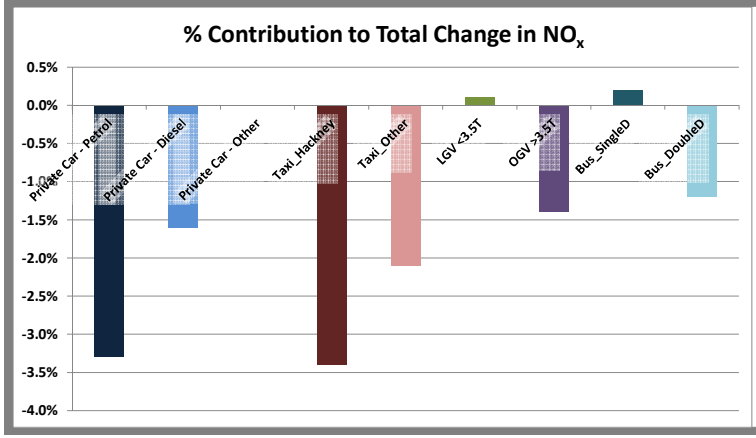


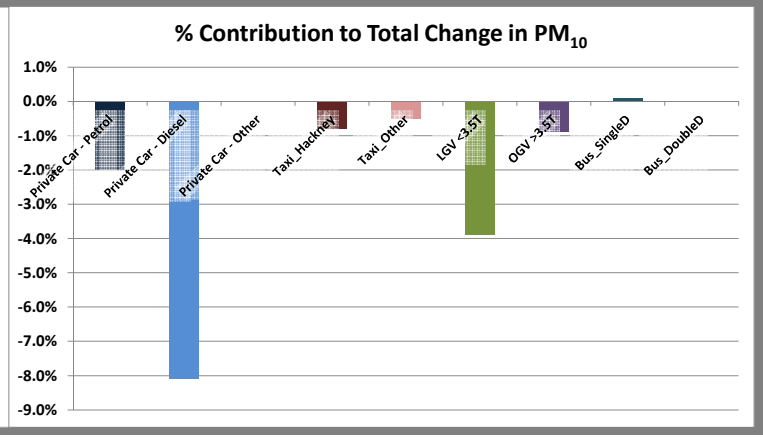
Strategy Year	2015	Description	Option 1g	Taxi Emission rate (medium achievement separated) - proportion of fleet type affected - 75-85%

Fleet Characteristics		Do Minimum NO_x Emission Rates (g/km)			Do Minimum PM_{10} Emission Rates (index/km)			ERROR COMMENT	Strategy Setting: By Emission Rate		By Euroclass	Fleet Change	
Main Vehicle Type	Vehicle Subclass	Existing minimum	Existing mean	Existing maximum	Existing minimum	Existing mean	Existing maximum		Target Maximum NO_x Emission Rate	Target Maximum PM_{10} Emission Rate	Minimum permitted Euroclass	Switch Petrol/ Diesel %	Remove %
Car	Private Car - Petrol	0.10	0.37	8.00	5	9	400		None	None	None	0	0
	Private Car - Diesel	0.10	1.07	7.00	5	27	1100		None	None	None		0
	Private Car - Other	0.10	0.14	0.70	5	6	60		None	None	None	-	0
	Taxi_Hackney	0.10	1.98	20.00	5	73	1100		0.90	None	None	-	0
	Taxi_Other	0.10	1.46	8.00	5	34	1100		0.60	None	None	0	0
LGV <3.5T	LGV <3.5T	0.10	1.29	9.00	5	42	700		None	None	None	0	0
OGV >3.5T	OGV >3.5T	0.10	4.94	24.00	5	82	4000		None	None	None	-	0
Bus	Bus_SingleD	0.10	5.39	20.00	5	126	1300		None	None	None	-	0
	Bus_DoubleD	0.10	5.55	29.00	5	113	1800		None	None	None	-	0
Total													

Impact of Strategy		Do Minimum		Strategy		Do Minimum		Strategy					
Main Vehicle Type	Vehicle Subclass	% Change in NO_x	% Contribution to Total Change in NO_x	% Change in NO_x	% Contribution to Total Change in NO_x	% Change in PM_{10}	% Contribution to Total Change in PM_{10}	% Change in PM_{10}	% Contribution to Total Change in PM_{10}	Proportion of fleet affected		Average Cost per affected vehicle	
Car	Private Car - Petrol	-18.3%	-3.3%	-18.3%	-3.3%	-10.9%	-2.0%	-10.9%	-2.0%	0%		£	-
	Private Car - Diesel	-4.3%	-1.6%	-4.3%	-1.6%	-23.0%	-8.1%	-23.0%	-8.1%	0%		£	-
	Private Car - Other	0.1%	0.0%	0.1%	0.0%	0.1%	0.0%	0.1%	0.0%	0%		£	-
	Taxi_Hackney	2.6%	0.2%	-58.5%	-3.4%	-9.8%	-0.8%	-9.8%	-0.8%	77%		£	12,000
	Taxi_Other	6.3%	0.2%	-62.4%	-2.1%	-15.9%	-0.5%	-15.9%	-0.5%	75%		£	11,000
LGV <3.5T	LGV <3.5T	0.8%	0.1%	0.8%	0.1%	-19.7%	-3.9%	-19.7%	-3.9%	0%		£	-
OGV >3.5T	OGV >3.5T	-13.3%	-1.4%	-13.3%	-1.4%	-13.0%	-0.9%	-13.0%	-0.9%	0%		£	-
	Bus_SingleD	4.2%	0.2%	4.2%	0.2%	3.1%	0.1%	3.1%	0.1%	0%		£	-
Bus	Bus_DoubleD	-18.1%	-1.2%	-18.1%	-1.2%	-0.7%	0.0%	-0.7%	0.0%	0%		£	-
Total		-6.8%	-6.8%	-12.7%	-12.7%	-16.1%	-16.1%	-16.1%	-16.1%	4%	Cost per fleet of 1000 vehicles (£m)		0.92
Strategy Effectiveness				Efficiency	Cost Effectiveness			Efficiency	Cost Effectiveness				
				74.1	6.4			0.0	0.0				

Mode	Vehicle Multiplier (based to car)
Private Car	1.0
Private Car	1.0
Private Car	1.0
Taxi_Hackney	5.4
Taxi_Other	4.2
LGV <3.5T	1.1
OGV >3.5T	1.0
BUS	4.3
BUS	4.3



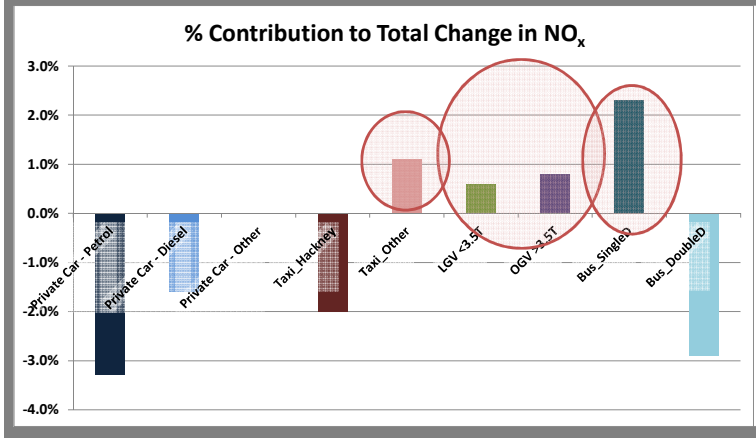


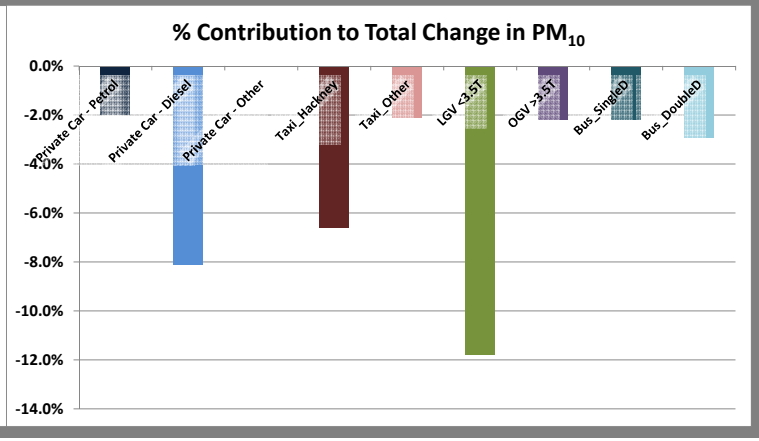
Strategy Year	2015	Description	Option 2a	Bus, Taxi, Goods Vehicles Euroclass strategy (very low achievement) - Taxi E5+ - Bus E5+ - Goods E5+

Fleet Characteristics		Do Minimum NO_x Emission Rates (g/km)			Do Minimum PM_{10} Emission Rates (index/km)			ERROR COMMENT	Strategy Setting: By Emission Rate		By Euroclass	Fleet Change	
Main Vehicle Type	Vehicle Subclass	Existing minimum	Existing mean	Existing maximum	Existing minimum	Existing mean	Existing maximum		Target Maximum NO_x Emission Rate	Target Maximum PM_{10} Emission Rate	Minimum permitted Euroclass	Switch Petrol/ Diesel %	Remove %
Car	Private Car - Petrol	0.10	0.37	8.00	5	9	400		None	None	None	0	0
	Private Car - Diesel	0.10	1.07	7.00	5	27	1100		None	None	None		0
	Private Car - Other	0.10	0.14	0.70	5	6	60		None	None	None	-	0
	Taxi_Hackney	0.10	1.98	20.00	5	73	1100		None	None	E5	-	0
	Taxi_Other	0.10	1.46	8.00	5	34	1100		None	None	E5	0	0
LGV <3.5T	LGV <3.5T	0.10	1.29	9.00	5	42	700		None	None	E5	0	0
OGV >3.5T	OGV >3.5T	0.10	4.94	24.00	5	82	4000		None	None	E5	-	0
Bus	Bus_SingleD	0.10	5.39	20.00	5	126	1300		None	None	E5	-	0
	Bus_DoubleD	0.10	5.55	29.00	5	113	1800		None	None	E5	-	0
Total													

Impact of Strategy		Do Minimum		Strategy		Do Minimum		Strategy					
Main Vehicle Type	Vehicle Subclass	% Change in NO_x	% Contribution to Total Change in NO_x	% Change in NO_x	% Contribution to Total Change in NO_x	% Change in PM_{10}	% Contribution to Total Change in PM_{10}	% Change in PM_{10}	% Contribution to Total Change in PM_{10}	Proportion of fleet affected		Average Cost per affected vehicle	
Car	Private Car - Petrol	-18.3%	-3.3%	-18.3%	-3.3%	-10.9%	-2.0%	-10.9%	-2.0%	0%		£	-
	Private Car - Diesel	-4.3%	-1.6%	-4.3%	-1.6%	-23.0%	-8.1%	-23.0%	-8.1%	0%		£	-
	Private Car - Other	0.1%	0.0%	0.1%	0.0%	0.1%	0.0%	0.1%	0.0%	0%		£	-
	Taxi_Hackney	2.6%	0.2%	-34.5%	-2.0%	-9.8%	-0.8%	-79.6%	-6.6%	91%		£	9,000
	Taxi_Other	6.3%	0.2%	32.9%	1.1%	-15.9%	-0.5%	-68.3%	-2.1%	82%		£	7,000
LGV <3.5T	LGV <3.5T	0.8%	0.1%	3.9%	0.6%	-19.7%	-3.9%	-60.0%	-11.8%	59%		£	4,000
OGV >3.5T	OGV >3.5T	-13.3%	-1.4%	7.8%	0.8%	-13.0%	-0.9%	-31.5%	-2.2%	48%		£	20,000
	Bus_SingleD	4.2%	0.2%	60.7%	2.3%	3.1%	0.1%	-63.1%	-2.2%	84%		£	25,000
Bus	Bus_DoubleD	-18.1%	-1.2%	-43.6%	-2.9%	-0.7%	0.0%	-55.4%	-2.9%	60%		£	57,000
Total		-6.8%	-6.8%	-4.9%	-5.0%	-16.1%	-16.1%	-37.8%	-37.9%	13%	Cost per fleet of 1000 vehicles (£m)		6.28
Strategy Effectiveness				Efficiency	Cost Effectiveness			Efficiency	Cost Effectiveness				
				-2.2	-0.3			26.6	3.5				

Mode	Vehicle Multiplier (based to car)
Private Car	1.0
Private Car	1.0
Private Car	1.0
Taxi_Hackney	5.4
Taxi_Other	4.2
LGV <3.5T	1.1
OGV >3.5T	1.0
BUS	4.3
BUS	4.3



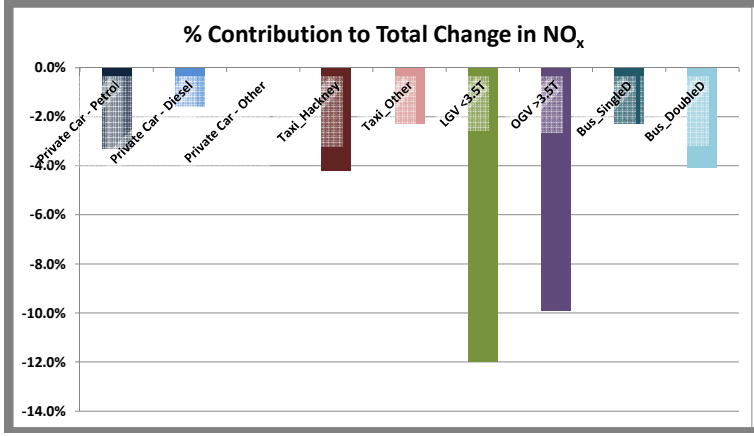


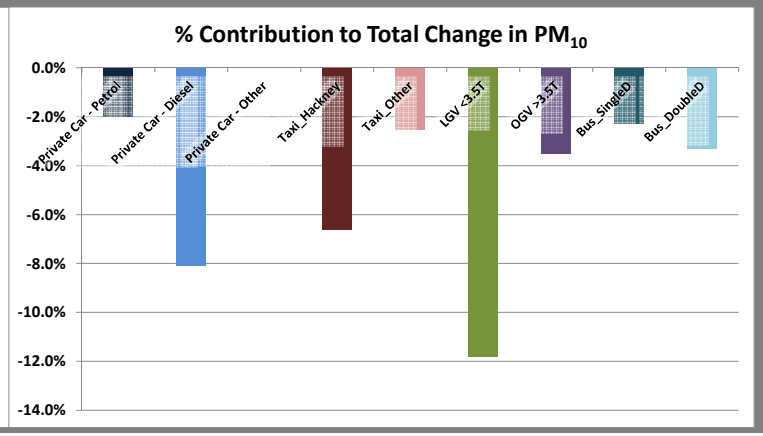
Strategy Year	2015	Description	Option 2b	Bus, Taxi, Goods Vehicles Euroclass strategy (excessive achievement) - Taxi E6 - Bus E6 - Goods E6

Fleet Characteristics		Do Minimum NO_x Emission Rates (g/km)			Do Minimum PM_{10} Emission Rates (index/km)			ERROR COMMENT	Strategy Setting: By Emission Rate		By Euroclass	Fleet Change	
Main Vehicle Type	Vehicle Subclass	Existing minimum	Existing mean	Existing maximum	Existing minimum	Existing mean	Existing maximum		Target Maximum NO_x Emission Rate	Target Maximum PM_{10} Emission Rate	Minimum permitted Euroclass	Switch Petrol/ Diesel %	Remove %
Car	Private Car - Petrol	0.10	0.37	8.00	5	9	400		None	None	None	0	0
	Private Car - Diesel	0.10	1.07	7.00	5	27	1100		None	None	None		0
	Private Car - Other	0.10	0.14	0.70	5	6	60		None	None	None	-	0
	Taxi_Hackney	0.10	1.98	20.00	5	73	1100		None	None	E6	-	0
	Taxi_Other	0.10	1.46	8.00	5	34	1100		None	None	E6	0	0
LGV <3.5T	LGV <3.5T	0.10	1.29	9.00	5	42	700		None	None	E6	0	0
OGV >3.5T	OGV >3.5T	0.10	4.94	24.00	5	82	4000		None	None	E6	-	0
Bus	Bus_SingleD	0.10	5.39	20.00	5	126	1300		None	None	E6	-	0
	Bus_DoubleD	0.10	5.55	29.00	5	113	1800		None	None	E6	-	0
Total													

Impact of Strategy		Do Minimum		Strategy		Do Minimum		Strategy					
Main Vehicle Type	Vehicle Subclass	% Change in NO_x	% Contribution to Total Change in NO_x	% Change in NO_x	% Contribution to Total Change in NO_x	% Change in PM_{10}	% Contribution to Total Change in PM_{10}	% Change in PM_{10}	% Contribution to Total Change in PM_{10}	Proportion of fleet affected		Average Cost per affected vehicle	
Car	Private Car - Petrol	-18.3%	-3.3%	-18.3%	-3.3%	-10.9%	-2.0%	-10.9%	-2.0%	0%		£	-
	Private Car - Diesel	-4.3%	-1.6%	-4.3%	-1.6%	-23.0%	-8.1%	-23.0%	-8.1%	0%		£	-
	Private Car - Other	0.1%	0.0%	0.1%	0.0%	0.1%	0.0%	0.1%	0.0%	0%		£	-
	Taxi_Hackney	2.6%	0.2%	-72.2%	-4.2%	-9.8%	-0.8%	-79.6%	-6.6%	100%		£	12,000
	Taxi_Other	6.3%	0.2%	-68.1%	-2.3%	-15.9%	-0.5%	-80.2%	-2.5%	100%		£	11,000
LGV <3.5T	LGV <3.5T	0.8%	0.1%	-76.9%	-12.0%	-19.7%	-3.9%	-60.0%	-11.8%	99%		£	7,000
OGV >3.5T	OGV >3.5T	-13.3%	-1.4%	-93.1%	-9.9%	-13.0%	-0.9%	-51.1%	-3.5%	85%		£	30,000
	Bus_SingleD	4.2%	0.2%	-61.4%	-2.3%	3.1%	0.1%	-66.7%	-2.3%	97%		£	29,500
Bus	Bus_DoubleD	-18.1%	-1.2%	-62.6%	-4.1%	-0.7%	0.0%	-63.1%	-3.3%	85%		£	67,000
Total		-6.8%	-6.8%	-39.7%	-39.7%	-16.1%	-16.1%	-40.1%	-40.1%	19%	Cost per fleet of 1000 vehicles (£m)		15.23
Strategy Effectiveness				Efficiency	Cost Effectiveness			Efficiency	Cost Effectiveness				
				25.0	2.2			18.2	1.6				

Mode	Vehicle Multiplier (based to car)
Private Car	1.0
Private Car	1.0
Private Car	1.0
Taxi_Hackney	5.4
Taxi_Other	4.2
LGV <3.5T	1.1
OGV >3.5T	1.0
BUS	4.3
BUS	4.3



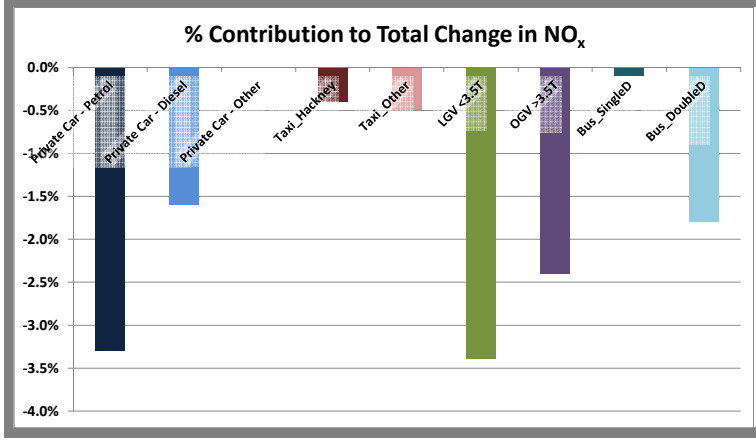


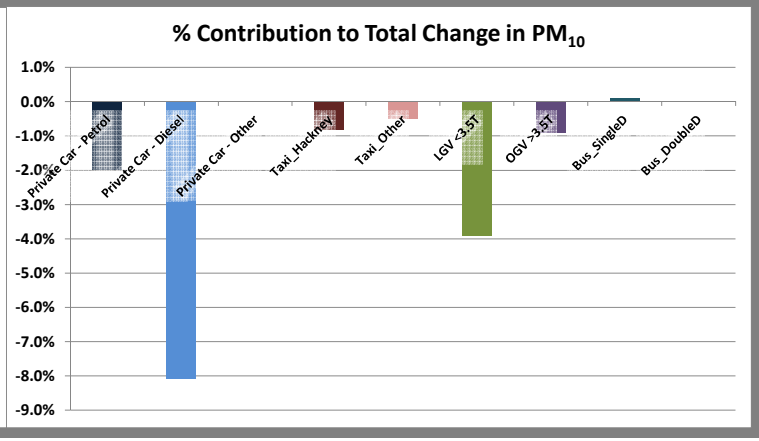
Strategy Year	2015	Description	Option 2c	Bus, Taxi, Goods Vehicles Emission rate (medium achievement) - proportion of each fleet type affected - 10-25%

Fleet Characteristics		Do Minimum NO_x Emission Rates (g/km)			Do Minimum PM_{10} Emission Rates (index/km)			ERROR COMMENT	Strategy Setting: By Emission Rate		By Euroclass	Fleet Change	
Main Vehicle Type	Vehicle Subclass	Existing minimum	Existing mean	Existing maximum	Existing minimum	Existing mean	Existing maximum		Target Maximum NO_x Emission Rate	Target Maximum PM_{10} Emission Rate	Minimum permitted Euroclass	Switch Petrol/ Diesel %	Remove %
Car	Private Car - Petrol	0.10	0.37	8.00	5	9	400		None	None	None	0	0
	Private Car - Diesel	0.10	1.07	7.00	5	27	1100		None	None	None		0
	Private Car - Other	0.10	0.14	0.70	5	6	60		None	None	None	-	0
	Taxi_Hackney	0.10	1.98	20.00	5	73	1100		3.00	None	None	-	0
	Taxi_Other	0.10	1.46	8.00	5	34	1100		2.00	None	None	0	0
LGV <3.5T	LGV <3.5T	0.10	1.29	9.00	5	42	700		1.80	None	None	0	0
OGV >3.5T	OGV >3.5T	0.10	4.94	24.00	5	82	4000		8.00	None	None	-	0
Bus	Bus_SingleD	0.10	5.39	20.00	5	126	1300		8.00	None	None	-	0
	Bus_DoubleD	0.10	5.55	29.00	5	113	1800		7.00	None	None	-	0
Total													

Impact of Strategy		Do Minimum		Strategy		Do Minimum		Strategy				Average Cost per affected vehicle
Main Vehicle Type	Vehicle Subclass	% Change in NO_x	% Contribution to Total Change in NO_x	% Change in NO_x	% Contribution to Total Change in NO_x	% Change in PM_{10}	% Contribution to Total Change in PM_{10}	% Change in PM_{10}	% Contribution to Total Change in PM_{10}	Proportion of fleet affected		
Car	Private Car - Petrol	-18.3%	-3.3%	-18.3%	-3.3%	-10.9%	-2.0%	-10.9%	-2.0%	0%		£ -
	Private Car - Diesel	-4.3%	-1.6%	-4.3%	-1.6%	-23.0%	-8.1%	-23.0%	-8.1%	0%		£ -
	Private Car - Other	0.1%	0.0%	0.1%	0.0%	0.1%	0.0%	0.1%	0.0%	0%		£ -
	Taxi_Hackney	2.6%	0.2%	-6.1%	-0.4%	-9.8%	-0.8%	-9.8%	-0.8%	10%		£ 221
	Taxi_Other	6.3%	0.2%	-15.8%	-0.5%	-15.9%	-0.5%	-15.9%	-0.5%	25%		£ 500
LGV <3.5T	LGV <3.5T	0.8%	0.1%	-21.8%	-3.4%	-19.7%	-3.9%	-19.7%	-3.9%	20%		£ 400
OGV >3.5T	OGV >3.5T	-13.3%	-1.4%	-23.0%	-2.4%	-13.0%	-0.9%	-13.0%	-0.9%	13%		£ 7,000
	Bus_SingleD	4.2%	0.2%	-3.4%	-0.1%	3.1%	0.1%	3.1%	0.1%	15%		£ 4,000
Bus	Bus_DoubleD	-18.1%	-1.2%	-26.6%	-1.8%	-0.7%	0.0%	-0.7%	0.0%	14%		£ 4,500
Total		-6.8%	-6.8%	-13.5%	-13.5%	-16.1%	-16.1%	-16.1%	-16.1%	4%	Cost per fleet of 1000 vehicles (£m)	0.30
Strategy Effectiveness				Efficiency	Cost Effectiveness			Efficiency	Cost Effectiveness			
				26.0	22.3			0.0	0.0			

Mode	Vehicle Multiplier (based to car)
Private Car	1.0
Private Car	1.0
Private Car	1.0
Taxi_Hackney	5.4
Taxi_Other	4.2
LGV <3.5T	1.1
OGV >3.5T	1.0
BUS	4.3
BUS	4.3





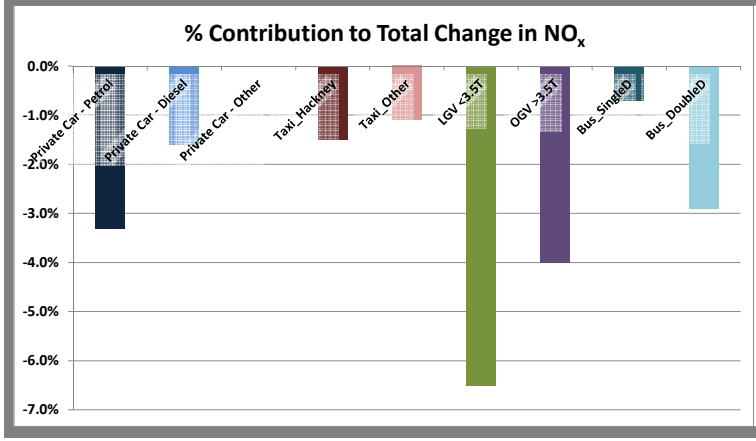
Strategy Year	2015	Description	Option 2d	Bus, Taxi, Goods Vehicles Emission rate (high achievement) - proportion of each fleet type affected - 35-45%

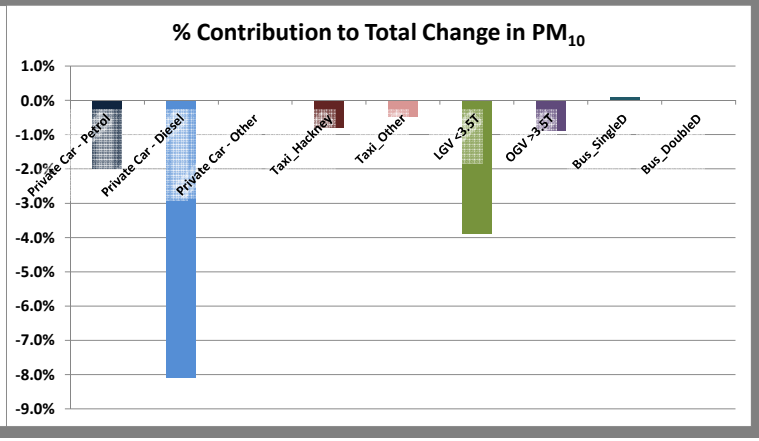
Fleet Characteristics		Do Minimum NO_x Emission Rates (g/km)			Do Minimum PM_{10} Emission Rates (index/km)			ERROR COMMENT	Strategy Setting: By Emission Rate		By Euroclass	Fleet Change	
Main Vehicle Type	Vehicle Subclass	Existing minimum	Existing mean	Existing maximum	Existing minimum	Existing mean	Existing maximum		Target Maximum NO_x Emission Rate	Target Maximum PM_{10} Emission Rate	Minimum permitted Euroclass	Switch Petrol/ Diesel %	Remove %
Car	Private Car - Petrol	0.10	0.37	8.00	5	9	400		None	None	None	0	0
	Private Car - Diesel	0.10	1.07	7.00	5	27	1100		None	None	None		0
	Private Car - Other	0.10	0.14	0.70	5	6	60		None	None	None	-	0
	Taxi_Hackney	0.10	1.98	20.00	5	73	1100		2.00	None	None	-	0
	Taxi_Other	0.10	1.46	8.00	5	34	1100		1.30	None	None	0	0
LGV <3.5T	LGV <3.5T	0.10	1.29	9.00	5	42	700		1.00	None	None	0	0
OGV >3.5T	OGV >3.5T	0.10	4.94	24.00	5	82	4000		5.00	None	None	-	0
Bus	Bus_SingleD	0.10	5.39	20.00	5	126	1300		5.00	None	None	-	0
	Bus_DoubleD	0.10	5.55	29.00	5	113	1800		4.00	None	None	-	0
Total													

Impact of Strategy		Do Minimum		Strategy		Do Minimum		Strategy		Proportion of fleet affected	Average Cost per affected vehicle
Main Vehicle Type	Vehicle Subclass	% Change in NO_x	% Contribution to Total Change in NO_x	% Change in NO_x	% Contribution to Total Change in NO_x	% Change in PM_{10}	% Contribution to Total Change in PM_{10}	% Change in PM_{10}	% Contribution to Total Change in PM_{10}		
Car	Private Car - Petrol	-18.3%	-3.3%	-18.3%	-3.3%	-10.9%	-2.0%	-10.9%	-2.0%	0%	£ -
	Private Car - Diesel	-4.3%	-1.6%	-4.3%	-1.6%	-23.0%	-8.1%	-23.0%	-8.1%	0%	£ -
	Private Car - Other	0.1%	0.0%	0.1%	0.0%	0.1%	0.0%	0.1%	0.0%	0%	£ -
	Taxi_Hackney	2.6%	0.2%	-25.7%	-1.5%	-9.8%	-0.8%	-9.8%	-0.8%	39%	£ 6,200
	Taxi_Other	6.3%	0.2%	-32.9%	-1.1%	-15.9%	-0.5%	-15.9%	-0.5%	45%	£ 1,500
LGV <3.5T	LGV <3.5T	0.8%	0.1%	-42.0%	-6.5%	-19.7%	-3.9%	-19.7%	-3.9%	44%	£ 1,750
OGV >3.5T	OGV >3.5T	-13.3%	-1.4%	-38.0%	-4.0%	-13.0%	-0.9%	-13.0%	-0.9%	32%	£ 20,000
	Bus_SingleD	4.2%	0.2%	-19.3%	-0.7%	3.1%	0.1%	3.1%	0.1%	39%	£ 19,000
Bus	Bus_DoubleD	-18.1%	-1.2%	-43.5%	-2.9%	-0.7%	0.0%	-0.7%	0.0%	44%	£ 29,500
Total		-6.8%	-6.8%	-21.7%	-21.6%	-16.1%	-16.1%	-16.1%	-16.1%	8%	
Strategy Effectiveness				Efficiency	Cost Effectiveness			Efficiency	Cost Effectiveness		
				25.8	5.6			0.0	0.0		

Cost per fleet of 1000 vehicles (£m)	2.64

Mode	Vehicle Multiplier (based to car)
Private Car	1.0
Private Car	1.0
Private Car	1.0
Taxi_Hackney	5.4
Taxi_Other	4.2
LGV <3.5T	1.1
OGV >3.5T	1.0
BUS	4.3
BUS	4.3



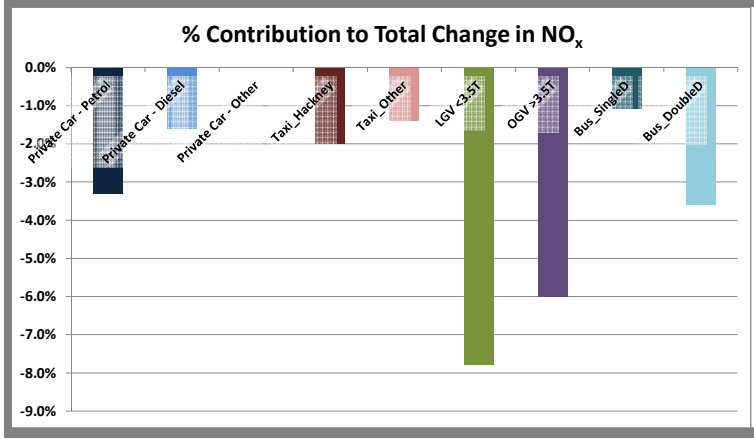


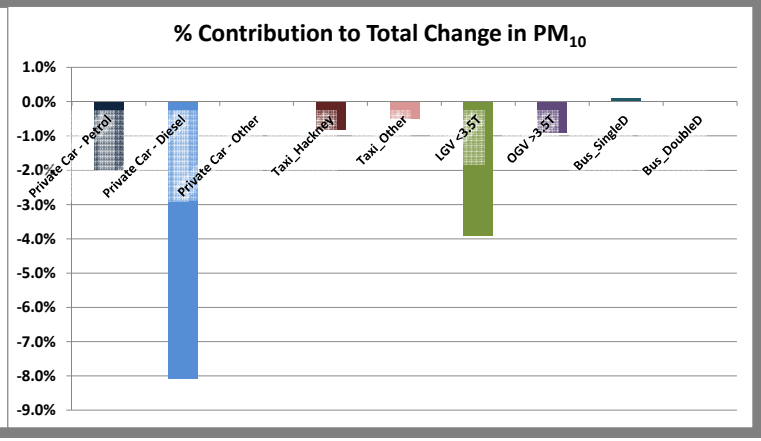
Strategy Year	2015	Description	Option 2e	Bus, Taxi, Goods Vehicles Emission rate (high achievement) - proportion of each fleet type affected - 50-65%

Fleet Characteristics		Do Minimum NO_x Emission Rates (g/km)			Do Minimum PM_{10} Emission Rates (index/km)			ERROR COMMENT	Strategy Setting: By Emission Rate		By Euroclass	Fleet Change	
Main Vehicle Type	Vehicle Subclass	Existing minimum	Existing mean	Existing maximum	Existing minimum	Existing mean	Existing maximum		Target Maximum NO_x Emission Rate	Target Maximum PM_{10} Emission Rate	Minimum permitted Euroclass	Switch Petrol/ Diesel %	Remove %
Car	Private Car - Petrol	0.10	0.37	8.00	5	9	400		None	None	None	0	0
	Private Car - Diesel	0.10	1.07	7.00	5	27	1100		None	None	None		0
	Private Car - Other	0.10	0.14	0.70	5	6	60		None	None	None	-	0
	Taxi_Hackney	0.10	1.98	20.00	5	73	1100		1.60	None	None	-	0
	Taxi_Other	0.10	1.46	8.00	5	34	1100		1.10	None	None	0	0
LGV <3.5T	LGV <3.5T	0.10	1.29	9.00	5	42	700		0.80	None	None	0	0
OGV >3.5T	OGV >3.5T	0.10	4.94	24.00	5	82	4000		3.00	None	None	-	0
Bus	Bus_SingleD	0.10	5.39	20.00	5	126	1300		4.00	None	None	-	0
	Bus_DoubleD	0.10	5.55	29.00	5	113	1800		3.00	None	None	-	0
Total													

Impact of Strategy		Do Minimum		Strategy		Do Minimum		Strategy				Average Cost per affected vehicle
Main Vehicle Type	Vehicle Subclass	% Change in NO_x	% Contribution to Total Change in NO_x	% Change in NO_x	% Contribution to Total Change in NO_x	% Change in PM_{10}	% Contribution to Total Change in PM_{10}	% Change in PM_{10}	% Contribution to Total Change in PM_{10}	Proportion of fleet affected		
Car	Private Car - Petrol	-18.3%	-3.3%	-18.3%	-3.3%	-10.9%	-2.0%	-10.9%	-2.0%	0%		£ -
	Private Car - Diesel	-4.3%	-1.6%	-4.3%	-1.6%	-23.0%	-8.1%	-23.0%	-8.1%	0%		£ -
	Private Car - Other	0.1%	0.0%	0.1%	0.0%	0.1%	0.0%	0.1%	0.0%	0%		£ -
	Taxi_Hackney	2.6%	0.2%	-35.3%	-2.0%	-9.8%	-0.8%	-9.8%	-0.8%	52%		£ 9,000
	Taxi_Other	6.3%	0.2%	-39.9%	-1.4%	-15.9%	-0.5%	-15.9%	-0.5%	53%		£ 7,000
LGV <3.5T	LGV <3.5T	0.8%	0.1%	-49.9%	-7.8%	-19.7%	-3.9%	-19.7%	-3.9%	53%		£ 4,000
OGV >3.5T	OGV >3.5T	-13.3%	-1.4%	-56.1%	-6.0%	-13.0%	-0.9%	-13.0%	-0.9%	51%		£ 30,000
	Bus_SingleD	4.2%	0.2%	-30.3%	-1.1%	3.1%	0.1%	3.1%	0.1%	59%		£ 57,000
Bus	Bus_DoubleD	-18.1%	-1.2%	-54.5%	-3.6%	-0.7%	0.0%	-0.7%	0.0%	61%		£ 67,000
Total		-6.8%	-6.8%	-26.8%	-26.8%	-16.1%	-16.1%	-16.1%	-16.1%	11%	Cost per fleet of 1000 vehicles (£m)	7.21
Strategy Effectiveness				Efficiency	Cost Effectiveness			Efficiency	Cost Effectiveness			
				27.6	2.8			0.0	0.0			

Mode	Vehicle Multiplier (based to car)
Private Car	1.0
Private Car	1.0
Private Car	1.0
Taxi_Hackney	5.4
Taxi_Other	4.2
LGV <3.5T	1.1
OGV >3.5T	1.0
BUS	4.3
BUS	4.3

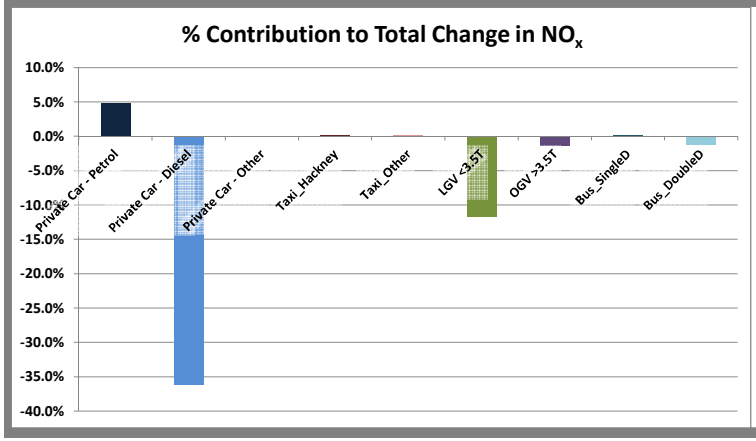


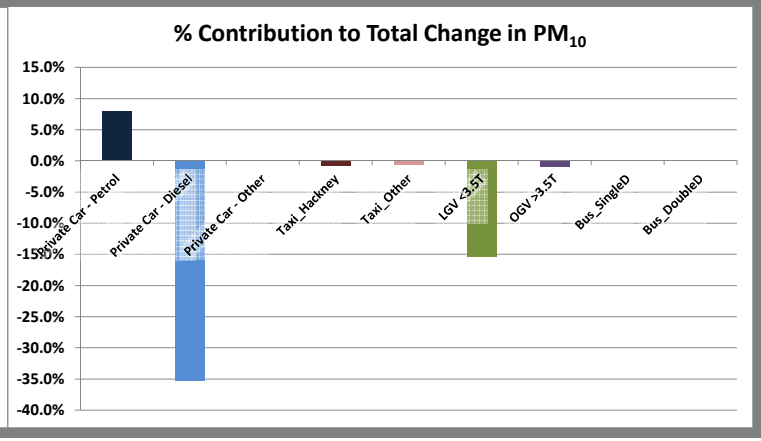


Strategy Year	2015	Description	Option 3a	100% Diesel Vehicles Switch to Petrol - affecting Car, LGV, Taxi PHV

Fleet Characteristics		Do Minimum NO_x Emission Rates (g/km)			Do Minimum PM_{10} Emission Rates (index/km)			ERROR COMMENT	Strategy Setting: By Emission Rate		By Euroclass	Fleet Change	
Main Vehicle Type	Vehicle Subclass	Existing minimum	Existing mean	Existing maximum	Existing minimum	Existing mean	Existing maximum		Target Maximum NO_x Emission Rate	Target Maximum PM_{10} Emission Rate	Minimum permitted Euroclass	Switch Petrol/ Diesel %	Remove %
Car	Private Car - Petrol	0.10	0.37	8.00	5	9	400		None	None	None	100	0
	Private Car - Diesel	0.10	1.07	7.00	5	27	1100		None	None	None	-	0
	Private Car - Other	0.10	0.14	0.70	5	6	60		None	None	None	-	0
	Taxi_Hackney	0.10	1.98	20.00	5	73	1100		None	None	None	100	0
	Taxi_Other	0.10	1.46	8.00	5	34	1100		None	None	None	100	0
LGV <3.5T	LGV <3.5T	0.10	1.29	9.00	5	42	700		None	None	None	-	0
OGV >3.5T	OGV >3.5T	0.10	4.94	24.00	5	82	4000		None	None	None	-	0
Bus	Bus_SingleD	0.10	5.39	20.00	5	126	1300		None	None	None	-	0
	Bus_DoubleD	0.10	5.55	29.00	5	113	1800		None	None	None	-	0
Total													

Impact of Strategy		Do Minimum		Strategy		Do Minimum		Strategy				Mode	Vehicle Multiplier (based to car)
Main Vehicle Type	Vehicle Subclass	% Change in NO_x	% Contribution to Total Change in NO_x	% Change in NO_x	% Contribution to Total Change in NO_x	% Change in PM_{10}	% Contribution to Total Change in PM_{10}	% Change in PM_{10}	% Contribution to Total Change in PM_{10}	Proportion of fleet affected		Average Cost per affected vehicle	
Car	Private Car - Petrol	-18.3%	-3.3%	26.8%	4.8%	-10.9%	-2.0%	43.7%	7.9%	0%		£ -	Private Car 1.0
	Private Car - Diesel	-4.3%	-1.6%	-100.0%	-36.1%	-23.0%	-8.1%	-100.0%	-35.3%	100%		£ -	Private Car 1.0
	Private Car - Other	0.1%	0.0%	0.1%	0.0%	0.1%	0.0%	0.1%	0.0%	0%		£ -	Private Car 1.0
	Taxi_Hackney	2.6%	0.2%	2.6%	0.2%	-9.8%	-0.8%	-9.8%	-0.8%	0%		£ -	Taxi_Hackney 5.4
	Taxi_Other	6.3%	0.2%	6.3%	0.2%	-15.9%	-0.5%	-15.9%	-0.5%	100%		£ -	Taxi_Other 4.2
LGV <3.5T	LGV <3.5T	0.8%	0.1%	-75.0%	-11.7%	-19.7%	-3.9%	-78.7%	-15.4%	100%		£ -	LGV <3.5T 1.1
OGV >3.5T	OGV >3.5T	-13.3%	-1.4%	-13.3%	-1.4%	-13.0%	-0.9%	-13.0%	-0.9%	0%		£ -	OGV >3.5T 1.0
	Bus_SingleD	4.2%	0.2%	4.2%	0.2%	3.1%	0.1%	3.1%	0.1%	0%		£ -	BUS 4.3
Bus	Bus_DoubleD	-18.1%	-1.2%	-18.1%	-1.2%	-0.7%	0.0%	-0.7%	0.0%	0%		£ -	BUS 4.3
Total		-6.8%	-6.8%	-45.0%	-45.0%	-16.1%	-16.1%	-45.0%	-44.9%	46%	Cost per fleet of 1000 vehicles (£m)	0.00	
Strategy Effectiveness				Efficiency	Cost Effectiveness			Efficiency	Cost Effectiveness				
				8.9				6.7					



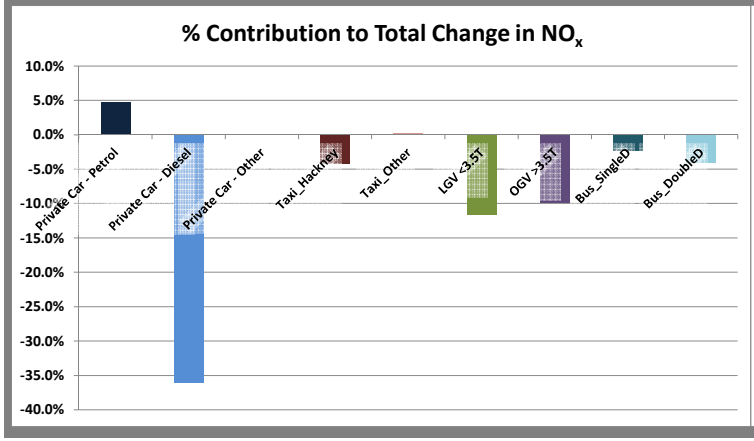


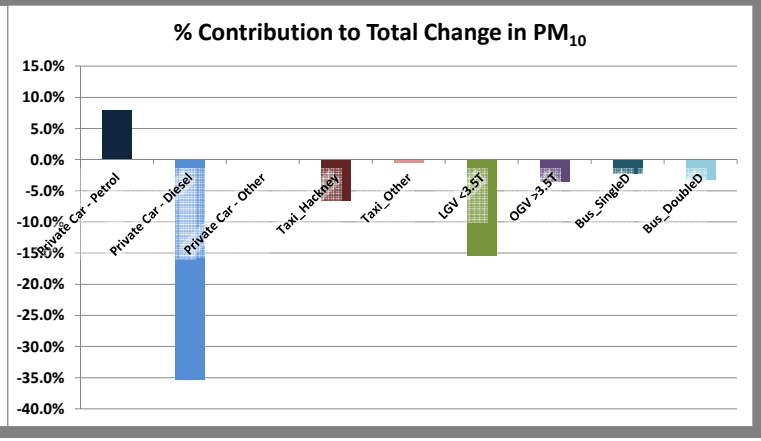
Strategy Year	2015	Description	Option 3b	100% Diesel Vehicles Switch to Petrol or CNG/equivalent - Petrol for Car, LGV, Taxi PHV - CNG for Taxi Hackney, OGV, Bus

Fleet Characteristics		Do Minimum NO_x Emission Rates (g/km)			Do Minimum PM_{10} Emission Rates (index/km)			ERROR COMMENT	Strategy Setting: By Emission Rate		By Euroclass	Fleet Change	
Main Vehicle Type	Vehicle Subclass	Existing minimum	Existing mean	Existing maximum	Existing minimum	Existing mean	Existing maximum		Target Maximum NO_x Emission Rate	Target Maximum PM_{10} Emission Rate	Minimum permitted Euroclass	Switch Petrol/ Diesel %	Remove %
Car	Private Car - Petrol	0.10	0.37	8.00	5	9	400		None	None	None	100	0
	Private Car - Diesel	0.10	1.07	7.00	5	27	1100		None	None	None		0
	Private Car - Other	0.10	0.14	0.70	5	6	60		None	None	None	-	0
	Taxi_Hackney	0.10	1.98	20.00	5	73	1100		None	None	CNG or equiv	-	0
	Taxi_Other	0.10	1.46	8.00	5	34	1100		None	None	None	100	0
LGV <3.5T	LGV <3.5T	0.10	1.29	9.00	5	42	700		None	None	None	100	0
OGV >3.5T	OGV >3.5T	0.10	4.94	24.00	5	82	4000		None	None	CNG or equiv	-	0
Bus	Bus_SingleD	0.10	5.39	20.00	5	126	1300		None	None	CNG or equiv	-	0
	Bus_DoubleD	0.10	5.55	29.00	5	113	1800		None	None	CNG or equiv	-	0
Total													

Impact of Strategy		Do Minimum		Strategy		Do Minimum		Strategy				
Main Vehicle Type	Vehicle Subclass	% Change in NO_x	% Contribution to Total Change in NO_x	% Change in NO_x	% Contribution to Total Change in NO_x	% Change in PM_{10}	% Contribution to Total Change in PM_{10}	% Change in PM_{10}	% Contribution to Total Change in PM_{10}	Proportion of fleet affected		Average Cost per affected vehicle
Car	Private Car - Petrol	-18.3%	-3.3%	26.8%	4.8%	-10.9%	-2.0%	43.7%	7.9%	0%		£ -
	Private Car - Diesel	-4.3%	-1.6%	-100.0%	-36.1%	-23.0%	-8.1%	-100.0%	-35.3%	100%		£ -
	Private Car - Other	0.1%	0.0%	0.1%	0.0%	0.1%	0.0%	0.1%	0.0%	0%		£ -
	Taxi_Hackney	2.6%	0.2%	-72.2%	-4.2%	-9.8%	-0.8%	-79.6%	-6.6%	100%		£ -
	Taxi_Other	6.3%	0.2%	6.3%	0.2%	-15.9%	-0.5%	-15.9%	-0.5%	100%		£ -
LGV <3.5T	LGV <3.5T	0.8%	0.1%	-75.0%	-11.7%	-19.7%	-3.9%	-78.7%	-15.4%	100%		£ 5,000
OGV >3.5T	OGV >3.5T	-13.3%	-1.4%	-93.1%	-9.9%	-13.0%	-0.9%	-51.1%	-3.5%	100%		£ 30,000
	Bus_SingleD	4.2%	0.2%	-61.4%	-2.3%	3.1%	0.1%	-66.7%	-2.3%	100%		£ 30,000
Bus	Bus_DoubleD	-18.1%	-1.2%	-62.6%	-4.1%	-0.7%	0.0%	-63.1%	-3.3%	87%		£ 30,000
Total		-6.8%	-6.8%	-63.3%	-63.3%	-16.1%	-16.1%	-59.1%	-59.0%	52%	Cost per fleet of 1000 vehicles (£m)	12.15
Strategy Effectiveness				Efficiency	Cost Effectiveness			Efficiency	Cost Effectiveness			
				12.3	4.7			9.4	3.5			

Mode	Vehicle Multiplier (based to car)
Private Car	1.0
Private Car	1.0
Private Car	1.0
Taxi_Hackney	5.4
Taxi_Other	4.2
LGV <3.5T	1.1
OGV >3.5T	1.0
BUS	4.3
BUS	4.3

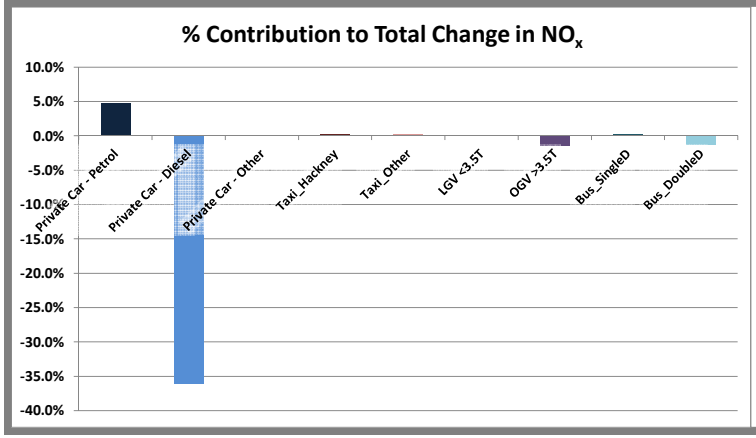


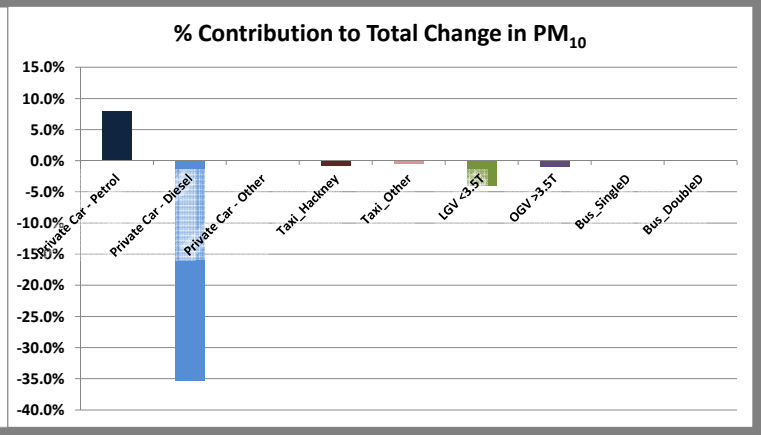


Strategy Year	2015	Description	Option 4a	100% Diesel Cars Switch to Petrol

Fleet Characteristics		Do Minimum NO_x Emission Rates (g/km)			Do Minimum PM_{10} Emission Rates (index/km)			ERROR COMMENT	Strategy Setting: By Emission Rate		By Euroclass	Fleet Change	
Main Vehicle Type	Vehicle Subclass	Existing minimum	Existing mean	Existing maximum	Existing minimum	Existing mean	Existing maximum		Target Maximum NO_x Emission Rate	Target Maximum PM_{10} Emission Rate	Minimum permitted Euroclass	Switch Petrol/ Diesel %	Remove %
Car	Private Car - Petrol	0.10	0.37	8.00	5	9	400		None	None	None	100	0
	Private Car - Diesel	0.10	1.07	7.00	5	27	1100		None	None	None	-	0
	Private Car - Other	0.10	0.14	0.70	5	6	60		None	None	None	-	0
	Taxi_Hackney	0.10	1.98	20.00	5	73	1100		None	None	None	-	0
	Taxi_Other	0.10	1.46	8.00	5	34	1100		None	None	None	0	0
LGV <3.5T	LGV <3.5T	0.10	1.29	9.00	5	42	700		None	None	None	0	0
OGV >3.5T	OGV >3.5T	0.10	4.94	24.00	5	82	4000		None	None	None	-	0
Bus	Bus_SingleD	0.10	5.39	20.00	5	126	1300		None	None	None	-	0
	Bus_DoubleD	0.10	5.55	29.00	5	113	1800		None	None	None	-	0
Total													

Impact of Strategy		Do Minimum		Strategy		Do Minimum		Strategy				Mode	Vehicle Multiplier (based to car)
Main Vehicle Type	Vehicle Subclass	% Change in NO_x	% Contribution to Total Change in NO_x	% Change in NO_x	% Contribution to Total Change in NO_x	% Change in PM_{10}	% Contribution to Total Change in PM_{10}	% Change in PM_{10}	% Contribution to Total Change in PM_{10}	Proportion of fleet affected		Average Cost per affected vehicle	
Car	Private Car - Petrol	-18.3%	-3.3%	26.8%	4.8%	-10.9%	-2.0%	43.7%	7.9%	0%		£ -	Private Car 1.0
	Private Car - Diesel	-4.3%	-1.6%	-100.0%	-36.1%	-23.0%	-8.1%	-100.0%	-35.3%	100%		£ -	Private Car 1.0
	Private Car - Other	0.1%	0.0%	0.1%	0.0%	0.1%	0.0%	0.1%	0.0%	0%		£ -	Private Car 1.0
	Taxi_Hackney	2.6%	0.2%	2.6%	0.2%	-9.8%	-0.8%	-9.8%	-0.8%	0%		£ -	Taxi_Hackney 5.4
	Taxi_Other	6.3%	0.2%	6.3%	0.2%	-15.9%	-0.5%	-15.9%	-0.5%	0%		£ -	Taxi_Other 4.2
LGV <3.5T	LGV <3.5T	0.8%	0.1%	0.8%	0.1%	-19.7%	-3.9%	-19.7%	-3.9%	0%		£ -	LGV <3.5T 1.1
OGV >3.5T	OGV >3.5T	-13.3%	-1.4%	-13.3%	-1.4%	-13.0%	-0.9%	-13.0%	-0.9%	0%		£ -	OGV >3.5T 1.0
	Bus_SingleD	4.2%	0.2%	4.2%	0.2%	3.1%	0.1%	3.1%	0.1%	0%		£ -	BUS 4.3
Bus	Bus_DoubleD	-18.1%	-1.2%	-18.1%	-1.2%	-0.7%	0.0%	-0.7%	0.0%	0%		£ -	BUS 4.3
Total		-6.8%	-6.8%	-33.2%	-33.2%	-16.1%	-16.1%	-33.4%	-33.4%	32%	Cost per fleet of 1000 vehicles (£m)	0.00	
Strategy Effectiveness				Efficiency	Cost Effectiveness			Efficiency	Cost Effectiveness				
				8.2				5.4					

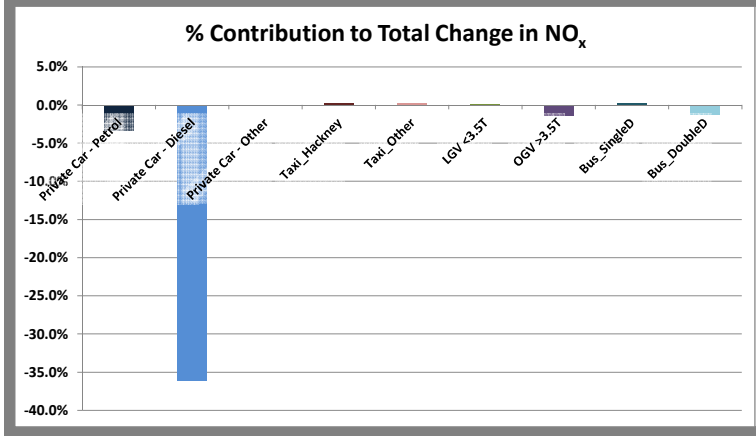


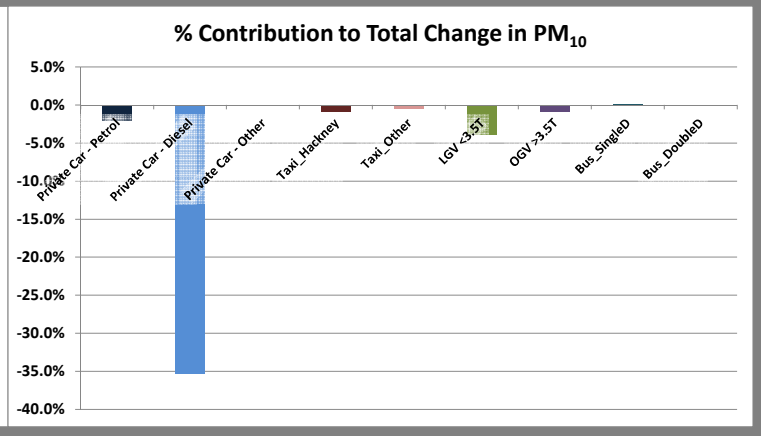


Strategy Year	2015	Description	Option 4b	100% Diesel cars removed and not replaced

Fleet Characteristics		Do Minimum NO_x Emission Rates (g/km)			Do Minimum PM_{10} Emission Rates (index/km)			ERROR COMMENT	Strategy Setting: By Emission Rate		By Euroclass	Fleet Change	
Main Vehicle Type	Vehicle Subclass	Existing minimum	Existing mean	Existing maximum	Existing minimum	Existing mean	Existing maximum		Target Maximum NO_x Emission Rate	Target Maximum PM_{10} Emission Rate	Minimum permitted Euroclass	Switch Petrol/ Diesel %	Remove %
Car	Private Car - Petrol	0.10	0.37	8.00	5	9	400		None	None	None	0	0
	Private Car - Diesel	0.10	1.07	7.00	5	27	1100		None	None	None		100
	Private Car - Other	0.10	0.14	0.70	5	6	60		None	None	None	-	0
	Taxi_Hackney	0.10	1.98	20.00	5	73	1100		None	None	None	-	0
	Taxi_Other	0.10	1.46	8.00	5	34	1100		None	None	None	0	0
LGV <3.5T	LGV <3.5T	0.10	1.29	9.00	5	42	700		None	None	None	0	0
OGV >3.5T	OGV >3.5T	0.10	4.94	24.00	5	82	4000		None	None	None	-	0
Bus	Bus_SingleD	0.10	5.39	20.00	5	126	1300		None	None	None	-	0
	Bus_DoubleD	0.10	5.55	29.00	5	113	1800		None	None	None	-	0
Total													

Impact of Strategy		Do Minimum		Strategy		Do Minimum		Strategy				Mode	Vehicle Multiplier (based to car)
Main Vehicle Type	Vehicle Subclass	% Change in NO_x	% Contribution to Total Change in NO_x	% Change in NO_x	% Contribution to Total Change in NO_x	% Change in PM_{10}	% Contribution to Total Change in PM_{10}	% Change in PM_{10}	% Contribution to Total Change in PM_{10}	Proportion of fleet affected		Average Cost per affected vehicle	
Car	Private Car - Petrol	-18.3%	-3.3%	-18.3%	-3.3%	-10.9%	-2.0%	-10.9%	-2.0%	0%		£ -	Private Car	1.0
	Private Car - Diesel	-4.3%	-1.6%	-100.0%	-36.1%	-23.0%	-8.1%	-100.0%	-35.3%	100%		£ -	Private Car	1.0
	Private Car - Other	0.1%	0.0%	0.1%	0.0%	0.1%	0.0%	0.1%	0.0%	0%		£ -	Private Car	1.0
	Taxi_Hackney	2.6%	0.2%	2.6%	0.2%	-9.8%	-0.8%	-9.8%	-0.8%	0%		£ -	Taxi_Hackney	5.4
	Taxi_Other	6.3%	0.2%	6.3%	0.2%	-15.9%	-0.5%	-15.9%	-0.5%	0%		£ -	Taxi_Other	4.2
LGV <3.5T	LGV <3.5T	0.8%	0.1%	0.8%	0.1%	-19.7%	-3.9%	-19.7%	-3.9%	0%		£ -	LGV <3.5T	1.1
OGV >3.5T	OGV >3.5T	-13.3%	-1.4%	-13.3%	-1.4%	-13.0%	-0.9%	-13.0%	-0.9%	0%		£ -	OGV >3.5T	1.0
	Bus_SingleD	4.2%	0.2%	4.2%	0.2%	3.1%	0.1%	3.1%	0.1%	0%		£ -	BUS	4.3
Bus	Bus_DoubleD	-18.1%	-1.2%	-18.1%	-1.2%	-0.7%	0.0%	-0.7%	0.0%	0%		£ -	BUS	4.3
Total		-6.8%	-6.8%	-41.4%	-41.3%	-16.1%	-16.1%	-43.3%	-43.3%	32%	Cost per fleet of 1000 vehicles (£m)	0.00		
Strategy Effectiveness				Efficiency	Cost Effectiveness			Efficiency	Cost Effectiveness					
				10.7				8.5						





Perth, Australia

Policy	**Free Transit Zone (FTZ)**
Technology	**>>>>>>>>>>>>**
Policy Description	The Department of Transport (DOT) is working on identifying long term strategies to facilitate the take up of cleaner new technologies and alternative fuels whilst also promoting fuel efficiency in the transport sector. Examples of State Government initiatives relating to transport emissions include the Perth hydrogen Fuel Cell Bus Trial and the CNG Transperth bus fleet. This case study focuses on the use of CNG to power all buses purchased for the Transperth bus fleet[1] which have operated in a Free Transit Zone in the central Perth Area since 2005. FTZ signposts are displayed on the route limits. For travel outside the FTZ, you may purchase a ticket Perth Central Area Transit (CAT) consists of three bus routes around central Perth, one in Fremantle and three more in Joondalup. All CAT services have a zero fare within the FTZ. The buses are fuelled by compressed natural gas (CNG) and have a Euro 4 environmental rating. Western Australia's Public Transport Authority is continuing to invest in CNG buses in Perth adding a further 80 CNG buses during the 2009–10 financial year to its 444 strong fleet, and another 74 CNG buses in 2010–11. Services operate in the Perth, Fremantle and Joondalup CBD. TransPerth – is the brand and operating name of the fully-integrated public transport system in the greater metropolitan area of Perth. The total cost of operating Transperth bus services increased by 1.1% from $251.2 million in 2005/06 to $254.0 million. The increase in operating costs were primarily driven by increases in the cost of fuel, labour and security[2]. However it should be noted that these costs include Transperth school bus service as well.

[1] www.transport.wa.gov.au

[2] Government of Western Australia Public Transport Authority Annual Report 2005/2006

Impacts of Policy	The increase in peak bus patronage by 18% between 2002 and 2005 is attributed partly due to Perth parking policy which controls parking in the metropolitan area[3].
Key Policy Issues	CNG buses are not able to carry the same number of passengers that a diesel bus can carry due to the additional space required to carry the CNG. Special 'fast filling' refuelling facilities were set up at the Public Transport Authority (PTA) bus depots across the metropolitan area. Improvements in clean diesel technology, lack of CNG re-fuelling infrastructure, and high maintenance costs are forcing governments to reconsider purchases of CNG-powered vehicles[4]. However the long-term benefits to the environment may out-weigh the financial costs.
Technology	
Transferability to Sheffield	46% of Western Australia's (WA) energy resources come from natural gas.[5] Biomethane is currently pumped into the UK gas grid, including within the South Yorkshire area.

[3] http://www.transport.wa.gov.au/regional_parkingpolicy.pdf

[4] http://gastoday.com.au

[5] J Ally, Murdoch University and Department of Planning and Infrastructure Feb 2008 Life Cycle Assessment (LCA) of the Hydrogen Fuel Cell, Natural Gas, and Diesel Bus Transportation Systems in Western Australia

London, United Kingdom

Policy	**Congestion Charging/ Low Emission Zones**
Technology	**Hybrid Buses**
Policy Description	**Congestion Charging Zone (CCZ)** The London Congestion Charge is a charge levied for vehicles travelling within the boundary of the designated congestion charge zone. The london congestion charge was introduced in 2003 and is operated by TfL. The congestion charge was introduced to reduce congestion in central London, increase the average speed of traffic moving through the area and raise funds for the London transport system. The initial costs of setting up the scheme were 161.7 million GBP[6]. Road signs alert drivers they are entering the congestion charging zone. It is not a cordon, there are no barriers or toll booths instead drivers pay to register their vehicle number plates on a database. There is a network of approximately 200 cameras which monitor entry and exit points to the congestion charging zones[7]. The cameras take pictures of your number plate as you enter, exit or drive in the congestion charging zone and record the time and date. The vehicle registration number (VRN) is sent to an automatic number plate recognition computer system which matches the number against a database showing whether a charge has been paid. If no charge has been paid by midnight of the day of the violation the VRN is matched against the Driver and Vehcile Licensing Agency (DVLA) records and penalty notices issues to the registered owners[8]. The congestion charging zone includes the areas of Victoria and St James's, waterloo, Borough, City of London, Clerkenwell, Finsbury, Holborn, Bloomsbury, Soho, Mayfair and parts of Marylebone. There has been a number of changes to the boundary of the congestion charging zone during this time. For example the Western extension has now been removed. Cars which emit 100g/km or less of CO2 and that meet Euro 5 standard for air quality have a 100 percent discount from the congestion charge. As electric and hybrid electric plug in vehicles are brought into the market there are future plans to reduce the criteria to 80g/km or lower. Electric and plug-in hybrid electric vehicles receive 100 per cent discount. Vehicles with 9 plus seats also receive 100 per cent discount. The congestion charge is 10 GBP per day for vehicles driving within the congestion charging zone and operates 7am to 6pm Monday to Friday excluding public bank holidays if paid in advance or on the day of travel and 12 GBP if paid by midnight of the day after travel. The cost was increased from 8 GBP per day to 10 GBP per day in January 2011. Payment of the daily charge allows you to drive into the zone and leave and re-enter as many times as you wish on that day.

[6] http://www.bbc.co.uk/london/content/articles/2006/11/21/congestion_update_feature.shtml

[7] http://www.tfl.gov.uk/assets/downloads/cc-cameras.pdf

[8] http://news.bbc.co.uk/2/shared/spl/hi/uk/03/congestion_charge/exemptions_guide/html/works.stm

In January 2011 Congestion Charging Autopay (CCA) an automated payment system was introduced. It automatically records the number of charging days a vehicle travels within the charging zone each month and takes the charge from a registered credit card on a monthly basis. Because the payment is automated there is a reduced risk of receiving a Penalty Charge Notice. There is a registration charge to sign up to this payment method of 10 GBP[9].

TfL's annual report for 2006-2007 shows a revenue of 252.4 million GBP over the financial year, more than half of this (130.1 million GBP) is required to run the system on annual basis[10] overall annual operating net income was 89.1 million GBP for TfL. Surplus profit by law has to be reinvested into the transport system. Net revenue reported for 2009/2010 financial year was 149 million GBP[11].

Low Emission Zone (LEZ)

A Low Emission Zone (LEZ) is a designated area where measures have been put in place to improve air quality by preventing or deterring the most polluting vehicles from entering the zone. A LEZ represents the most effective option for achieving reductions of the most harmful road transport generated emissions in London and improved air quality. The scheme cost 57 million GBP to set up entry charge into the LEZ is 100-200 GBP a day depending upon vehicle type. The costs to implement a LEZ depends on type of enforcement method, types of vehicles included, however the London LEZ costs and 10.7 million GBP per annum to run with an income of between 5 million and 11 million GBP per annum[12]

The scheme targets older diesel engine HGVs, buses, coaches, heavier LGVs and minibuses. As of 2011 lorry, bus, coach and other specialist heavy diesel vehicles are subject emission standards within the zone and need to meet Euro II standards for particulate matter (PM). In January 2012 these vehicle types will need to meet Euro IV for PM emissions. Both UK and non-UK registered vehicles need to comply.

The Low Emission Zone (LEZ) operates 24 hours a day, every day of the year, including weekends and public and Bank Holidays. Charging days run from midnight to midnight.

All roads within Greater London, those at Heathrow and parts of the M1 and M4 are included. However, the M25 is not included (even where it passes within the Greater London Authority boundary).

The LEZ is operated by TfL and was introduced in 2008 in a phased approach with standards being less stringent to enable start-up and the emission standards increasing over time.

The objectives of the LEZ were to reduce emissions of oxides of nitrogen (Nox), PM10 and No2 in the atmosphere by only allowing vehicles which meet specified

[9] http://www.tfl.gov.uk/roadusers/congestioncharging/17094.aspx#AutoPay

[10] http://www.tfl.gov.uk/assets/downloads/corporate/annual-report-and-statement-of-accounts-06-07.pdf

[11] http://www.tfl.gov.uk/roadusers/congestioncharging/6723.aspx

[12] http://www.guardian.co.uk/environment/2008/feb/04/travelandtransport.carbonemissions

emission standards to drive within the LEZ.

The legal framework of the LEZ required a robust set of scheme rules base on vehicle type and emissions. This had to be supported operationally by a database that would correctly classify each vehicle and enable automatic classification of the majority of UK vehicles[13].

Impacts of Policy

Congestion Charging

In the congestion charging zone congestion has risen back to pre-charging levels but would be much worse without the charge. The rise in congestion is due to roadworks which have greatly reduced the road capacity; and traffic management measures to help pedestrians and other road users. There has been a six per cent increase in bus passengers during charging hours[14]

TFL 6th Annual Monitoring Report estimates that reductions inside the original charging zone are: 8 percent in road traffic emissions of oxides of nitrogen (Nox); 7 percent in emissions of fine particulate matter (PM10) and 16 percent emissions of carbon dioxide (CO2) between 2002 and 2003[15]

Low Emission Zone

Carbon dioxide emissions have not been reported to change significantly however there is a potential climate gain through reductions in black carbon[16] The effectiveness of the LEZ depends upon the emission standards implemented.

Key Policy Issues

Congestion Charging Zone

There has been an increase in number plate cloning as result of people trying to illegally avoid the paying the congestion charge. In addition a number of small businesses have reported a reduction in profits due to the congestion charge.

Low Emission Zone

Implementation costs vary significantly with factors such as size of the city, whether manual or automatic enforcement is used or the compliance rate aimed for.

Communication of the LEZ details is key to its success.

A national or regional LEZ framework has been shown to enable LEZs to be set up more easily with lower costs[17].

[13] http://www.deloitte.com/assets/Dcom-UnitedKingdom/Local%20Assets/Documents/Industries/GPS/Transport/UK_GPS_The_London_Low_Emission_Zone.pdf

[14] http://www.tfl.gov.uk/roadusers/congestioncharging/6723.aspx

[15] http://www.tfl.gov.uk/assets/downloads/sixth-annual-impacts-monitoring-report-2008-07.pdf

[16] Sadler Consultants, Low Emission Zones in Europe for the UK Department of Transport, February 2010 p2

[17] Sadler Consultants, Low Emission Zones in Europe for the UK Department of Transport, February 2010

Technology	**London Hybrid Passenger Bus** **Diesel hybrid (Euro IV and V)** 
Fuel type	**Ultra-Low Sulphur Diesel**
Technology Description	In 2006, London became the first European city to undertake extensive hybrid public bus trials. The transport provider Transport for London (TfL) began trialling diesel hybrid buses in order to assess the suitability of the technology in an urban environment. Buses were supplied from several manufacturers, in order to test different hybrid drive-trains. 56 vehicles (total London bus fleet of 8,300) – 300 planned by 2012. The trial involved 4 bus suppliers each using dissimilar battery types, drive-trains power control methods and engine sizes – 6 different models were used, supplied by Wrightbus (series hybrid; Li-ion battery; single/double deck), Alexander Dennis (series hybrid; Li-ion battery; single/double deck), Volvo (parallel hybrid; Li-ion battery; double deck) and Optare (parallel hybrid; NiMH battery; single deck). The engines, which include Euro IV and V, range from 2.4 to 6.0 litres. In 2004, emissions modelling predicted that hybrid bus fleets could achieve a 30% reduction to CO2 emissions, and reduce NOx and PMs, compared to conventional ULSD diesel operation. The hybrid bus strategy also helps TfL achieve its 20% reduction in CO2 target by 2017/18, and improves air quality in line with the Mayor's Air Quality Strategy.
Emissions Impacts of technology	As of 2010, London's bus fleet accounts for 5% of London's transport CO2 emissions and 38% TfL's CO2 footprint (representing the largest emitter). Levels of NOx and PM at street level are often in breach of EU regulations. In back-to-back vehicle comparisons (ULSD baseline), the hybrid bus fleet has resulted in the following emissions impacts: • 9 out of the 10 bus routes reported improvements to CO2/MPG (2010/11), with one route reporting a 44% reduction in CO2 emissions, and the average improvement being 31%. The greatest CO2/MPG benefits were recorded from the series hybrids, particularly on inner city routes. • The impacts on air quality included: PM reduced by 33%; NOx reduced by 12%; CO reduced by 98%; HCs by 76% • Tests also reported a 30% reduction in perceived noise with a 5 dBA noise reduction compared to diesel buses (EC test cycle).
Lessons Learned	The hybrid trial has placed TfL at the forefront of technological hybrid bus development. The trial has proved that hybrid is a robust technology that can be implemented in the short-term, one that delivers significant environmental

improvements.

Although the buses require significant additional capital investment, there are clear environmental benefits. However, the trial did find that, especially for the single deck bus fleets, that there is a large variation in emissions/MPG improvements – in 2010/11 one bus route saw a 44% improvement in MPG whilst another route saw a 17% decline. Selecting the correct technology for the route and drive cycle is therefore a key requirement.

Transferability to Sheffield

Congestion Charging

Congestion Charging is transferable to Sheffield. It is worth noting that Low Emission Zones and Congestion Charging Zones can share enforcement activities using the same Automatic Number Plate Recognition (ANPR) systems.

Low Emission Zone

It is not possible to directly relate improvements from an LEZ in one city to those in another. The impact varies based on vehicles affected, vehicle fleet make up, compliance, topography, weather etc[18].

It is worth noting that Low Emission Zones and Congestion Charging Zones can share enforcement activities using the same Automatic Number Plate Recognition (ANPR) systems.

Hybrid Bus Technology

Stagecoach Yorkshire are already using Hybrid buses in Sheffield.

[18] Sadler Consultants, Low Emission Zones in Europe for the UK Department of Transport, February 2010

Singapore

Policy	Electronic Road Pricing
Technology	**>>>>>>>>>>>>>>>>>>>>**
Policy Description	Singapore was the first city to implement a cordon-based congestion pricing system in 1975. The charging area is much smaller than that of London and is divided into central business districts and expressways/outer ring roads. An ERP (Electronic Road Pricing) system introduced in 1998 now charges for different roads at different times automatically as vehicle passes under gantries[19]. Electronic Road Pricing (ERP) is an electronic system of road pricing based on a pay-as-you-use principle. It is designed to be a fair system as motorists are charged when they use the road during peak hours. LTA reviews the traffic conditions on the expressways and roads, where the ERP system is in operation, on a quarterly basis and during the June and December school holidays. After the review, the ERP rates would then be adjusted where necessary to minimise congestion on the roads. ERP has been effective in maintaining an optimal speed range of 45 to 65 km/h for expressways and 20 to 30 km/h for arterial roads. The ERP system uses a dedicated short-range radio communication system to deduct ERP charges from CashCards. These are inserted in the In-vehicle Units (IUs) of vehicles before each journey. Each time vehicles pass through a gantry when the system is in operation, the ERP charges will be automatically deducted[20]. ERP prices vary with the 85 percentile speed along the corridors. The first road pricing scheme, known as the Area Licensing Scheme (ALS), was introduced in the Restricted Zone (RZ) in 1975. The scheme was subsequently extended to major expressways with the Road Pricing Scheme (RPS). In September 1998, the ERP system replaced the manual system for the RZ and expressways. In September 1999, ERP was extended to some of our key arterial roads beyond the RZ. The pay-as-you-use principle of ERP makes motorists more aware of the true cost of driving. This way, road usage can be optimized[21]: ■ Charges are levied on a per-pass basis and rates are set based on traffic

[19] http://www.transalt.org/campaigns/congestion/international

[20] Singapore Government Land and Transport Authority

[21] Singapore Government Land and Transport Authority

	conditions at the pricing points; ■ A motorist is encouraged to decide whether to drive, when to drive and where to drive; ■ He may choose a different route, mode of transport, time of travel, or not travel at all; and Those who choose to pay and stay on the road will enjoy a smoother ride. The capital cost of the ERP system since its inception in September 1998 is S$ 197 million. The program's annual revenue is estimated at S$144 million in 2008-09[22] The system has annual operational maintenance cost of S$25 million for 66 control gantries (in 2009).
Impacts of Policy	The charge has been successful in reducing the number of solo drivers and shifting trips from peak to non-peak times. Singapore's Congestion Zone has seen a 13% reduction of traffic during charging period. It has also led to a reduction of 24,700 cars driving during peak and a 22% rise of traffic speeds[23].
Key Policy Issues	ERP charges are reviewed at 3 monthly intervals and are tied to the prevailing speeds being experienced during a particular half-hour. The desired speed range for the roads in the downtown is 20-30 kph and for expressways 45-65 kph. If the 85th percentile speed during the tree month under view for a particular half-hour is below the lower limit, ERP charges are raised for that half-hour and if the average speed is above the higher limit, ERP rates are reduced. The charges then remain fixed for a period of 3 months. Prior to ERP[24].
Technology	
Transferability to Sheffield	The ERP system needs to be tailor made to fit local traffic conditions and is not a case of 'one size fits all'. The success of the system depends on its perceived reliability therefore there needs to be a high level of operational reliability. This is unlikely to be a cost-effective solution for a city like Sheffield.

[22] G. Menon, S.Guttikunda 2010 Electronic Road Pricing: Experience & Lessons from Singapore

[23] http://www.transalt.org/campaigns/congestion/international

[24] G. Menon, S.Guttikunda 2010 Electronic Road Pricing: Experience & Lessons from Singapore

West London Freight Study

Project	**Study into reduction of Freight Emissions**
Technology	**>>>>>>>>>>>>**
Project Description	The West London Air Quality Group (WLAQG) is a group of seven London Boroughs (Brent, Ealing, Hammersmith & Fulham, Harrow, Hillingdon, Hounslow and Richmond upon Thames) which meets regularly to discuss local and regional air quality issues and to collaborate on projects to bring about improvements in air quality in the West London area. This Group identified a need to improve their understanding of the likely impacts of a range of freight-related intervention measures on emissions generated by freight vehicles operating in West London, in order to tackle poor air quality and freight's contribution to climate change by reducing emissions of air pollutants and CO2 caused by freight operations.
Project Outcome	The project provided a clear quantification of the likely emissions-related impacts of a wide range of freight-related policies and interventions and allowed the Group to develop a more effective Freight Emissions Strategy for the area.
Project Approach	The Study used a detailed emissions model to test four high-level freight-related measures: - Time of day restrictions for non-essential goods movements on key transport corridors; - Increased night-time freight operations; - Increased use of freight consolidation centres serving London destinations; and - Reduction of lost vehicle miles on London's roads through better directional signage and increased facilities for parking, loading and unloading. The study updated and used the TRL's TEEM model which has been developed for the WLAQG.
Technology	
Transferability to Sheffield	The study findings are directly relevant to Sheffield and can be used to assist development of an LEZ strategy.

New York, US

Policy	Anti/Idling
Technology	**New York Hybrid Bus Fleet**
Policy Description	PlanNYC, the City's comprehensive sustainability plan established an aggressive strategy to reduce the City's greenhouse gas emissions in 2030 by 30% from 2005 levels. As part of that overall goal, transportation emissions which currently account for 22% of the New York's City's total green house gas emissions would be reduced by 44% by 2030. PlanNYC also targeted a reduction in the city's levels of harmful particulate emissions and pollutants to improve New York's air quality. There are a number of initiatives under PlanNYC which help towards the reduction of vehicle emissions anti-idling and the uptake of electric vehicles are detailed below. **Anti Idling**  Idling releases pollutants into the air, increases engine operating costs for fleets and shortens engine life. Effective anti-idling strategies include a mixture of incentives for retrofits, laws and enforcement of those laws and education. In New York an anti-idling law was established in 1990 which set a five minute idling limit for heavy duty diesel vehicles. In 2003 rules were enacted that enables 2,300 Traffic Enforcement Agents to issue tickets for idling violations. GreenNYC a New York public outreach programme launched an anti-idling campaign to inform New Yorkers about economic and public health costs associated with idling[25]. According to a study undertaken by the Environmental Defence Fund, idling vehicles in New York City emit 2,200 tons of smog forming volatile organic compounds, 24 tons of soot, 130,000 tons of Co2 and 940 tons of smog forming nitrogen oxides each year[26]. **Clean Fleet Transition Plan** The New York City's fleet is currently about 25% hybrid or alternative fuel vehicles, including 339 electric vehicles. In January 2010, the City launched the Clean Fleet Transition Plan to ensure that vehicles are replaced with right-sized and efficient vehicles to further green the fleet. As part of this effort, the City is introducing at least 60 additional electric vehicles to the fleet and will receive at least 42 chargers through a U.S. The Metropolitan Transit Authority's New York city Transit (NYCT) is

[25] PlaNYC A Greener Greater New York The City of New York Mayor Michael R. Bloomberg Update April 2011

[26] Turn it Off. Anti Idling Campaign Spring 2009 GreenNYC

	the largest pubic transportation system in the United States and a leader in the use of clean bus technologies. Since 1992 NYCT has displayed its commitment to cleaner vehicles by testing and evaluating a variety of clean fuel buses in revenue service. NYCT's Clean Fuel Bus Program is continuing to lower bus fleet emissions, reduce traffic congestion and improve air quality. The plan includes using new clean diesel engines with particulate filters and ultra low sulfur (30 parts per million sulfur content) diesel fuel for the entire diesel fleet (starting in 1998) as well as purchasing compressed natural gas (CNG) and hybrid electric buses.
Impacts of Policy	Increased amount of electric vehicles increase the demand for charging stations and demands upon the electric grid.
Key Policy Issues	A strong media campaign was behind the success of the anti idling campaign. It is likely that a supply of electric vehicles will not meet demand particularly from the early adopters due to the long period from design to mass production until at least 2015[27]. In 2005 NYCT had 325 hybrid electric buses about 7% of its entire fleet and 476 CNG buses about 18% of its entire fleet[28]. In 2004 the NYCT was using Orion VII hybrid buses and the drivers liked the quick acceleration of the buses suitable for traffic conditions in New York.
Technology	**New York Hybrid Bus Fleet – Passenger Bus**
	Diesel hybrid
Fuel type	**Ultra-Low Sulphur Diesel**
Technology Description	New York City Transit was been working on a range of clean fuel buses since the early 1990's, and now has a significant fleet of diesel hybrids as part of its working fleet (alongside a large number of CNG buses). As of 2010, 27% of the NYCT fleet are diesel-hybrid, and only 35% are conventional diesel, with the rest CNG. This is the largest operational fleet of hybrid buses in the world, one that has covered over 20 million miles. Around 1,700 hybrids currently in operation. First 10 hybrid buses in 1998. 141 added in 2004, 335 added in 2005, 474 added in 2006 and over 825 added in 2007/08. Total New York City Transit fleet is 4,300 strong. The operator is New York City Transit (NYCT), as part of the Metropolitan Transportation Authority (MTA).

[27] PlanNYC Exporing Electric Vehicle Adoption in New York City January 2010 A Greener Greater New York

[28] Advanced Technology Vehicles in Service New York City Transit Diesel Hybrid Electric Buses US Department Of Energy

	Buses are Orion VII/BAE hybrids supplied by Orion Bus Industries (a part of DaimlerChrysler Commercial Buses North America), using BAE Systems HybriDrive (series drive-train, lead-acid/lithium-ion batteries). Key objectives were to: achieve emission reductions comparable to the best available CNG technology, whilst avoiding the cost inherent with implementing widespread CNG vehicles and infrastructure; to improve fuel economy across the fleet; reduce noise levels; improve acceleration; and reducing local air pollutants
Emissions Impacts of technology	The latest production buses used in the hybrid fleet demonstrate an average fuel consumption of 3.2 mpg, compared to the standard bus average of 2.5 mpg - this represents an improvement of 32% to 52% (baseline without EGR), and a similar reduction in CO2. Gen 2 hybrids also have 5.9% improved fuel economy as compared to Gen 1. New technology improvement programs also show a potential reduction of an additional 10-15% over production configuration hybrids. These include software modifications, improved energy storage, fuel additives and acceleration reduction. Emissions impacts also include some NOx benefit which are reduced compared to conventional diesel buses (no EGR/DPF). However, Gen II hybrids emit higher NOx and PMs than conventional diesels with EGR and DPFs.
Lessons Learned	Currently, lead-acid batteries are used in majority of hybrids - these have a life expectancy of 3 to 4 years and require periodic maintenance. However, these are being replaced (from 2009) by lithium-ion batteries which are expected to last for 6 years, and reduce the weight of the bus by 1,400 kg. Hybrids have proven to be a successful technology for the New York bus fleet. The hybrid buses all show improved acceleration, smoother, quieter and little or no operator training is required. Importantly, they can be used on all NYCT bus routes. Future hybrid developments being considered by NYCT include super-capacitors, and other zero emissions options.
Transferability to Sheffield	Data from trials show seasonal variation in MPG due to air conditioning loads. The energy penalty amounted to around 1 MPG reduction (3.7 MPG winter compared to 2.7 MPG summer). Positively, there was a smooth transition from diesel to hybrid-diesel buses in New York, with little change to operations etc. The mix of generation sources that provide power to the New York city electric grid are favourable to electric vehicles, as approximately 40% of the electricity consumed in New York City is generated by low carbon energy sources such as nuclear and hydrogen electric power[29]. Northeast Regional Electric Vehicle Partnership (NREVP) identified the difficulty of the installation process for EV charging equipment as one of the key barriers to EVs[30]. New York City has a lower than the national average percentage of household car ownership due to the dense development pattern and extensive public transport network.

[29] PlaNYC A Greener Greater New York The City of New York Mayor Michael R. Bloomberg Update April 2011

[30] PlaNYC A Greener Greater New York The City of New York Mayor Michael R. Bloomberg Update April 2011

Report Appendix J – Detailed Preferred Strategy Results (LESAT)

Option	Strategy Component Description	Effectiveness (Total NO_x Reduction)	% Total Fleet Affected	Efficiency (NO_x) higher = more efficient	Cost per fleet of 1000 vehicles (in total fleet) £m	Cost Effectiveness (% NO_x reduction per £m for fleet upgrade)
PreferredStratA - Targets	Preferred Strategy A - Setting Emission Rate and Euroclass Targets	20%	6%	Medium	Low	Medium
PreferredStratB-Targets&Fleet	Preferred Strategy B - Setting Emission Rate and Euroclass Targets and Fleet Changes	25%	12%		Low	

Strategy Achievement	Achievement Description
Very Low	0-5% NOx emission reduction
Low	5-10% NOx emission reduction
Medium	10-20% NOx emission reduction
High	20-30% NOx emission reduction
Excessive	30%+ NOx emission reduction

Cost Indicator	Cost per 1000 vehicle fleet
Very Low	<£1m
Low	1-5
Medium	5-10
High	10+

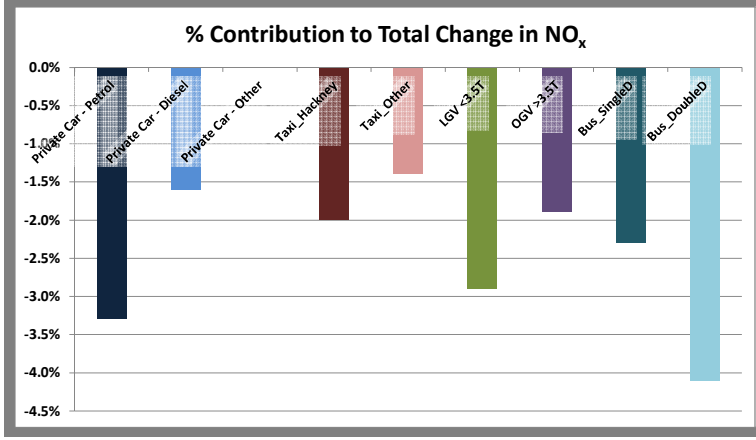
Strategy Year	2015	Description	Preferred Strategy A	Preferred Strategy A - Setting Emission Rate and Euroclass Targets

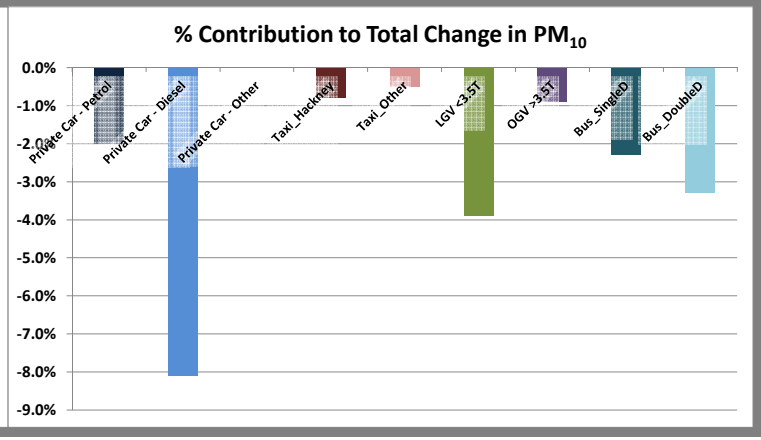
Fleet Characteristics		Do Minimum NO_x Emission Rates (g/km)			Do Minimum PM_{10} Emission Rates (index/km)			ERROR COMMENT	Strategy Setting: By Emission Rate – Target Maximum NO_x Emission Rate	Strategy Setting: By Emission Rate – Target Maximum PM_{10} Emission Rate	Strategy Setting: By Euroclass – Minimum permitted Euroclass	Strategy Setting: Fleet Change – Switch Petrol/ Diesel %	Strategy Setting: Fleet Change – Remove %
Main Vehicle Type	Vehicle Subclass	Existing minimum	Existing mean	Existing maximum	Existing minimum	Existing mean	Existing maximum						
Car	Private Car - Petrol	0.10	0.37	8.00	5	9	400		None	None	None	0	0
	Private Car - Diesel	0.10	1.07	7.00	5	27	1100		None	None	None		0
	Private Car - Other	0.10	0.14	0.70	5	6	60		None	None	None	-	0
	Taxi_Hackney	0.10	1.98	20.00	5	73	1100		1.60	None	None	-	0
	Taxi_Other	0.10	1.46	8.00	5	34	1100		1.10	None	None	0	0
LGV <3.5T	LGV <3.5T	0.10	1.29	9.00	5	42	700		2.00	None	None	0	0
OGV >3.5T	OGV >3.5T	0.10	4.94	24.00	5	82	4000		10.00	None	None	-	0
Bus	Bus_SingleD	0.10	5.39	20.00	5	126	1300		None	None	E6	-	0
	Bus_DoubleD	0.10	5.55	29.00	5	113	1800		None	None	E6	-	0
Total													

Impact of Strategy		Do Minimum		Strategy		Do Minimum		Strategy		Proportion of fleet affected	Average Cost per affected vehicle
Main Vehicle Type	Vehicle Subclass	% Change in NO_x	% Contribution to Total Change in NO_x	% Change in NO_x	% Contribution to Total Change in NO_x	% Change in PM_{10}	% Contribution to Total Change in PM_{10}	% Change in PM_{10}	% Contribution to Total Change in PM_{10}		
Car	Private Car - Petrol	-18.3%	-3.3%	-18.3%	-3.3%	-10.9%	-2.0%	-10.9%	-2.0%	0%	£ -
	Private Car - Diesel	-4.3%	-1.6%	-4.3%	-1.6%	-23.0%	-8.1%	-23.0%	-8.1%	0%	£ -
	Private Car - Other	0.1%	0.0%	0.1%	0.0%	0.1%	0.0%	0.1%	0.0%	0%	£ -
	Taxi_Hackney	2.6%	0.2%	-35.3%	-2.0%	-9.8%	-0.8%	-9.8%	-0.8%	52%	£ 9,000
	Taxi_Other	6.3%	0.2%	-39.9%	-1.4%	-15.9%	-0.5%	-15.9%	-0.5%	53%	£ 7,000
LGV <3.5T	LGV <3.5T	0.8%	0.1%	-18.7%	-2.9%	-19.7%	-3.9%	-19.7%	-3.9%	17%	£ 400
OGV >3.5T	OGV >3.5T	-13.3%	-1.4%	-18.3%	-1.9%	-13.0%	-0.9%	-13.0%	-0.9%	8%	£ 7,000
	Bus_SingleD	4.2%	0.2%	-61.4%	-2.3%	3.1%	0.1%	-66.7%	-2.3%	97%	£ 29,500
Bus	Bus_DoubleD	-18.1%	-1.2%	-62.6%	-4.1%	-0.7%	0.0%	-63.1%	-3.3%	85%	£ 67,000
Total		-6.8%	-6.8%	-19.6%	-19.5%	-16.1%	-16.1%	-21.7%	-21.8%	6%	
Strategy Effectiveness				Efficiency	Cost Effectiveness			Efficiency	Cost Effectiveness		
				45.6	5.0			20.4	2.2		

Cost per fleet of 1000 vehicles (£m)	2.55

Mode	Vehicle Multiplier (based to car)
Private Car	1.0
Private Car	1.0
Private Car	1.0
Taxi_Hackney	5.4
Taxi_Other	4.2
LGV <3.5T	1.1
OGV >3.5T	1.0
BUS	4.3
BUS	4.3





Strategy Year	2015	Description	Preferred Strategy B	Preferred Strategy B - Setting Emission Rate and Euroclass Targets and Fleet Changes

Fleet Characteristics		Do Minimum NO_x Emission Rates (g/km)			Do Minimum PM_{10} Emission Rates (index/km)			ERROR COMMENT	Strategy Setting: By Emission Rate		By Euroclass	Fleet Change	
Main Vehicle Type	Vehicle Subclass	Existing minimum	Existing mean	Existing maximum	Existing minimum	Existing mean	Existing maximum		Target Maximum NO_x Emission Rate	Target Maximum PM_{10} Emission Rate	Minimum permitted Euroclass	Switch Petrol/ Diesel %	Remove %
Car	Private Car - Petrol	0.10	0.37	8.00	5	9	400		None	None	None	10	5
	Private Car - Diesel	0.10	1.07	7.00	5	27	1100		None	None	None		5
	Private Car - Other	0.10	0.14	0.70	5	6	60		None	None	None	-	0
	Taxi_Hackney	0.10	1.98	20.00	5	73	1100		1.60	None	None	-	0
	Taxi_Other	0.10	1.46	8.00	5	34	1100		1.10	None	None	0	0
LGV <3.5T	LGV <3.5T	0.10	1.29	9.00	5	42	700		2.00	None	None	0	0
OGV >3.5T	OGV >3.5T	0.10	4.94	24.00	5	82	4000		10.00	None	None	-	5
Bus	Bus_SingleD	0.10	5.39	20.00	5	126	1300		None	None	E6	-	0
	Bus_DoubleD	0.10	5.55	29.00	5	113	1800		None	None	E6	-	0
Total													

Impact of Strategy		Do Minimum		Strategy		Do Minimum		Strategy		Proportion of fleet affected	Average Cost per affected vehicle
Main Vehicle Type	Vehicle Subclass	% Change in NO_x	% Contribution to Total Change in NO_x	% Change in NO_x	% Contribution to Total Change in NO_x	% Change in PM_{10}	% Contribution to Total Change in PM_{10}	% Change in PM_{10}	% Contribution to Total Change in PM_{10}		
Car	Private Car - Petrol	-18.3%	-3.3%	-18.1%	-3.3%	-10.9%	-2.0%	-10.2%	-1.8%	5%	£ -
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	Private Car - Other	0.1%	0.0%	0.1%	0.0%	0.1%	0.0%	0.1%	0.0%	0%	£ -
	Taxi_Hackney	2.6%	0.2%	-35.3%	-2.0%	-9.8%	-0.8%	-9.8%	-0.8%	52%	£ 9,000
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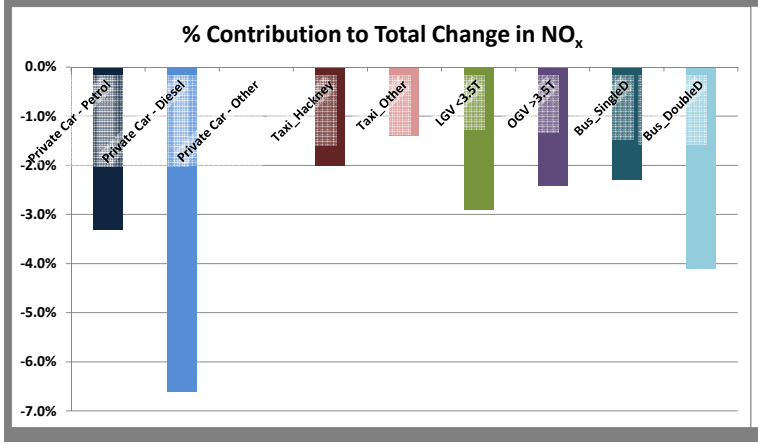
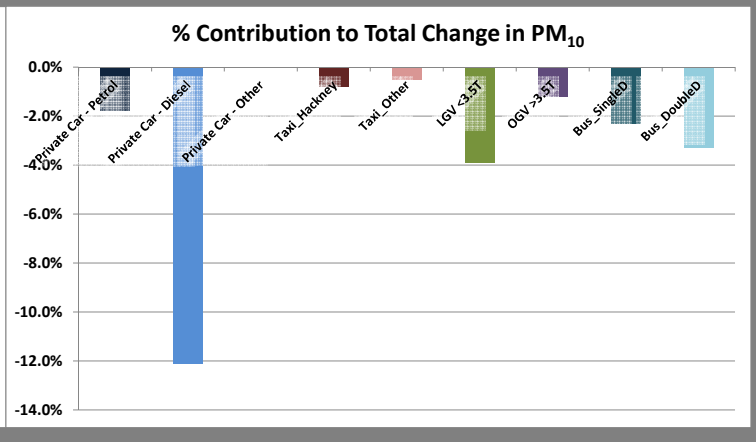
OGV >3.5T	OGV >3.5T	-13.3%	-1.4%	-22.4%	-2.4%	-13.0%	-0.9%	-17.3%	-1.2%	8%	£ 7,000
	Bus_SingleD	4.2%	0.2%	-61.4%	-2.3%	3.1%	0.1%	-66.7%	-2.3%	97%	£ 29,500
Bus	Bus_DoubleD	-18.1%	-1.2%	-62.6%	-4.1%	-0.7%	0.0%	-63.1%	-3.3%	85%	£ 67,000
Total		-6.8%	-6.8%	-25.0%	-25.0%	-16.1%	-16.1%	-25.8%	-25.9%	12%	
Strategy Effectiveness				Efficiency	Cost Effectiveness			Efficiency	Cost Effectiveness		

Cost per fleet of 1000 vehicles (£m)	2.55

Mode	Vehicle Multiplier (based to car)
Private Car	1.0
Private Car	1.0
Private Car	1.0
Taxi_Hackney	5.4
Taxi_Other	4.2
LGV <3.5T	1.1
OGV >3.5T	1.0
BUS	4.3
BUS	4.3





Report Appendix K – Sites with Air Quality Problems 2010-2012 post LEZ strategy

Site	2010	2011	2012	2013 Predicted	Reduction Required (All Sectors)	Road Traffic proportion of total NO_2 Emissions	Reduction from Road Traffic Through LEZ Strategy	Remaining Reduction Required
463 Queens Road	52	57	57	56	29%	45%	22%	35%
Chesterfield Road / Meersbrook Park Roa	57	53	55	54	27%	44%	36%	19%
Fitzalan Square	60	51	55	54	26%	59%	46%	0%
Whitham Road / Crookes	53	51	54	53	25%	50%	22%	28%
London Road / Sark Road	52	51	54	53	25%	45%	40%	13%
Waingate	59	53	52	52	22%	59%	55%	0%
Penistone Road	45	54	52	52	22%	51%	27%	18%
London Road / Ponsfords	52	51	51	51	21%	55%	43%	0%
Queens Road / G Casino	50	48	50	50	19%	52%	19%	19%
University Roundabout	47	50	49	49	18%	69%	23%	8%
82 Bawtry Road	48	43	49	48	17%	15%	8%	19%
Barnsley Road / Fir Vale	53	45	49	48	17%	48%	25%	9%
La Scala	43	50	48	48	16%	44%	18%	14%
Whitham Road / Moor Oaks Road	50	52	48	48	16%	59%	33%	0%
47 Bawtry Road	51	51	47	47	15%	15%	8%	16%
Ladys Bridge	40	45	47	47	14%	59%	50%	0%
Western Bank / Clarkson Road	48	49	47	47	14%	69%	27%	0%
West Street / Leopold Street.	45	49	47	47	14%	59%	47%	0%
Chesterfield Road / Olivet Road	48	47	47	47	14%	76%	37%	0%
Tinsley Junior School Field	44	49	45	45	10%	15%	21%	8%
Catchbar Lane Traffic Light	46	49	45	45	10%	35%	19%	5%
98 Bawtry Road	47	45	44	44	8%	15%	8%	8%
Town Street / Tinsley	43	49	44	44	8%	82%	6%	17%
Chippendale	45	47	44	44	8%	53%	20%	0%
West Street / Regent Street	44	40	44	44	8%	69%	34%	0%
7 Bawtry Gate	46	45	44	43	8%	82%	8%	7%
Ecclesall Road / Pear Street	50	43	43	43	7%	69%	18%	0%
Ecclesfield Road / Low Wincobank	47	47	43	43	7%	90%	17%	0%
73 Burngreave Road	38	43	43	43	6%	61%	41%	0%
879 Abbeydale Road	40	46	43	43	6%	53%	29%	0%
Manchester Road / Sale Road	42	42	43	43	6%	50%	27%	0%
Shoreham Street	49	43	43	42	6%	52%	21%	0%
109 Bawtry Road	42	43	43	42	5%	15%	8%	5%
Sheffield Parkway / Broad Lane duplicate	42	40	42	42	4%	10%	26%	1%
Wicker	38	42	42	42	4%	61%	35%	0%
Queens Road / Netto	40	40	42	42	4%	45%	31%	0%
Attercliffe Road / Meadowhall Retail Park	47	42	42	42	4%	35%	18%	0%
Tinsley Junior School Building	40	44	41	41	2%	15%	21%	0%
Western Bank / Northumberland Road	39	39	41	41	2%	59%	25%	0%
Tinsley GH22	36	44	41	41	2%	80%	21%	0%
Upper Hanover Street	47	38	41	41	1%	69%	21%	0%
Chesterfield Road / Woodseats	46	38	40	40	0%	53%	27%	0%
Duke Street	45	43	40	40	0%	10%	36%	0%
Fielding Road	43	42	39	39	0%	35%	23%	0%
Abbeydale Rd / Carter Knowle	42	39	39	39	0%	44%	35%	0%
Upwell Street	45	36	39	39	0%	64%	15%	0%
Shop Front Parkway R/A	41	39	39	39	0%	30%	25%	0%
Seimens Close	40	44	38	38	0%	15%	8%	0%
Queens Road / Edmund Road	41	36	37	37	0%	45%	22%	0%
Loxley New Road	46	35	36	36	0%	73%	25%	0%
Netherthorpe School	42	37	35	34	0%	69%	22%	0%

LEZ Strategy traffic reduction exceeds that required by all sectors

LEZ Strategy traffic reduction lower than that required by all sectors

Report Appendix L – Consolidated Slides from Steering Group Meetings

Sheffield Air Quality Modelling – LEZ Phase 2 Steering Group Meetings

Sheffield City Council

defra
Department for Environment Food and Rural Affairs

MVA
SYSTRA GROUP

Summary

1. LEZ Phase 1 – Background
2. LEZ Phase 2 – Project Scope and Methodology
3. Review of Model Forecasts
4. Updated Emissions Calculations – The Key Hotspots
5. Apportionment of Current Emissions
6. Initial Strategy Development
7. LEZ Strategy Development

1.

LEZ Phase 1 - Background

Context

- All 4 South Yorkshire Local Authorities have declared AQMAs due to the exceedance of $_{NO2}$ health-based limit values including PM_{10} in Sheffield
- Sheffield has been highlighted by the EU as an area requiring urgent attention because it is unlikely to meet these health-based AQ EU Limit Values by 2015
- Each year, the AQ impact on health costs the Sheffield economy £160m and results in up to 500 early deaths
- Transport emissions are the biggest single contributor
- There is the potential for the UK government to be fined if EU Air Quality limits continue to be breached beyond 2015 and the fines could be significant
- The UK Government's application to delay compliance with EU objectives has recently been turned down, confirming that the risk to Local Authorities remains

Phase 1 Approach

- The study used a webTAG compliant 2008 Base Year Transport Model (SRTM3)
- The DfT approved 2015 Forecast (for BRT North MSBC) underpinned the assessment
- The SATURN Highway Model provided detailed information on traffic speeds (on a link by link basis) and traffic composition
- MVA ENEVAL software was then used to calculate transport emissions
  - Use of local fleet composition compared with national averages
  - Emissions factors using latest COPERT compared with those in the then current version of the DEFRA Emissions Factor Toolkit

Phase 1 Key Findings

- Using the correct vehicle fleet assumptions when forecasting emissions is critical
- UK (DEFRA) v EU (COPERT) emission factors produce significantly different results
- Any potential interventions that are aimed at one vehicle type alone are unlikely to remove all of the air quality problems resulting from transport emissions
- Increasing diesel car proportions is a major issue
- Research suggests that later Euro standards have not had the expected impact on NO_X emissions, particularly for diesel cars
- WHO have now declared diesel fuel emissions as a carcinogen

2.

LEZ Phase 2 – Project Scope and Methodology

Objectives

- Build on the findings from Phase 1 in order to provide a robust evidence base upon which to develop an Air Quality Strategy / Low Emission Zone (LEZ)

- Aim of the Air Quality Strategy / LEZ is to help SCC and its partners to move towards compliance with European Air Quality Standards for NO_2 and PM_{10} by tackling the main traffic-related emissions which are contributing to our current air quality problems, as set out in the AQAP for Sheffield 2015

Provide a Robust Evidence Base

- Develop an understanding of the taxi fleet
- Estimate contribution of taxis towards emissions
- Refine car/freight fleet composition assumptions based on ANPR data
- Review of evidence/research into actual emissions
- Remote sensing of actual vehicle emissions at 5 Sheffield locations
- Review transport model forecasts
- Update emissions calculations and review Phase 1 findings
- Modelling of air quality using transport emissions outputs

Air Quality Strategy / LEZ

Review the emissions and air quality estimates and identify potential initiatives:

- Consideration of impact of reducing age of vehicle fleet
- Consideration of retrofitting a selection of the vehicle fleet
- Consideration of impact of alternative fuels and emissions technology
- Identification of indicative costs of different initiatives
- Potential initiatives to be discussed with Steering Group
- Testing of individual/cumulative packages of initiatives on emissions and air quality

Air Quality Strategy / LEZ

Develop an Air Quality Strategy / LEZ:

- Based on findings from testing of initiatives
- Considering deliverability, affordability and acceptability of initiatives to be considered, through discussion with Steering Group
- Discussion of recommendations with Steering Group
- Discussion of implementation timescales
- Identify funding mechanisms

3.

Review of Model Forecasts

Phase 1 2015 Model Forecasts

2015 Local Low Growth Forecast from Best and Final Funding Bid for BRT North

Development Assumptions:

- Some developments, particularly in Rotherham, have proceeded further than expected
- In Sheffield fewer developments are now seen as Near Certain

Supply Assumptions:

- A number of smaller transport schemes have progressed more quickly than anticipated, but these are unlikely to have a strategic impact
- Tram-train and Supertram Additional Vehicles not included in forecasts

Comparison of model forecasts and counts show:

- no significant growth in car trips between 2008 and 2012
- Goods vehicle trips have reduced between 2008 and 2012, particularly OGVs
- Unlikely that growth in 2015 forecasts will be realised, particularly for goods vehicles

Phase 2 2015 Traffic Model Forecasts

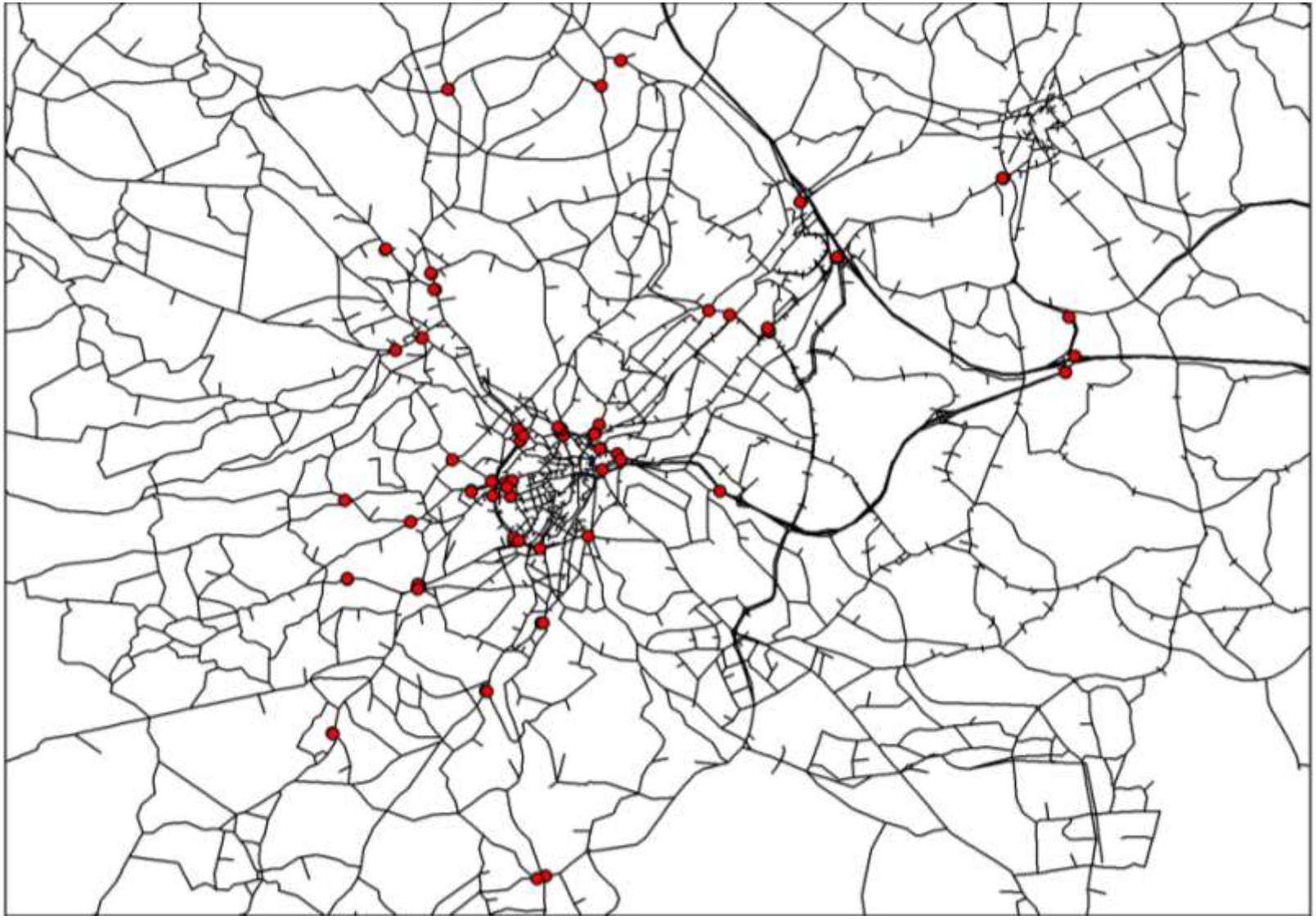
It was agreed to factor existing matrices to produce revised 2015 forecast matrices:

- Factors taken from Sheffield Vehicle Occupancy Survey counts
- Previous 2015 Matrices factored to target totals to include impact of developments
- Targets calculated by applying observed traffic growth to 2008 matrix totals
- Bus Flows reviewed and updated to current service patterns

Factors in relation to 2008 levels

	MORNING PEAK	INTER-PEAK	EVENING PEAK
Car	1.02	1.00	0.96
LGV	1.00	0.96	0.89
OGV	0.79	0.81	0.85

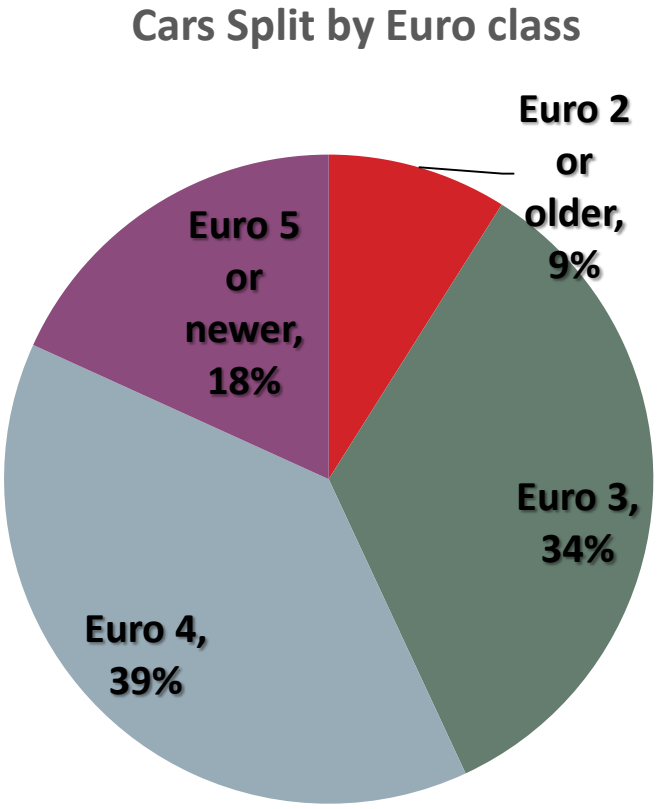
2013 ANPR Sites

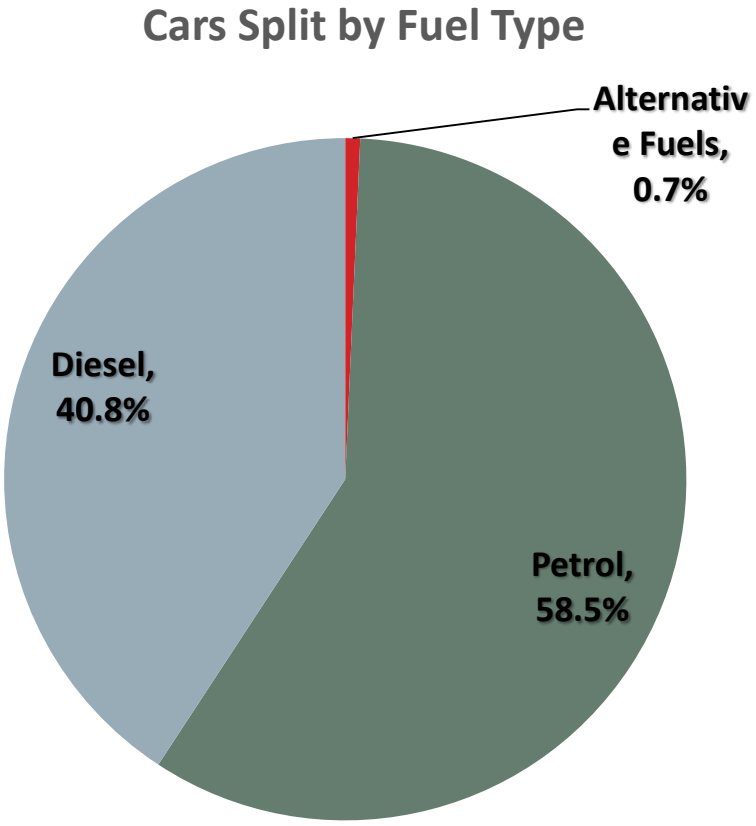


Reporting of ANPR Data

- The reporting of ANPR data in this presentation includes all observations at all sites shown on the previous slide
- Multiple observations of the same vehicle are included to give a view of vehicle usage not just fleet composition
- Analysis of fleet composition in different areas will be considered to improve our understanding of the fleet in different areas, particularly those with poor Air Quality

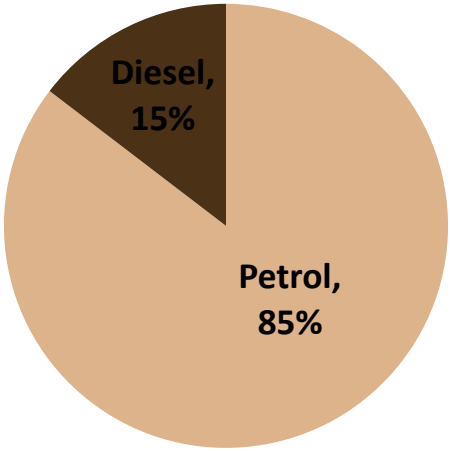
Weekday Car Fleet Composition from City Wide ANPR Data



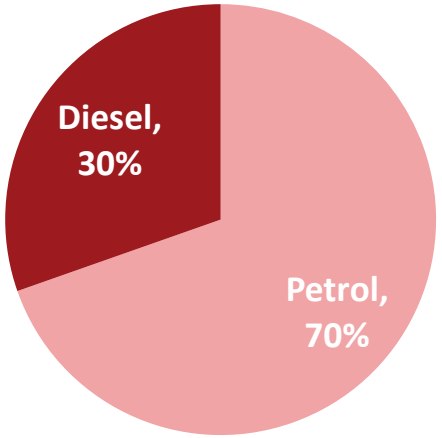


Weekday Car Fleet – Petrol/Diesel Split by Euro Class

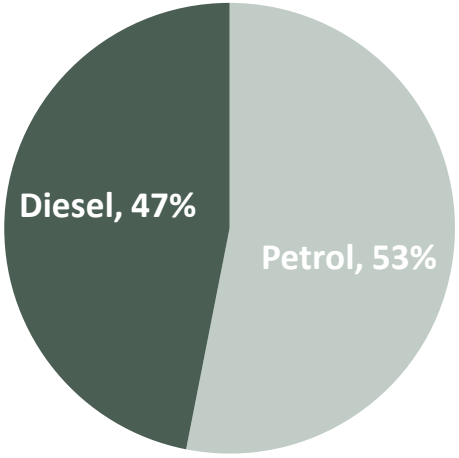
Euro 2 or Older



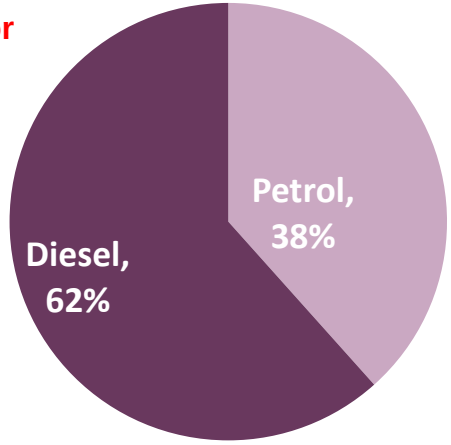
Euro 3



Euro 4



Euro 5 or newer

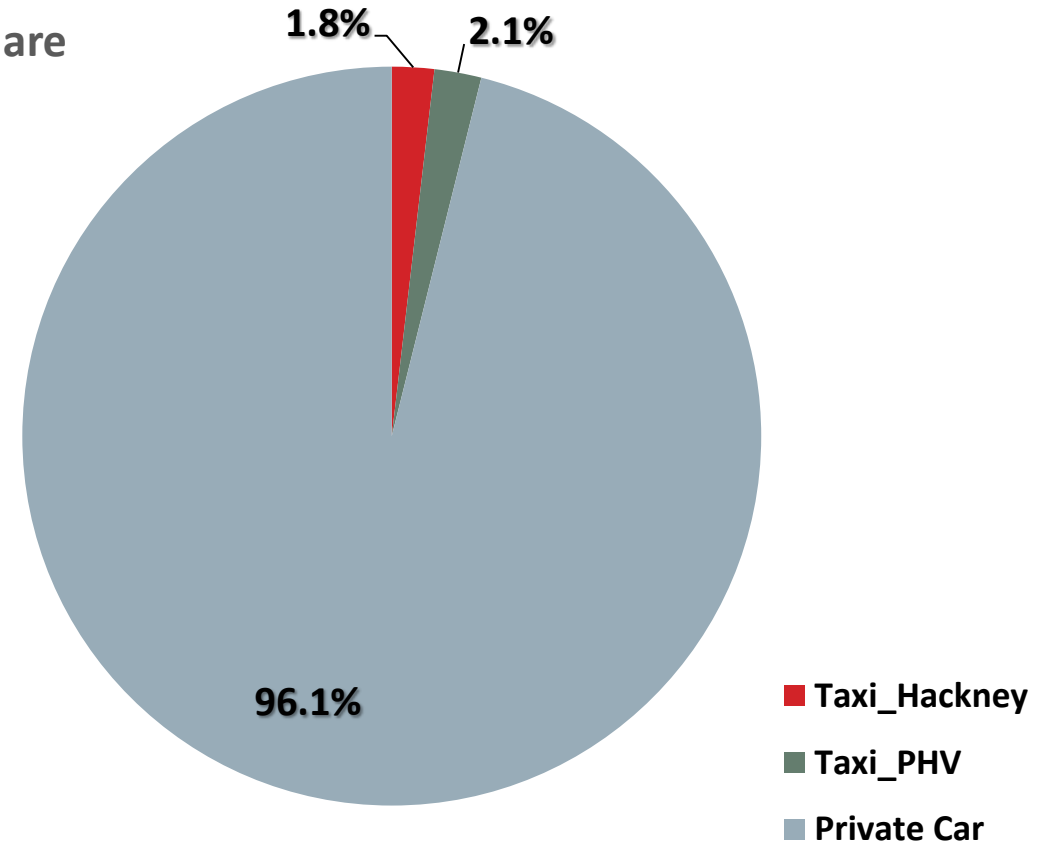


Car Fleet Composition Summary (all ANPR observations)

- Diesel proportion expected to be approaching 50% by 2015
- Only 0.7% of the fleet is alternative fuels, with the vast majority of these being hybrid electric
- Higher proportion of petrol cars Euro 3 or earlier than national average
- Sheffield fleet not as old as was expected in the Phase 1 assumptions (which used South Yorkshire data)
- Euro 5 proportion of petrol cars lower than national average
- Over 70% of diesel car fleet is Euro 4 or 5 and is comparable to national assumptions
- Lower proportion of diesel cars are Euro 5 than national assumptions (25% vs 33%)
- Phase 1 under-estimated the proportion of newer vehicles in Sheffield's diesel fleet

Weekday Split of Cars and Taxis from City Wide ANPR Data

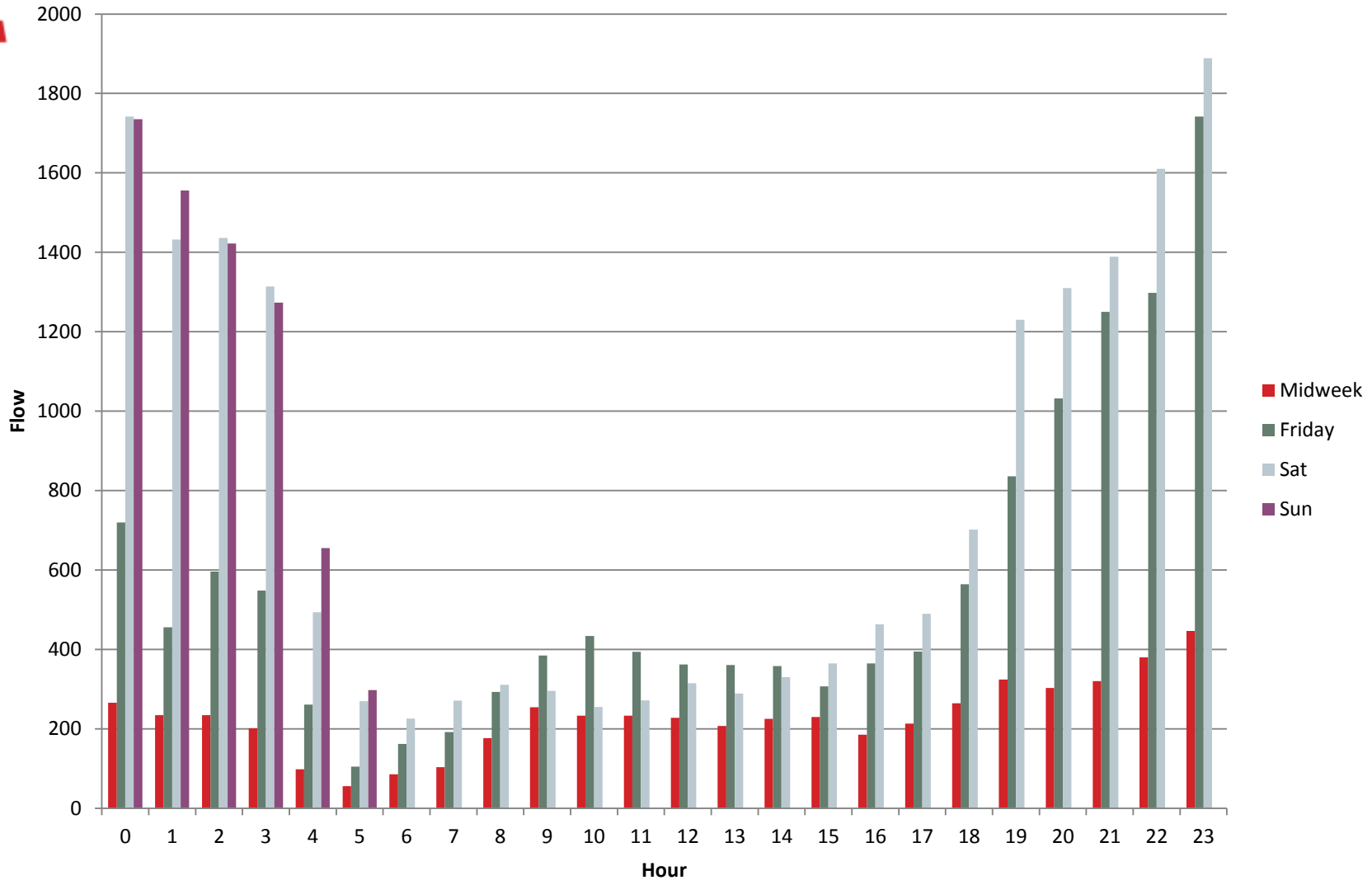
Proportion of cars that are hackney carriage and private hire vehicles



2013 Taxi Fleet Summary (all ANPR observations)

- Taxis represent on average about 4% of car traffic (and 10% of diesel cars)
- Taxi's proportion of all-car traffic ranges between 1% and 8% depending on the location
- Only 3% of taxis are the newer Euro 5, compared to the 27% of diesel private cars
- High taxi use after 7pm

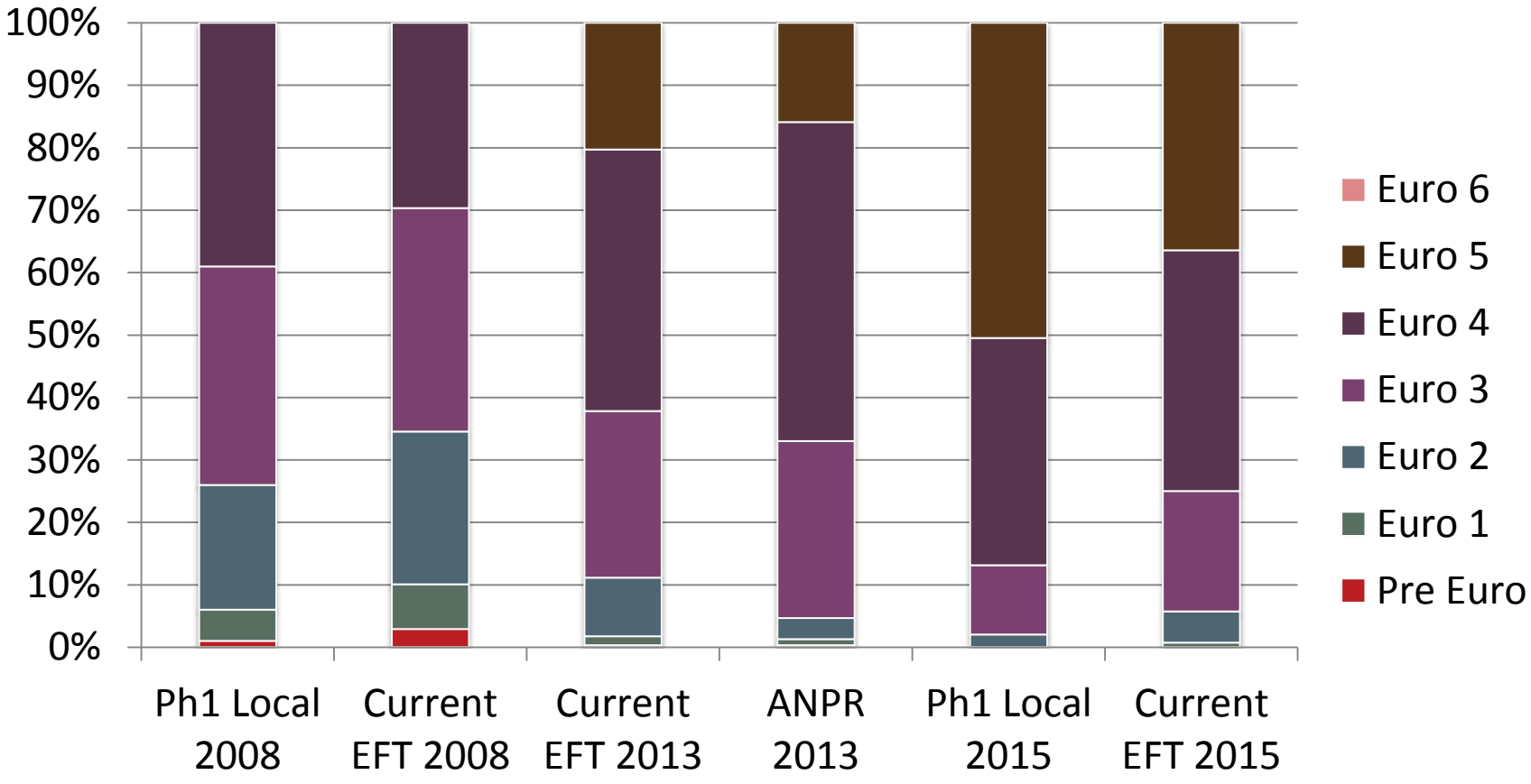
Taxi flows for Average Weekday, Friday and Saturday by hour (all taxi data in remainder of presentation is average weekday)



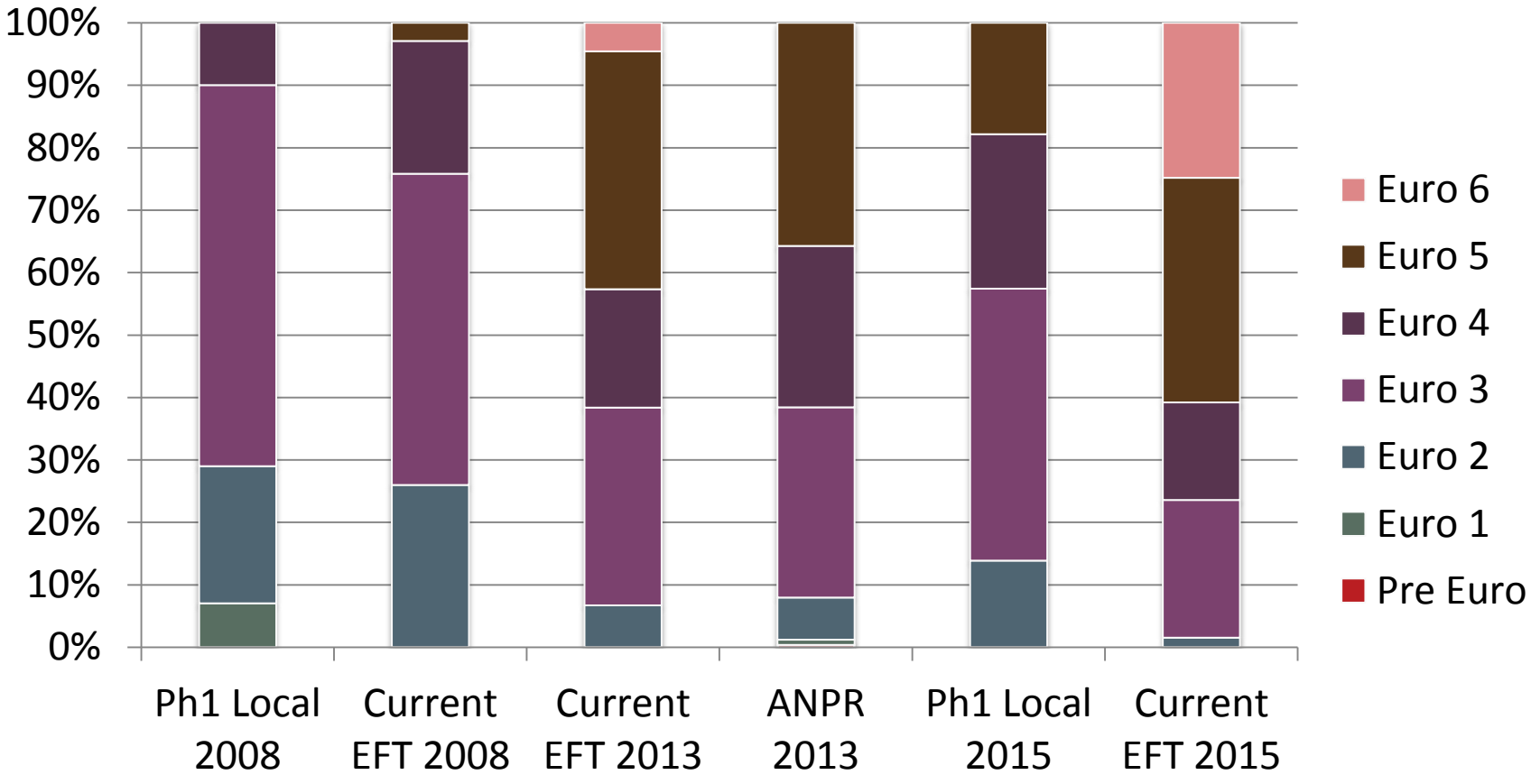
The 2013 Taxi Fleet: Diesel Car v Diesel Taxi by Euro Class (all ANPR observations)

Euro Class	Car %	Hackney Carriage and PHV%	PHV %	Hackney Carriage %
Pre Euro 1	0.1%	0%	0%	0%
Euro 1	0.4%	0%	0%	0%
Euro 2	3%	10%	0%	22%
Euro 3	25%	29%	13%	46%
Euro 4	44%	58%	83%	29%
Euro 5	27%	3%	3%	2%
Euro 6	0%	0%	0%	0%

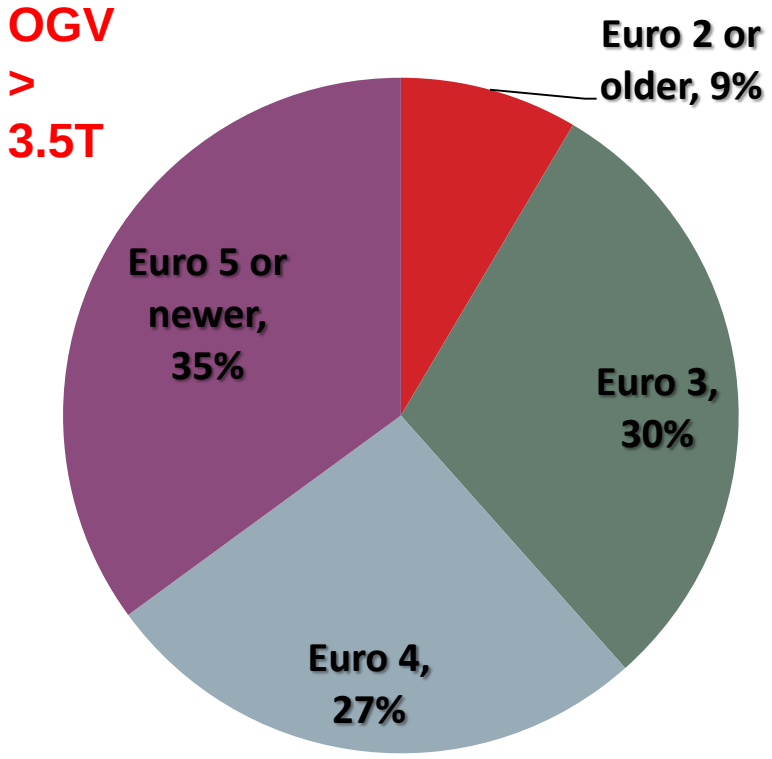
LGV (<3.5T) Fleet Composition: Diesel Euro Split (all ANPR observations)

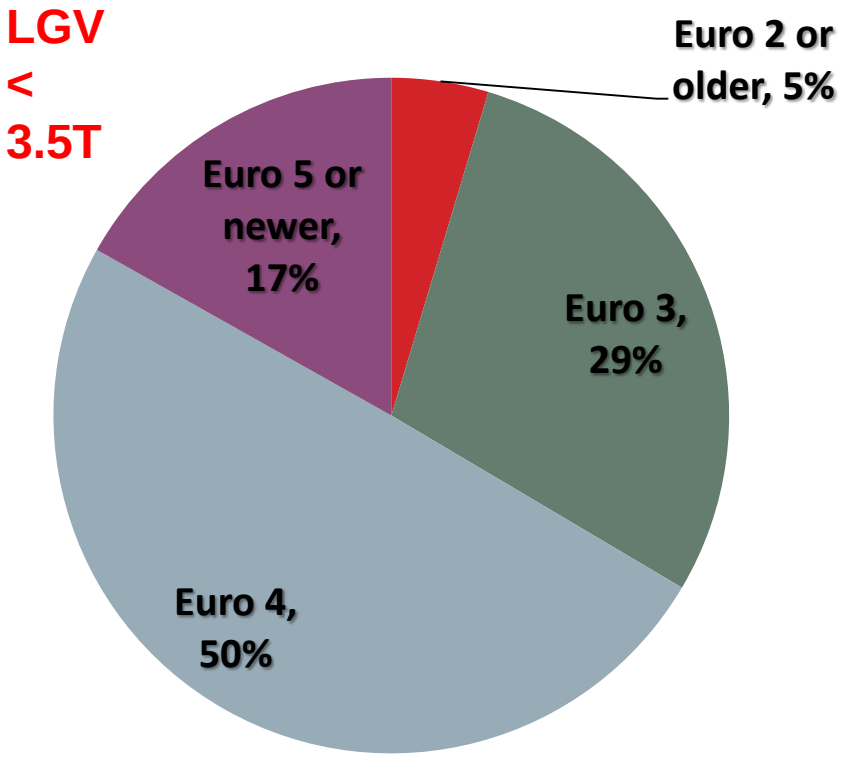


OGV (>3.5T) Fleet Composition: Euro Split (all ANPR observations)



Weekday Goods Vehicle Fleet by Euro Class from City Wide ANPR data

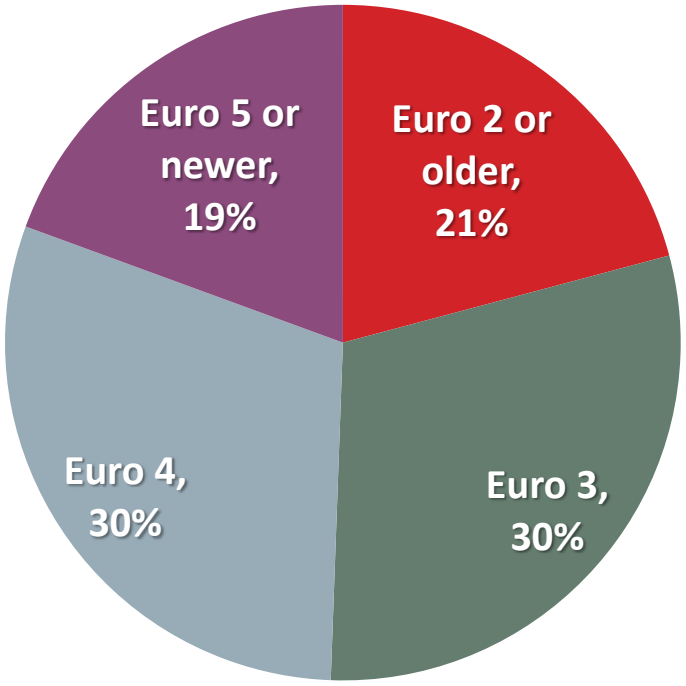




Goods Vehicle Fleet Composition Summary (all ANPR observations)

- Higher proportion of Euro 4/5 LGVs (<3.5T) than national average
- Phase 1 assumptions over-estimated the proportion of newer LGVs (<3.5T) but under-estimated the proportions of newer OGVs (>3.5T)

Weekday Bus Fleet by Euro Class from City Wide ANPR data



Summary of Vehicle Fleet

- Almost 60% of Car Fleet is Petrol
- Newer cars have increasing diesel proportions
- More than half of the goods fleet is Euro 4 or newer
- Only 17% of the LGV fleet is Euro 5 or newer, compared with 35% of the OGV fleet
- Taxi flows considerably higher on Fridays and Saturdays

4.

Updated Emissions Calculations – The Key Hotspots

Phase 2 Emissions Forecast Update

Revised Emissions Forecasts in ENEVAL:

- ENEVAL Software updated to be consistent with latest version of EFT, and then COPERT 4 v10
- Revised 2015 traffic model forecasts
- Vehicle fleet assumptions for comprehensive ANPR data set
- Bus fleet assumptions from operators
- Taxi fleet identified separately from car fleet

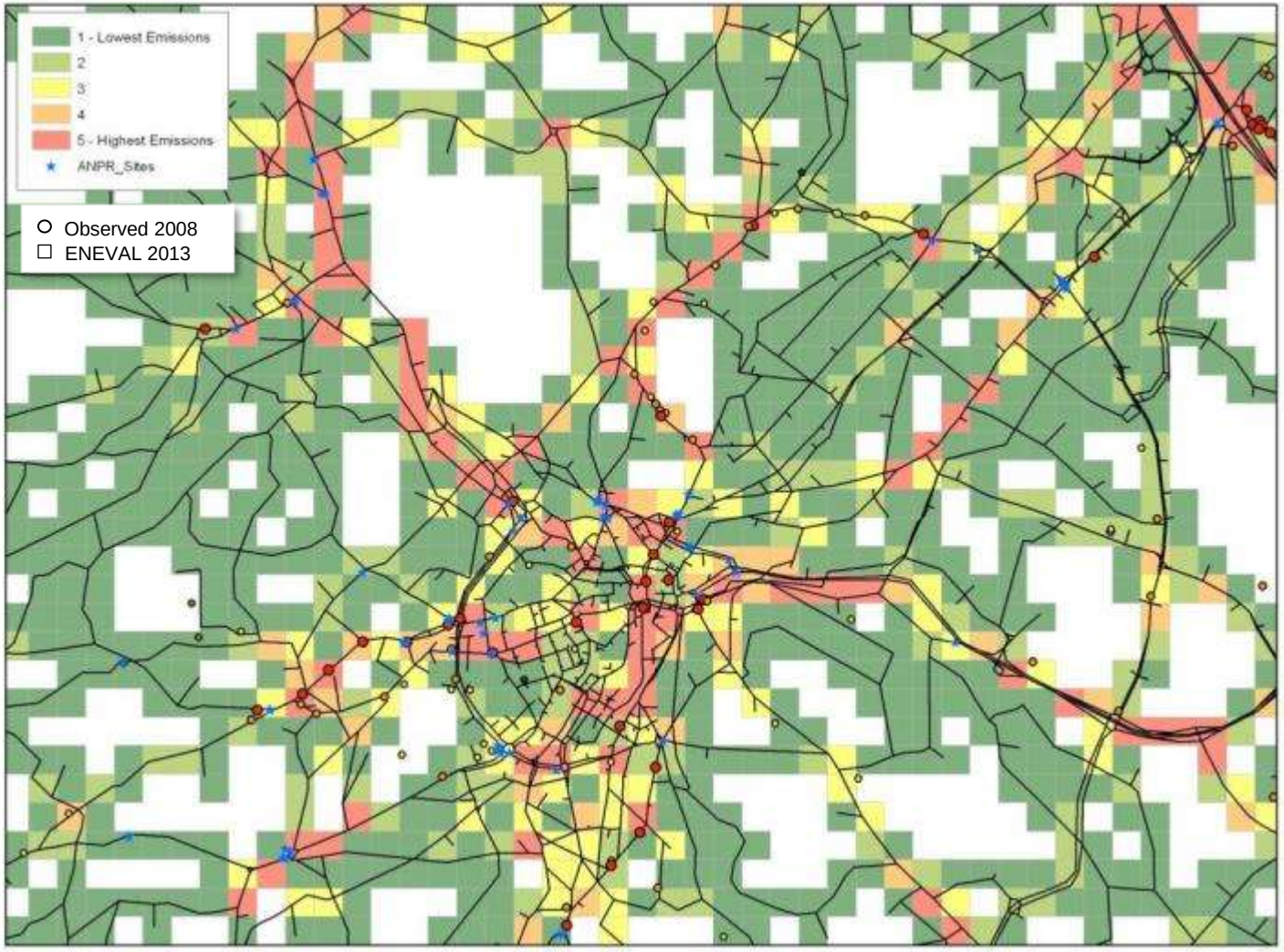
New LEZ Strategy Appraisal Tool developed using observed emissions distributions (based on data collected via roadside emissions monitoring by Dr James Tate (ITS Leeds)) up to EURO V and supplemented by EURO VI standards)

Comparison of NO_X Estimates from EFT 5.1.2 and ENEVAL

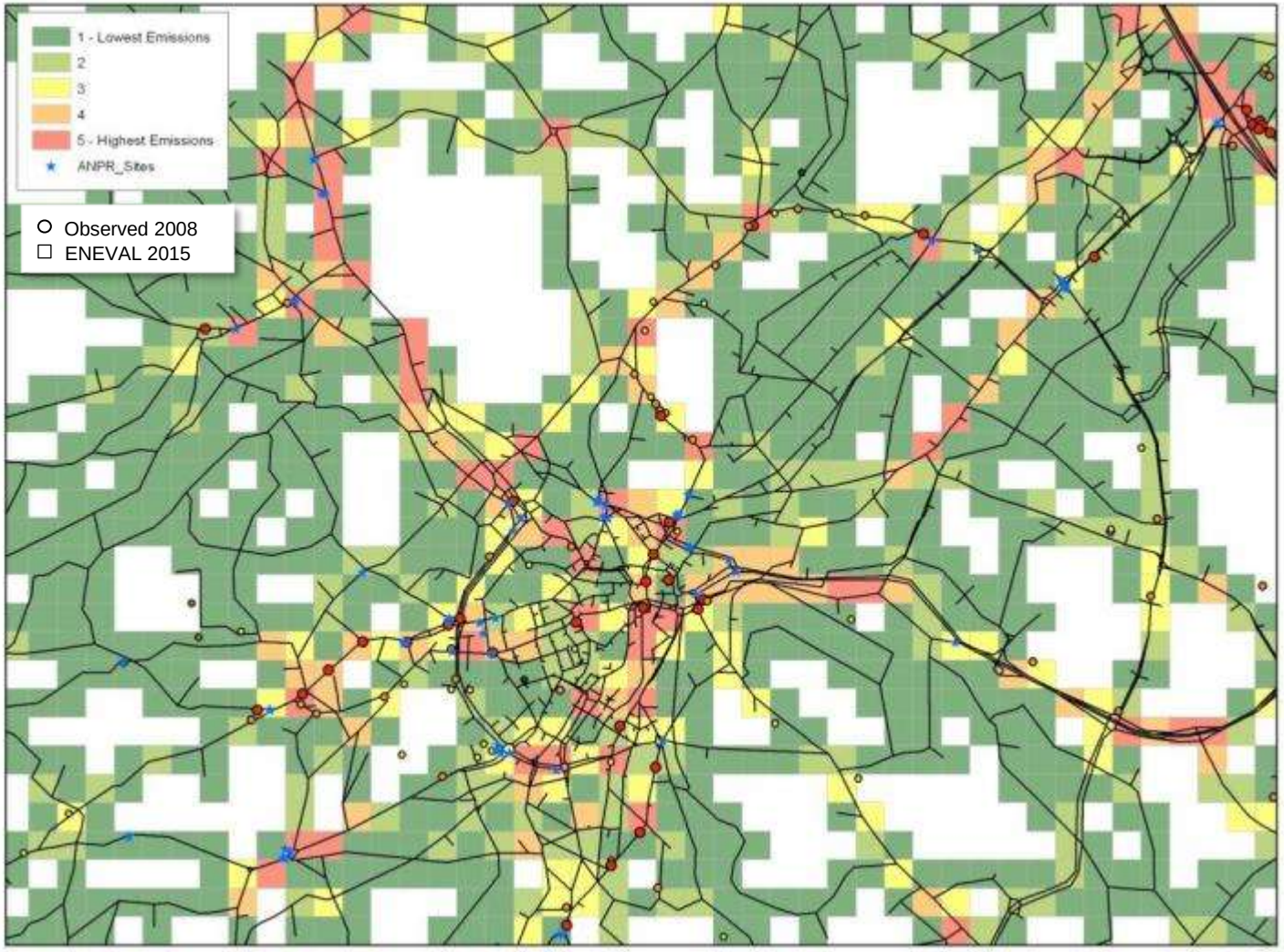
Link	Car	LGV	OGV	Bus
1	0%	4%	2%	0%
2	-2%	4%	0%	0%
3	0%	4%	3%	0%
4	-1%	4%	1%	0%
5	-1%	4%	1%	0%
6	-1%	4%	1%	0%
7	-1%	0%	0%	0%
8	0%	4%	0%	0%
9	0%	0%	1%	0%
10	0%	0%	0%	0%

- Dummy data on 10 random links run through both models
- Table shows % difference in NO_X emissions when comparing ENEVAL with EFT 5.1.2
- The differences are all within 5% which is due to rounding errors

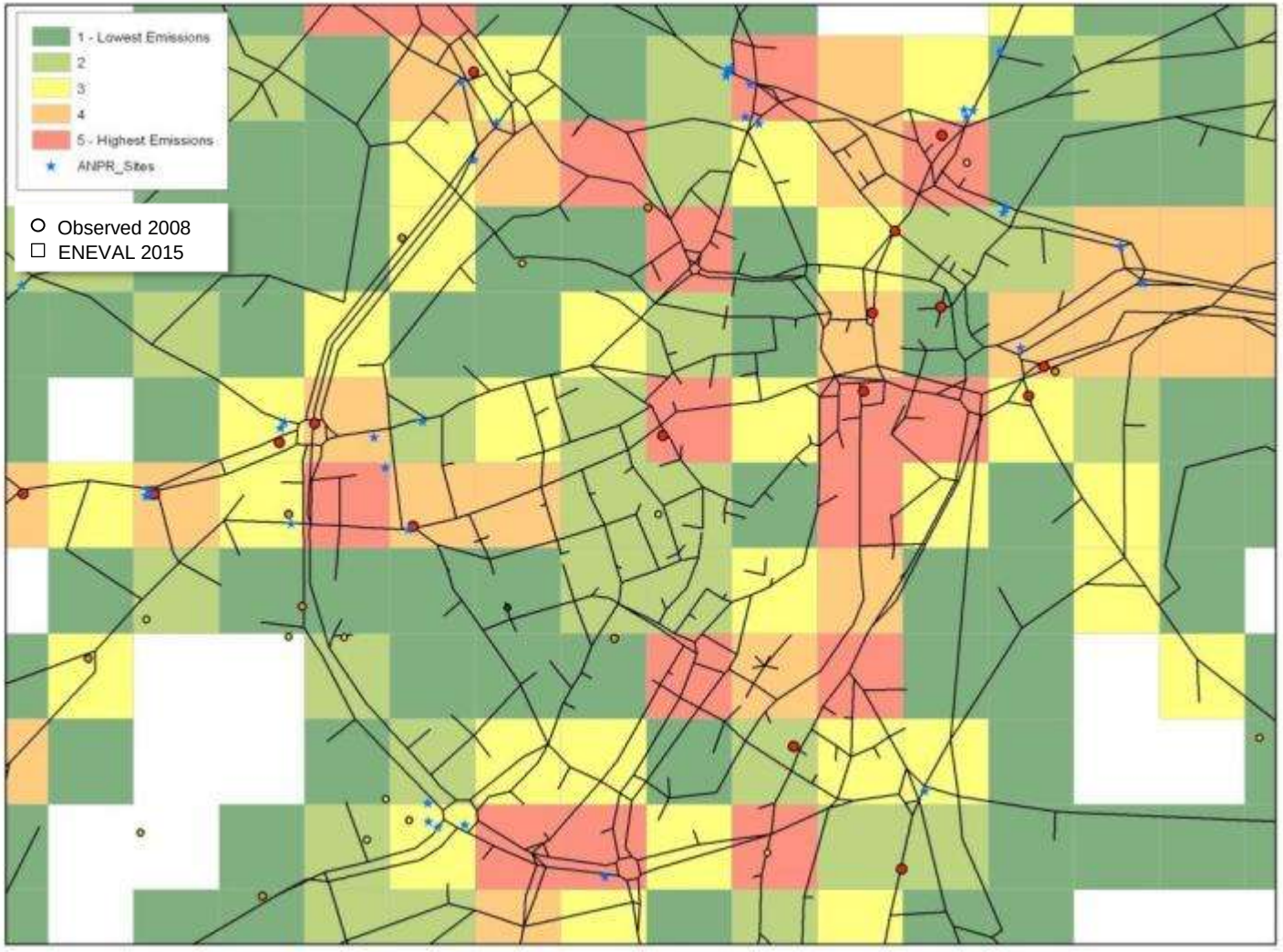
2013 Emissions Estimates from Latest ENEVAL using COPERT 10 Emissions Factors based on annualised weekday data



2015 Emissions Estimates from Latest ENEVAL using COPERT 10 Emissions Factors based on annualised weekday data

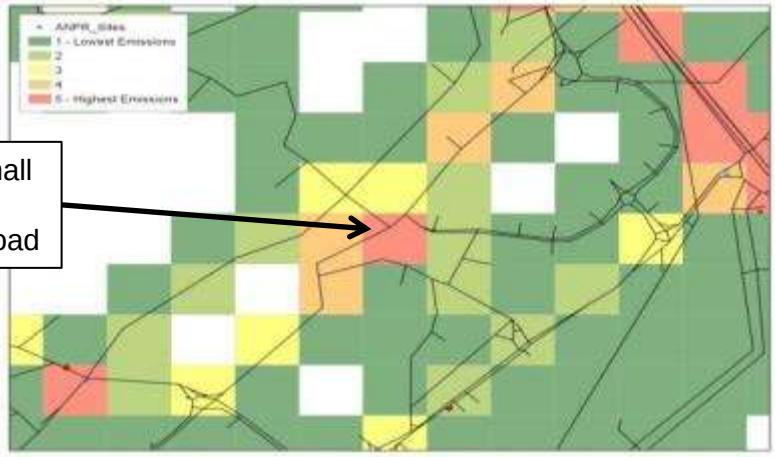


2015 City Centre Emissions Estimates from latest ENEVAL using COPERT 10 Emissions Factors based on annualised weekday data



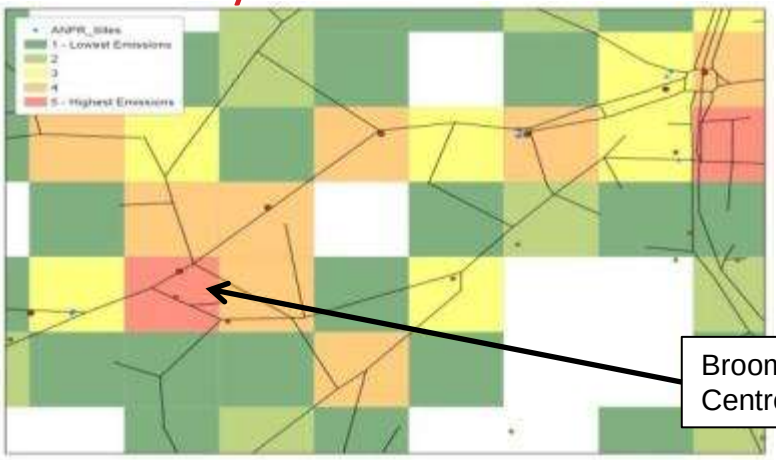
2015 Emissions Estimates at Phase 1 Hotspots from latest ENEVAL using COPERT 10 Emissions Factors based on annualised weekday data

Meadowhall



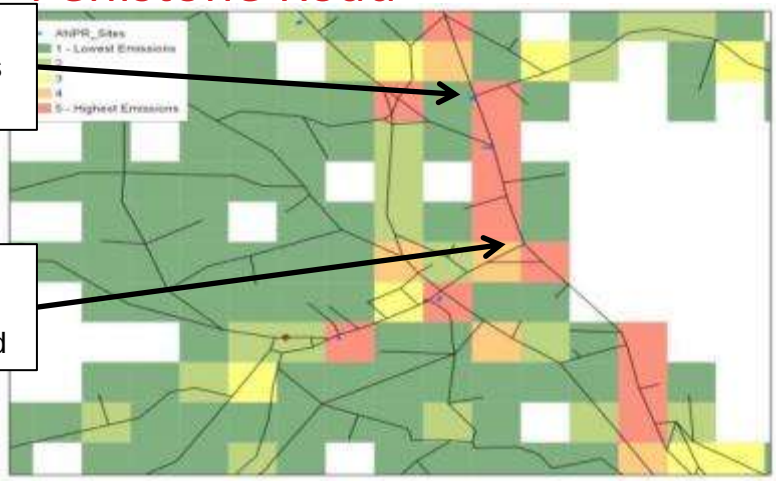
Meadowhall Road / Jenkin Road

University



Broomhill Centre

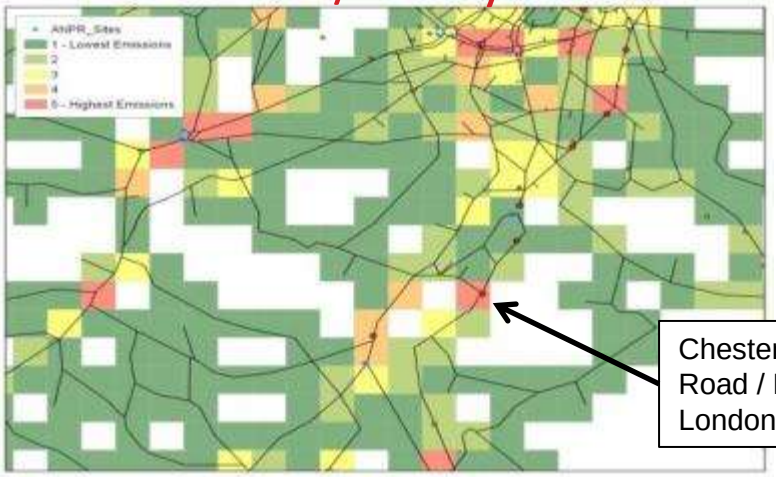
Penistone Road



Penistone Road / Herries Road

Penistone Road / Bradfield Road

London Road/Abbeydale Road



Chesterfield Road / Little London Road

Observed/Predicted Ratio

Hotspot	NOX_Car%	NOX_TaxiAll%	NOX_LGV%	NOX_HGV%	NOX_Bus%
City Centre	1.11	4.04	1.14	0.89	0.48
London/Abbeydale	1.00	2.59	0.97	0.52	1.13
Meadowhall	1.14	2.43	1.07	0.69	1.21
Penistone	1.30	2.66	1.29	0.69	0.42
University	1.25	3.04	1.23	0.60	0.48

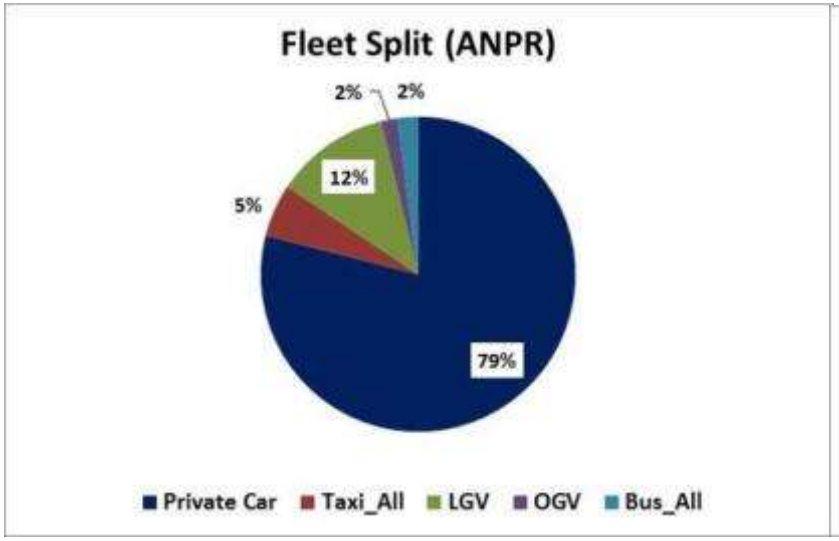
Change in NO_X Proportions (Observed – Predicted)

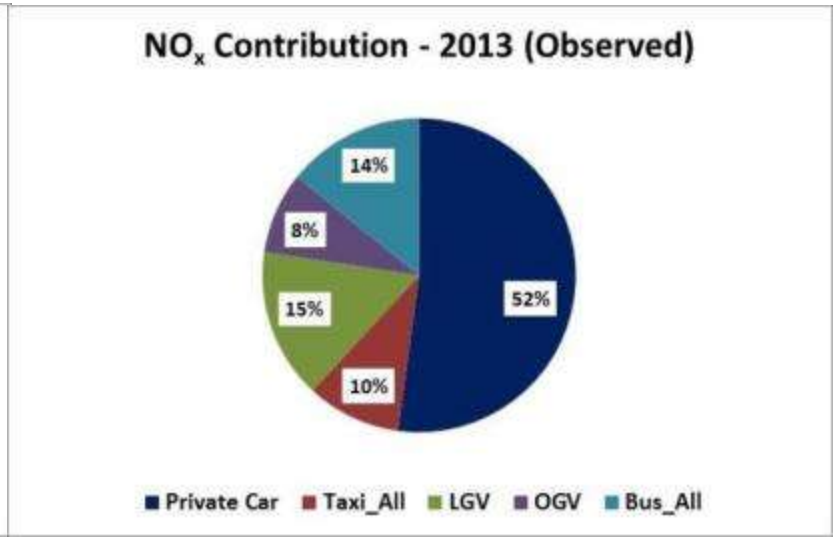
	NOX_Car%	NOX_TaxiAll%	NOX_LGV	NOX_HGV%	NOX_Bus%
City Centre	5%	8%	2%	-1%	-14%
London/Abbeydale	0%	4%	-1%	-6%	3%
Meadowhall	6%	2%	1%	-10%	1%
Penistone	13%	4%	4%	-4%	-16%
University	11%	8%	3%	-3%	-17%

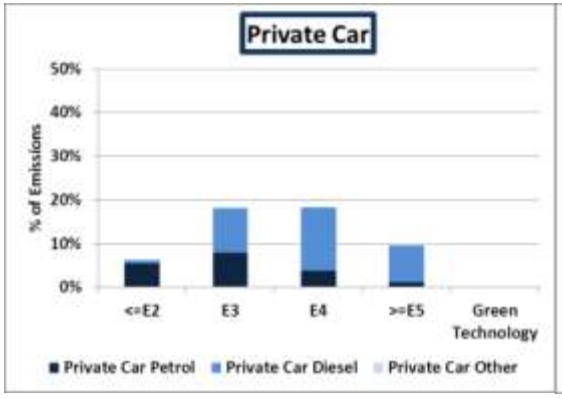
5.

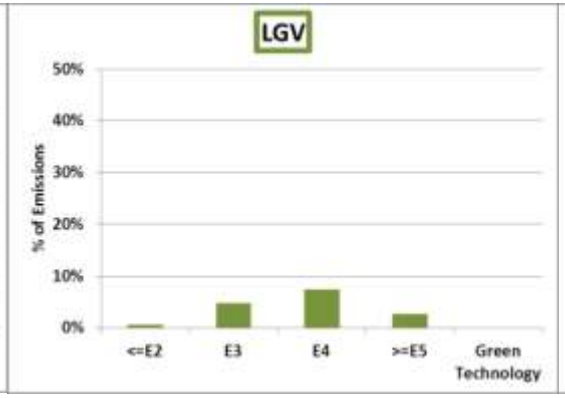
Apportionment of Current Emissions

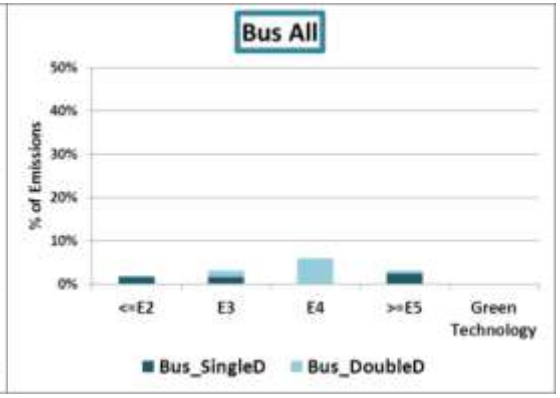
City Centre ANPR Sites Weekday Emissions Proportions using ANPR fleet split and observed emissions factors



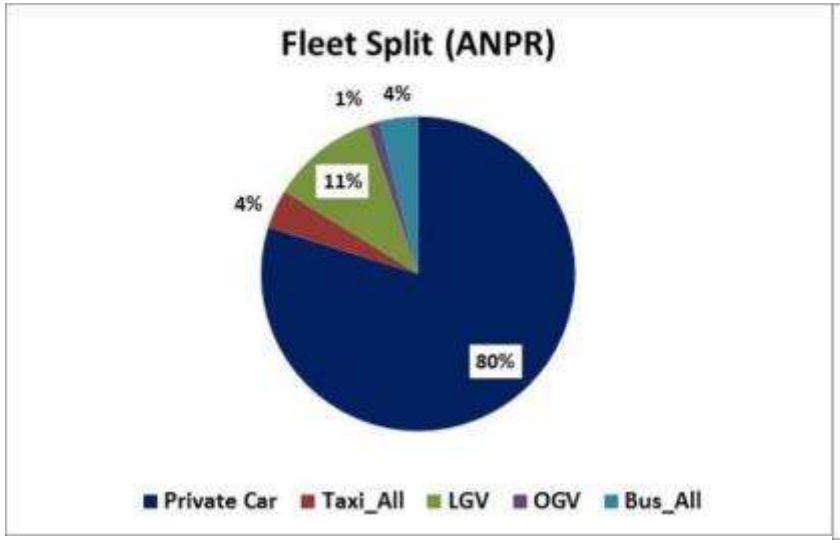


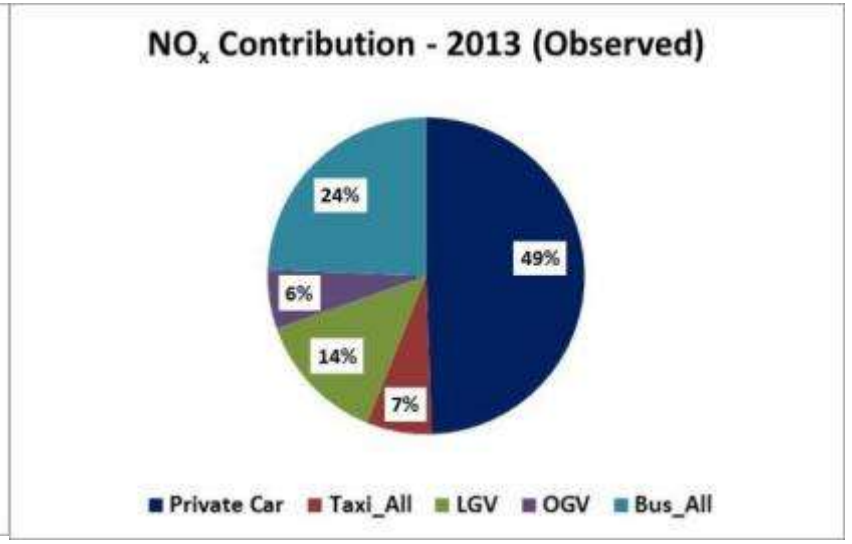


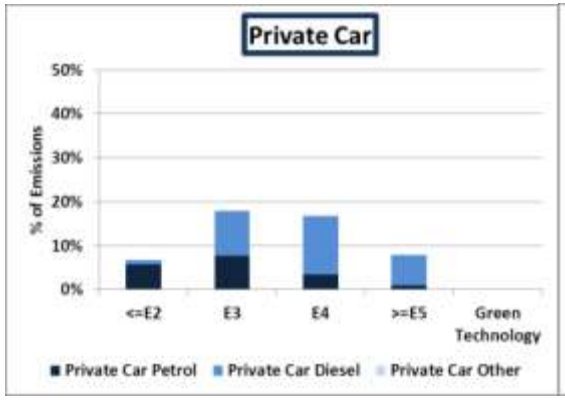


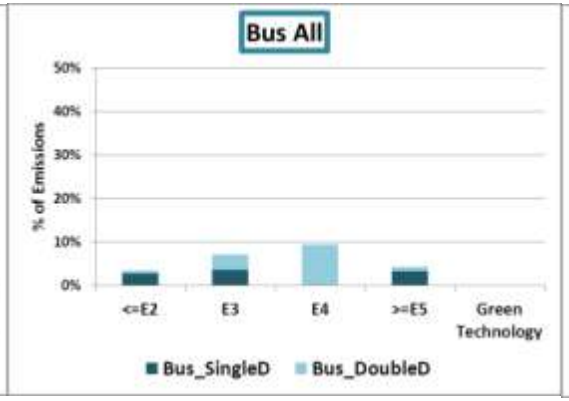


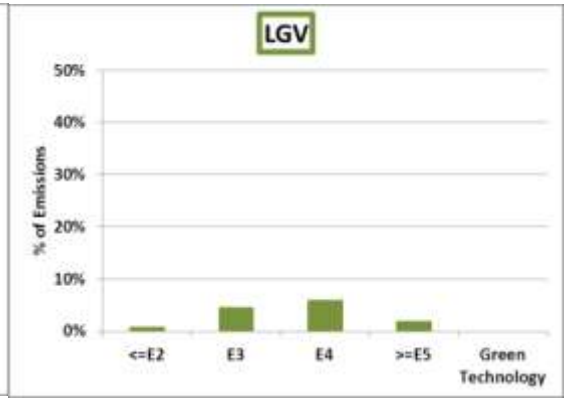
London Road / Abbeydale Road ANPR Sites Weekday Emissions Proportions using ANPR fleet split and observed emissions factors



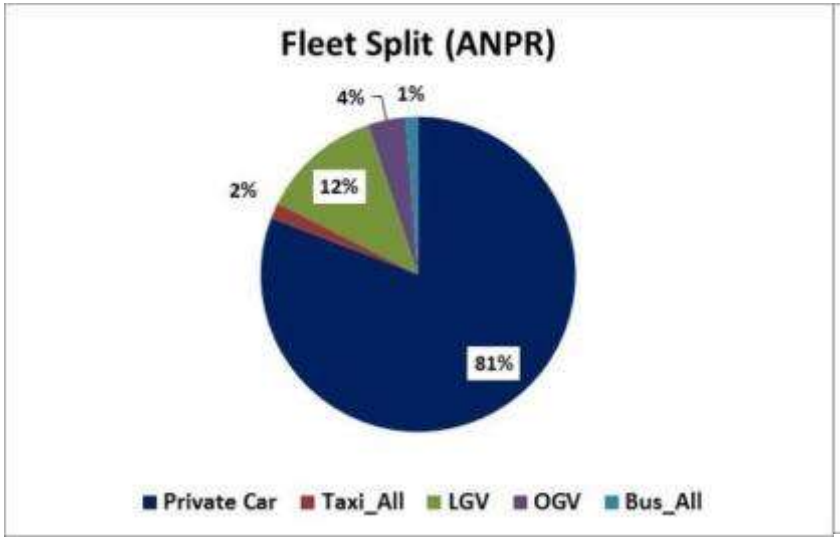


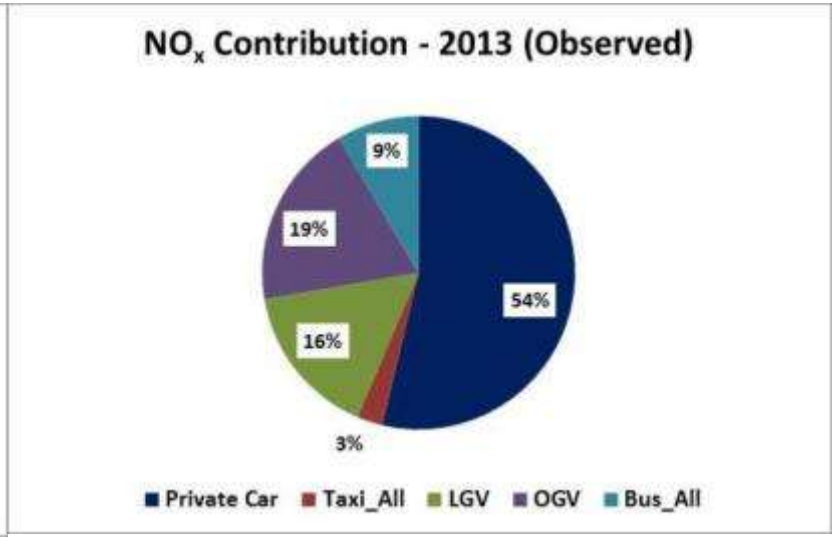


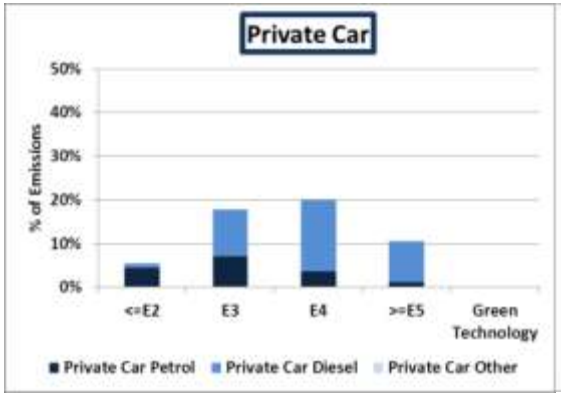


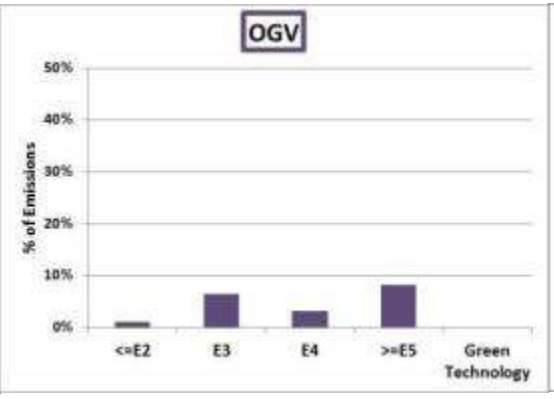


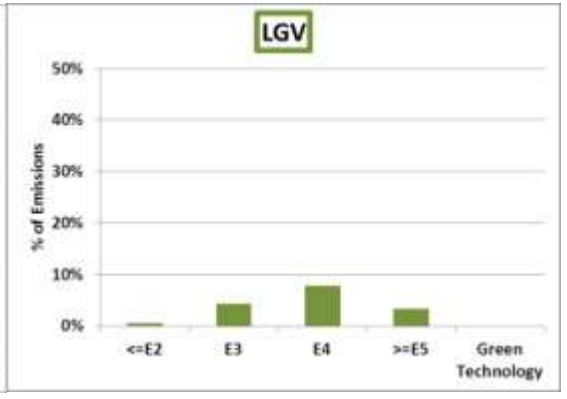
Meadowhall (excluding M1) ANPR Sites Weekday Emissions Proportions using ANPR fleet split and observed emissions factors



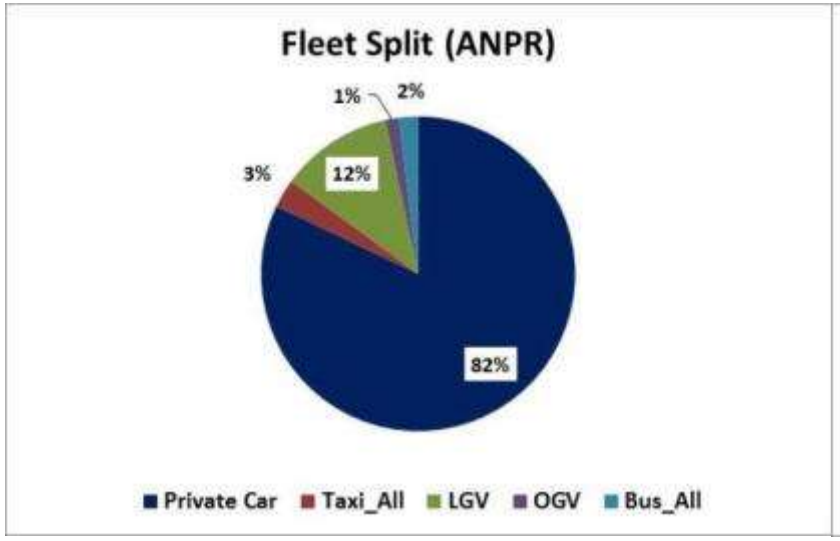


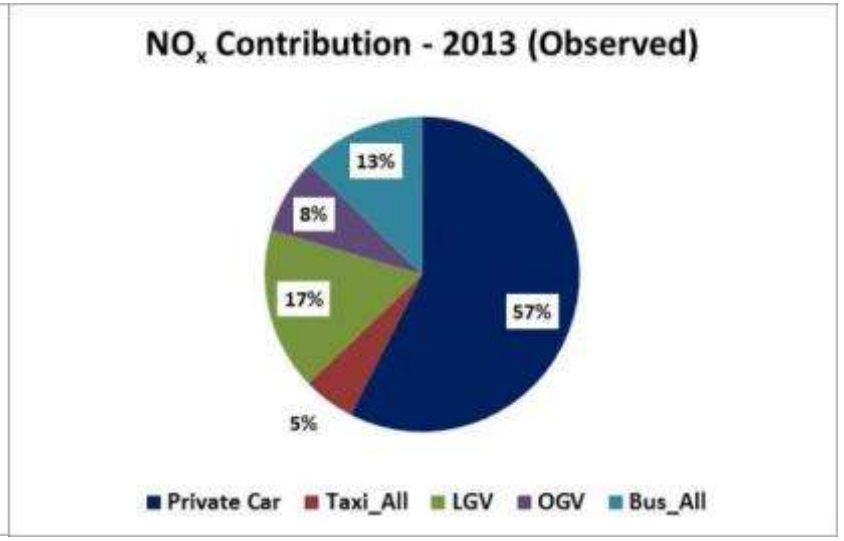


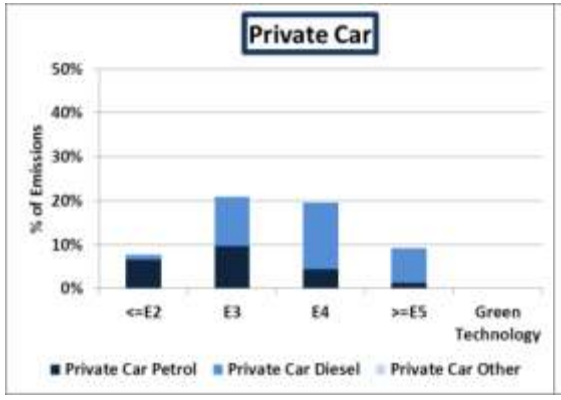


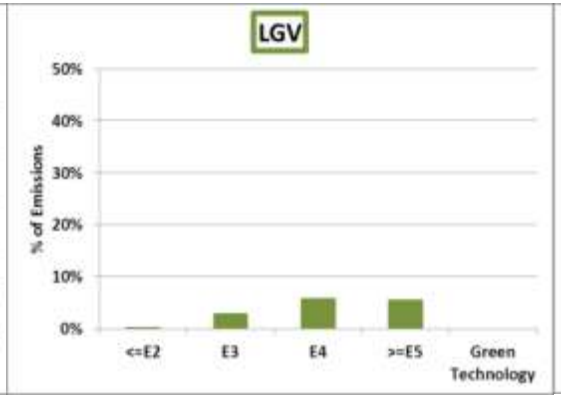


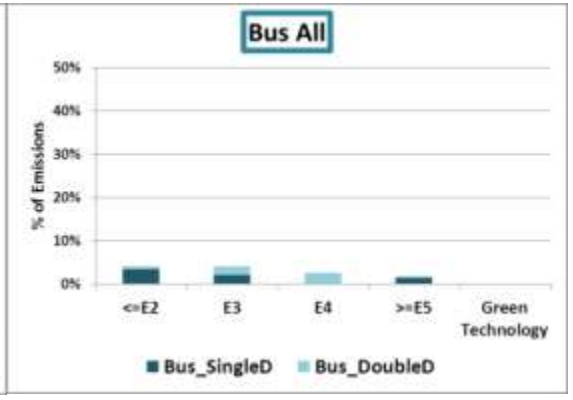
Penistone Road ANPR Sites Weekday Emissions Proportions using ANPR fleet split and observed emissions factors



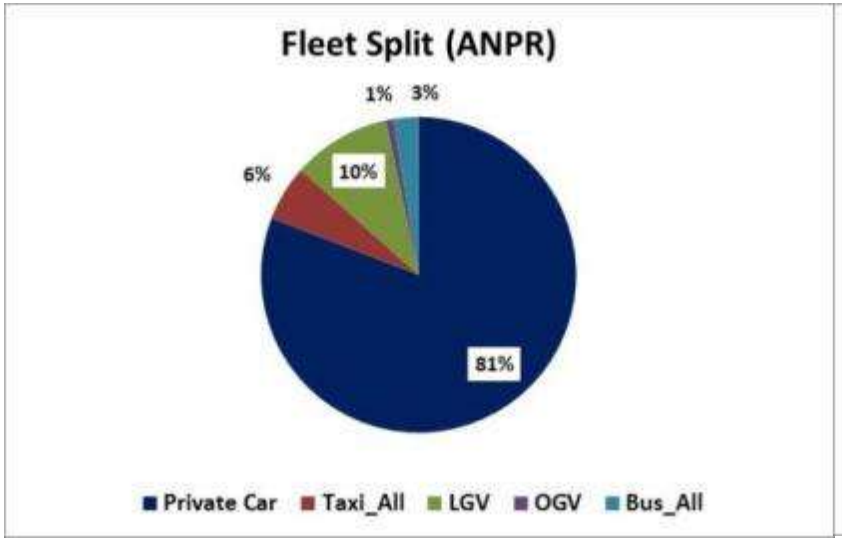


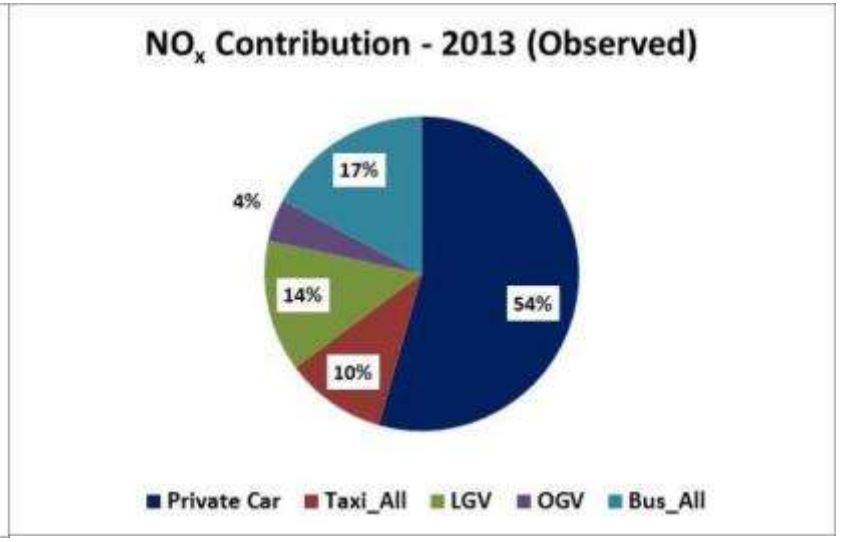


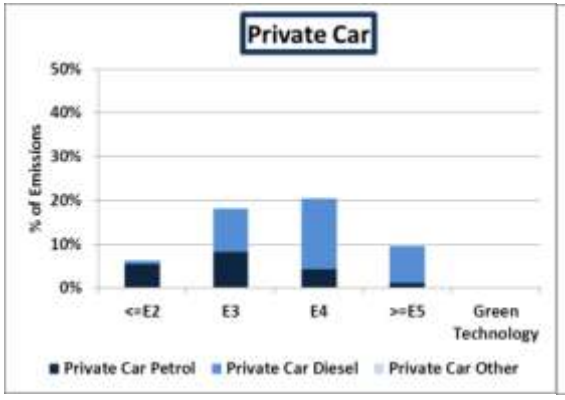


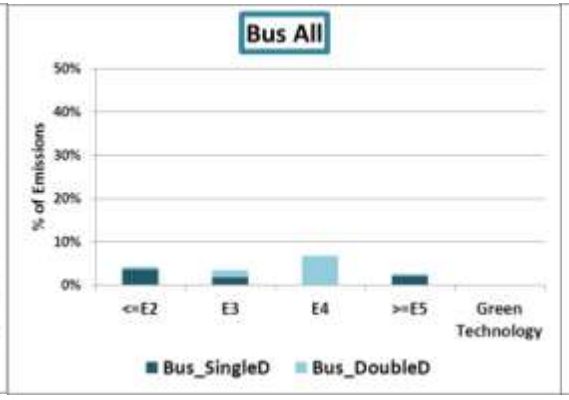


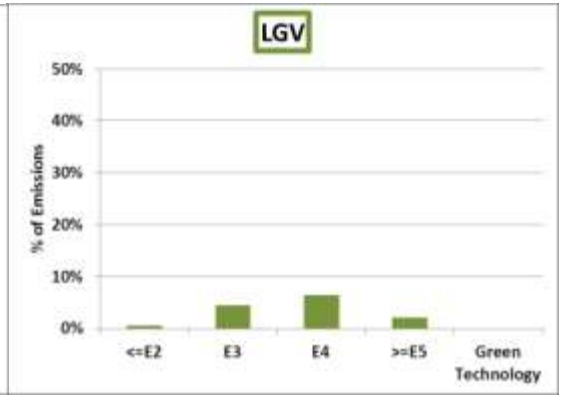
University ANPR Sites Weekday Emissions Proportions using ANPR fleet split and observed emissions factors











Comparison of Observed and Predicted NO_X Emission Proportions: Ratio

Ratio of Observed Emissions Proportion to Predicted Emissions Proportion:

- Observed Emission Proportion using local ANPR data and Emissions from Remote Sensing data
- Predicted Emissions Proportion using city wide ANPR data and Emissions from COPERT version 10

Red represents higher proportion of emissions in observed data, blue lower proportion

Hotspot	NOX_Car%	NOX_TaxiAll%	NOX_LGV%	NOX_OGV%	NOX_Bus%
City Centre	1.11	4.04	1.14	0.89	0.48
London/Abbeydale	1.00	2.59	0.97	0.52	1.13
Meadowhall (excl M1)	1.14	2.43	1.07	0.69	1.21
Penistone	1.30	2.66	1.29	0.69	0.42
University	1.25	3.04	1.23	0.60	0.48

Comparison of Observed and Predicted NO_X Emission Proportions: Absolute

Absolute Difference between Observed Emissions Proportions and Predicted Emissions Proportions

Red represents higher proportion of emissions in observed data, blue lower proportion

Hotspot	NOX_Car%	NOX_TaxiAll%	NOX_LGV	NOX_OGV%	NOX_Bus%
City Centre	5%	8%	2%	-1%	-14%
London/Abbeydale	0%	4%	-1%	-6%	3%
Meadowhall (excl M1)	6%	2%	1%	-10%	1%
Penistone	13%	4%	4%	-4%	-16%
University	11%	8%	3%	-3%	-17%

Summary of Contributors to Emissions

- Contribution from diesel cars is clear at all sites
- Contribution from LGV is around 15% at all sites
- Contribution for Taxi, Bus and OGV is more varied depending on location

6.

Initial Strategy Development

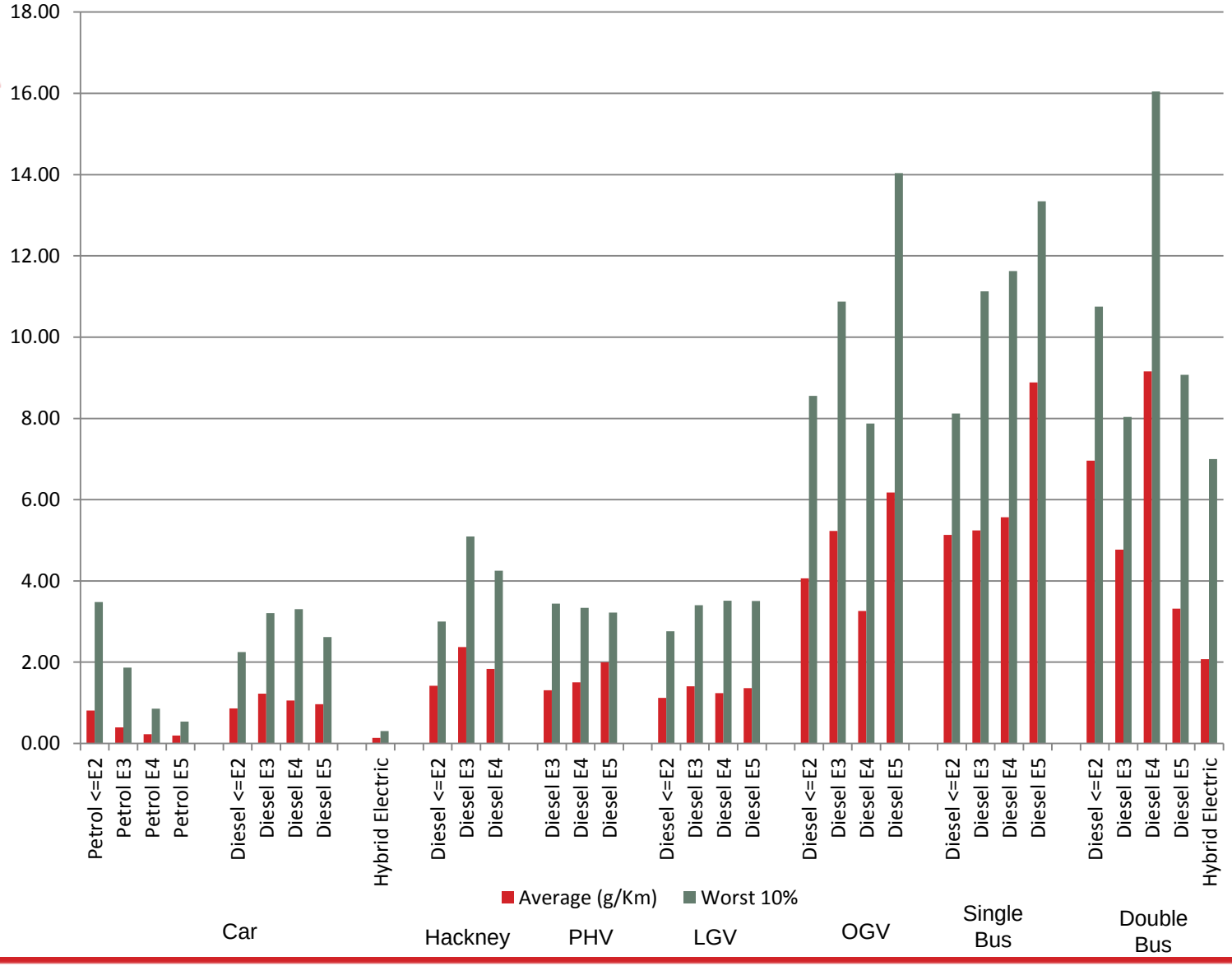
Desirable Features of the Strategy

- Effective – must target vehicles which contribute to current and future emissions
  - Significant proportion of current & future traffic
  - High emission rate
- Cost-effective – the cost of a strategy will be determined by:
  - The number of vehicles affected
  - The cost of making 'bad' vehicles compliant
  - A fixed component (Design, implementation, enforcement etc)
- Publicly/politically acceptable
  - Inversely proportional to the number of vehicles affected?
- Deliverable
  - Technically-feasible to meet emissions criteria
  - Enforceable
- Affordable

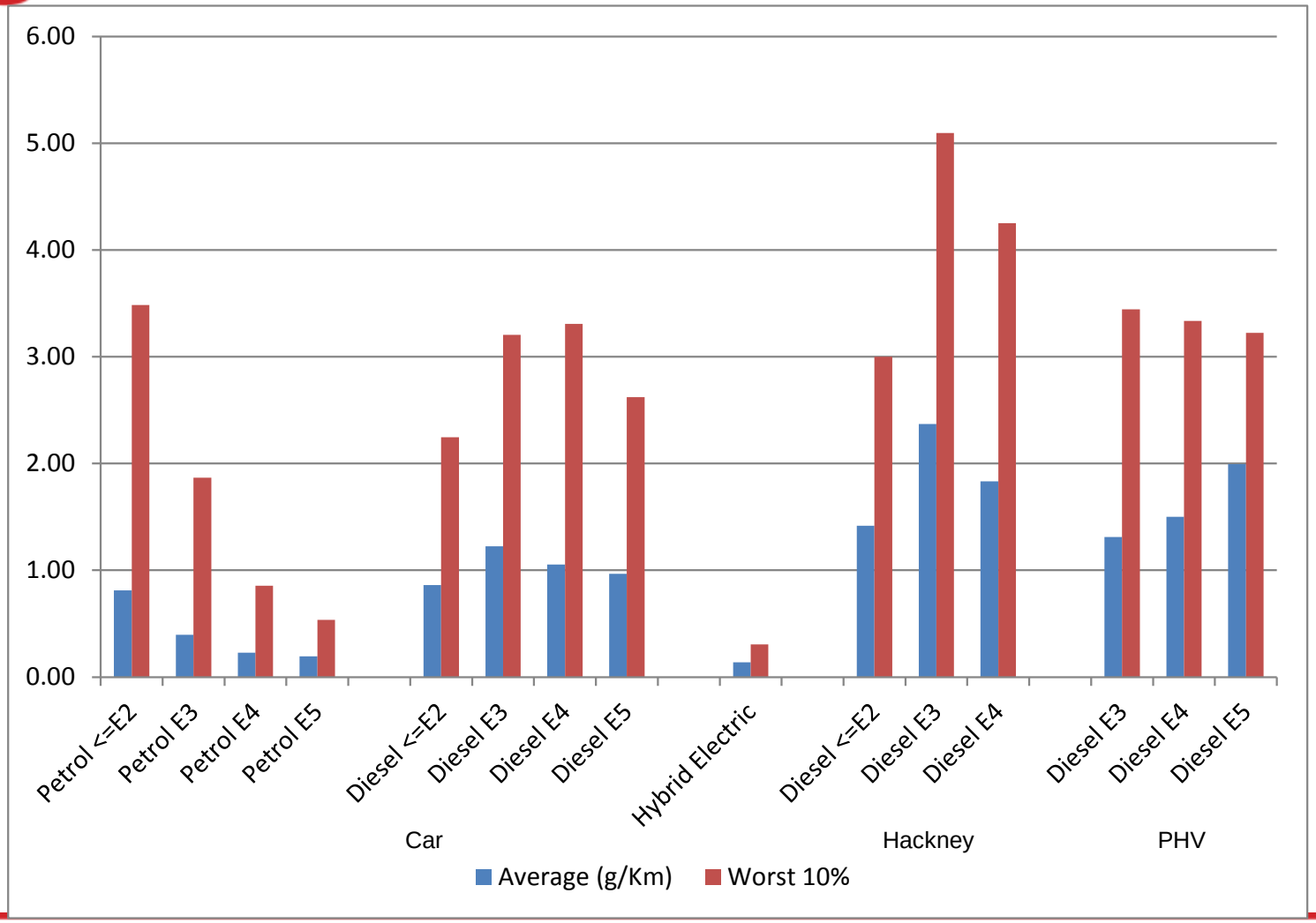
Questions to Be Considered

- 'Hotspot by Hotspot' or City-wide (or a combination of the two?)
- NO_X or PM (or both?)
- Based on Euro Class or actual emissions rate?
  - The latter is more likely to be a) effective and b) cost-effective
  - But is it achievable?

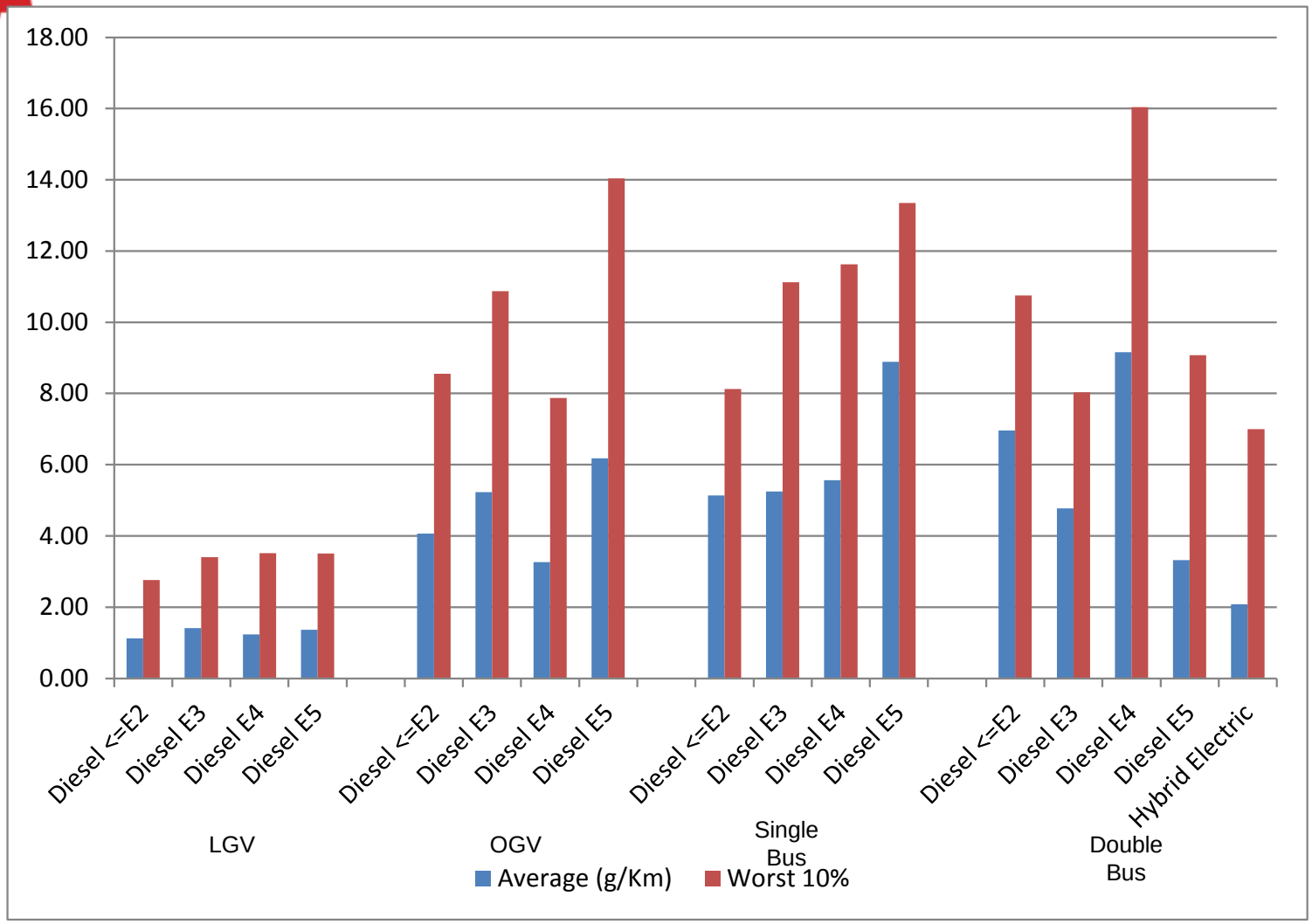
Observed NO_X Emissions - Average and Worst 10%



Average and Worst 10% Observed NO_X Emissions - Cars and Taxis



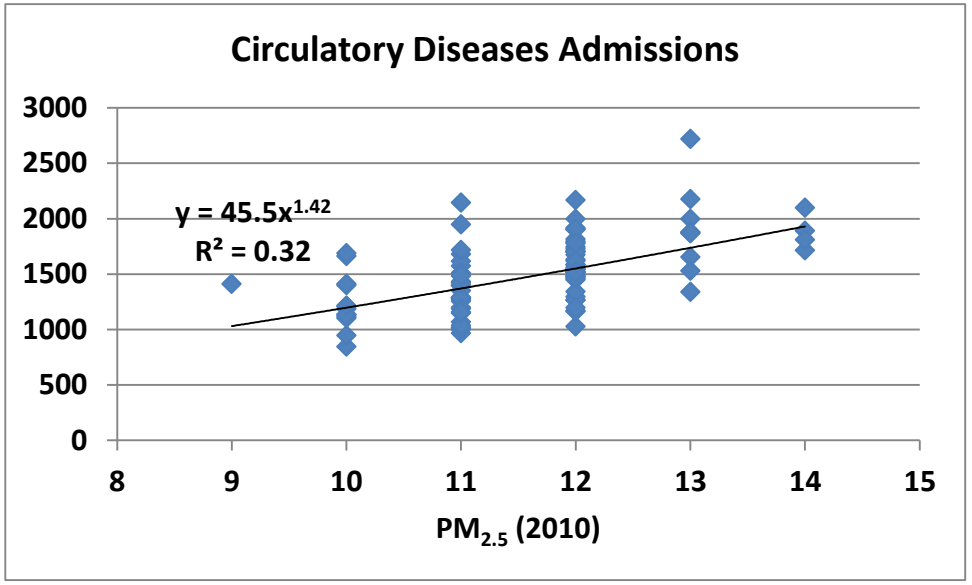
Average and Worst 10% Observed NO_X Emissions - LGVs, OGVs and Buses x 2

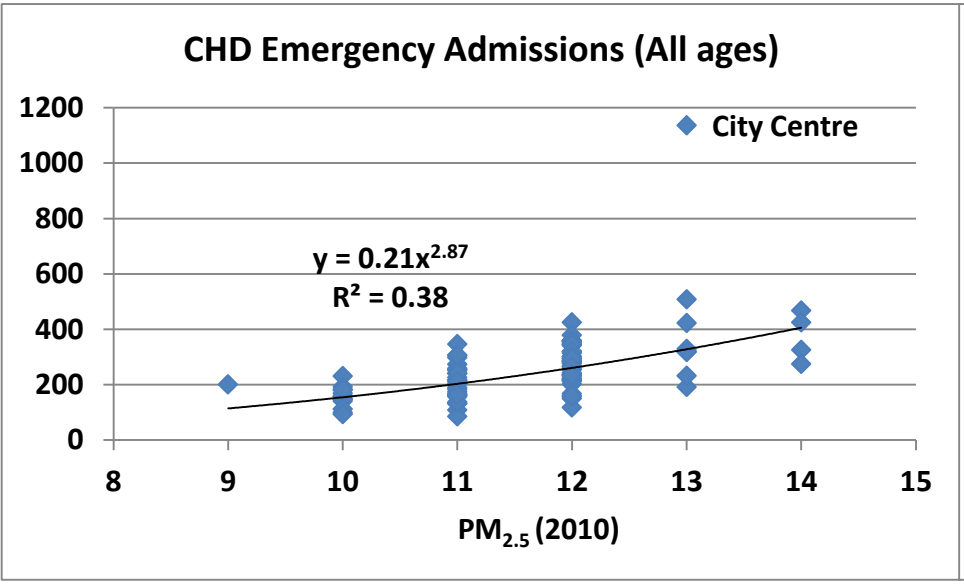


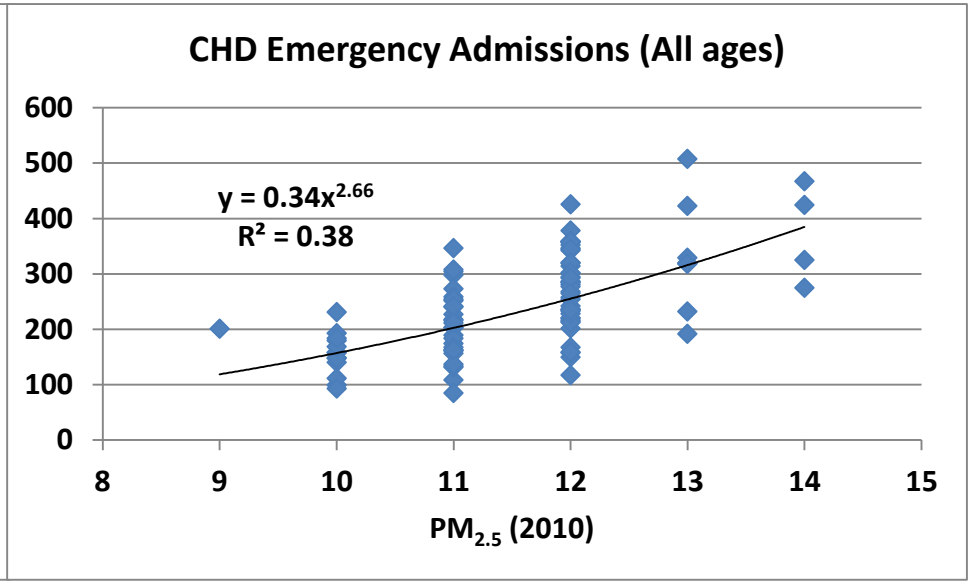
Strategy Appraisal Spreadsheet Tool

- Decide location – City-wide
- ANPR data used to (automatically) determine the relevant fleet proportions
- Specify the Future Year to be used for the assessment (eg 2015)
- Visual display of the main contributors to current and Future Year emissions – by main vehicle type and emission class
- Predicted Impacts of Do Minimum 'Wait and See' policy (ie fleet renewal effects only)
- Flexible specification of the strategy
  - Either EURO-based or
  - Maximum emission rate (NO_X and/or PM)
- All non-compliant vehicles assumed to be replaced by 'just-compliant' alternative
- Resulting change in emissions (relative to both current and Do Minimum)
- Vehicle replacement costs estimated as the total cost of the upgrade from current to 'just compliant'

Health vs $PM_{2.5}$ Concentrations in Sheffield Neighbourhoods







7.

LEZ Strategy Development

Approach to LEZ Strategy Development

Analysis of UK AIR (Defra 's Air Quality Data) and Sheffield AQ Monitoring Sites

- Magnitude of air quality problems
- Contributors to air quality problems eg traffic, other transport, industry, domestic

Strategy Development Tool

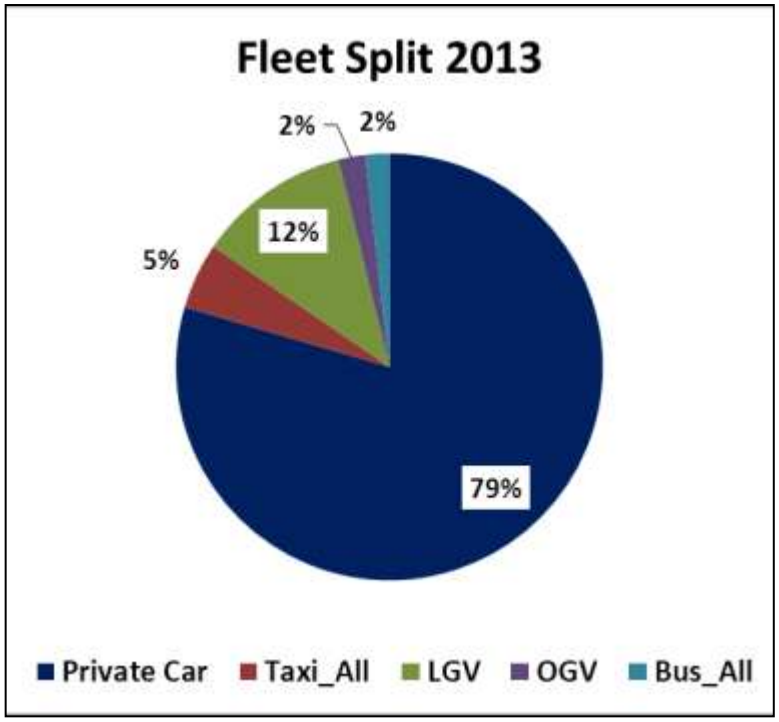
- Inputs: ANPR Data, Roadside Emissions Monitoring (Dr James Tate, ITS Leeds)
- Assumptions: Year, Strategy Elements
- Outputs: Contributions from different fleet to NO_x and PM_{10}

LEZ Strategy Objective:

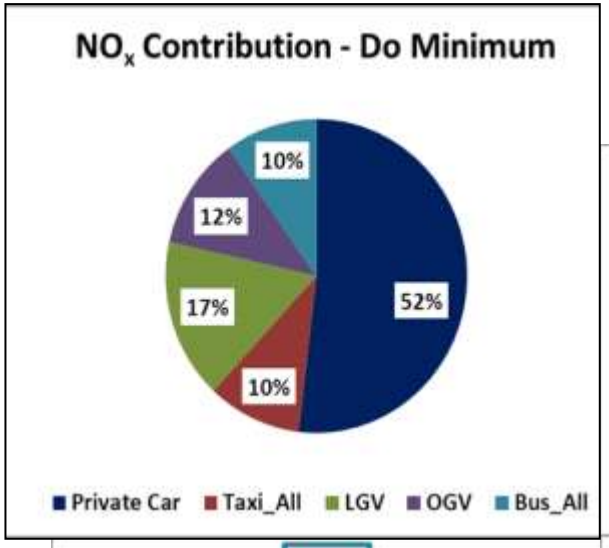
- Traffic just tackling its 'fair share' rather than being expected to solve problems caused by other emission sectors
- Focus on NO_x (EU fines), but PM_{10} also important (health impacts)

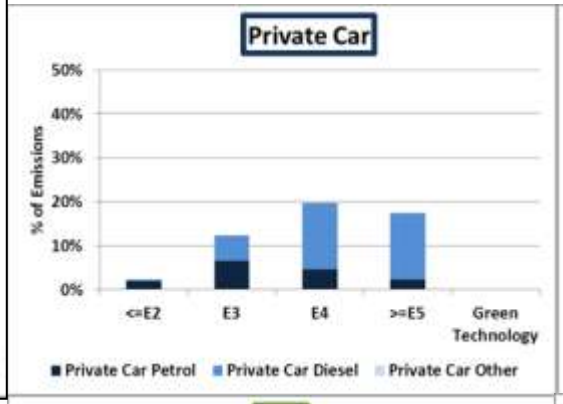
Study Area

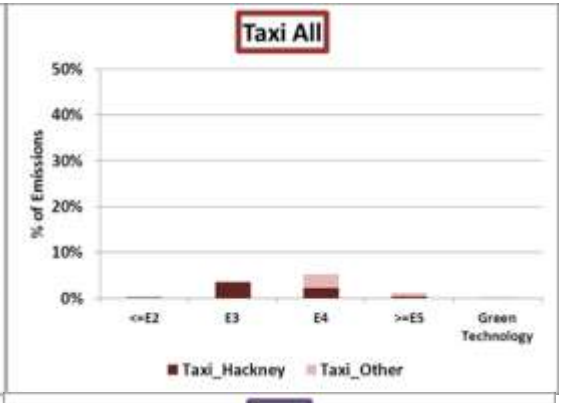
City-wide Distribution of Current Road Traffic (based on ANPR data)

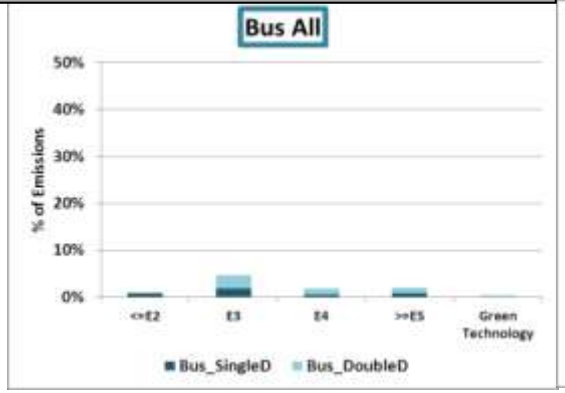


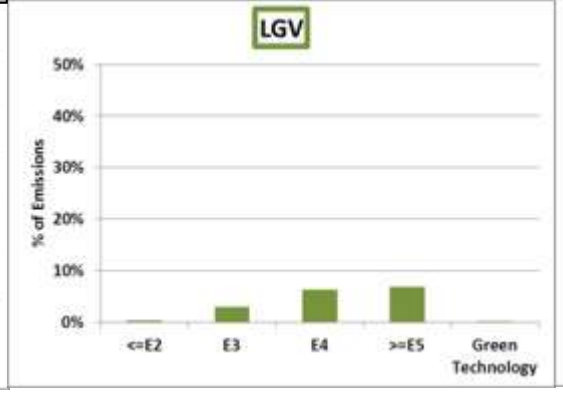
Predicted Proportions of City-wide Weekday NO_x Emissions 2015 (based on ANPR and observed emissions factors)

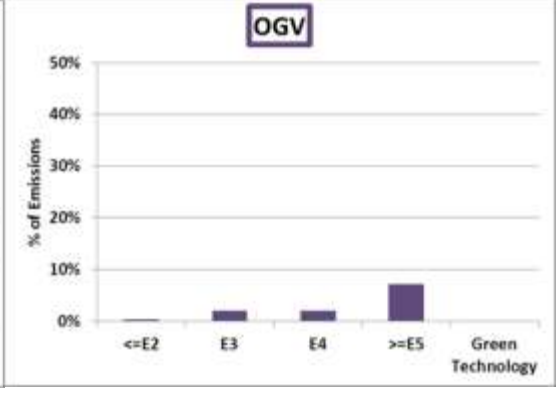




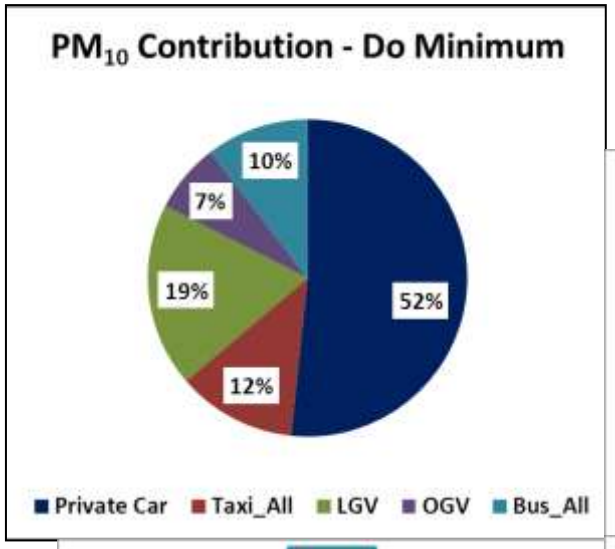


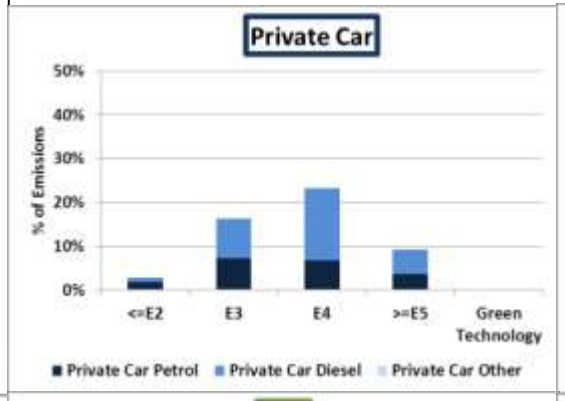


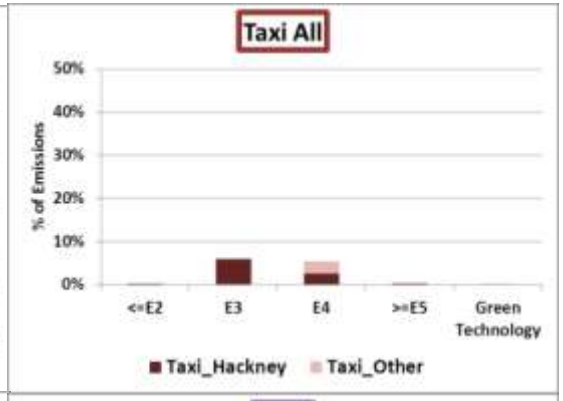


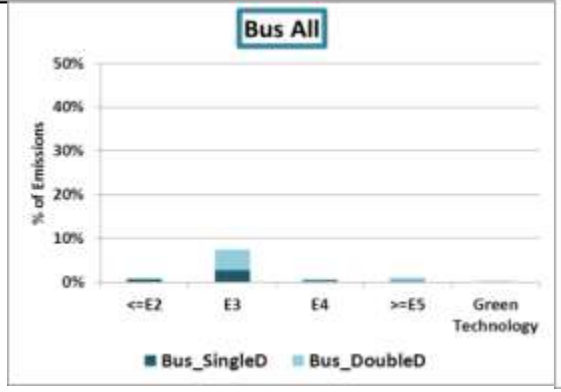


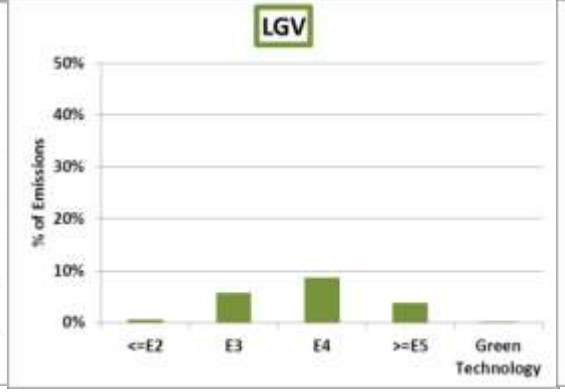
Predicted Proportions of City-wide Weekday PM_{10} Emissions 2015 (based on ANPR and observed emissions factors)

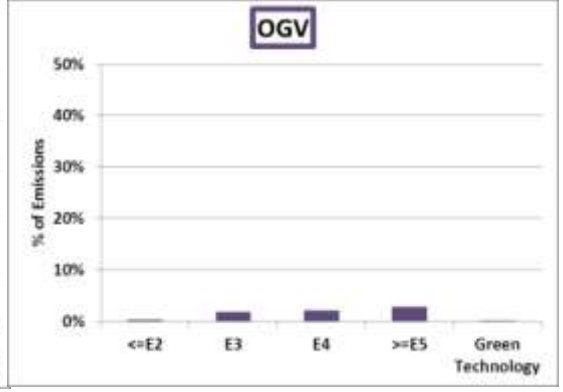




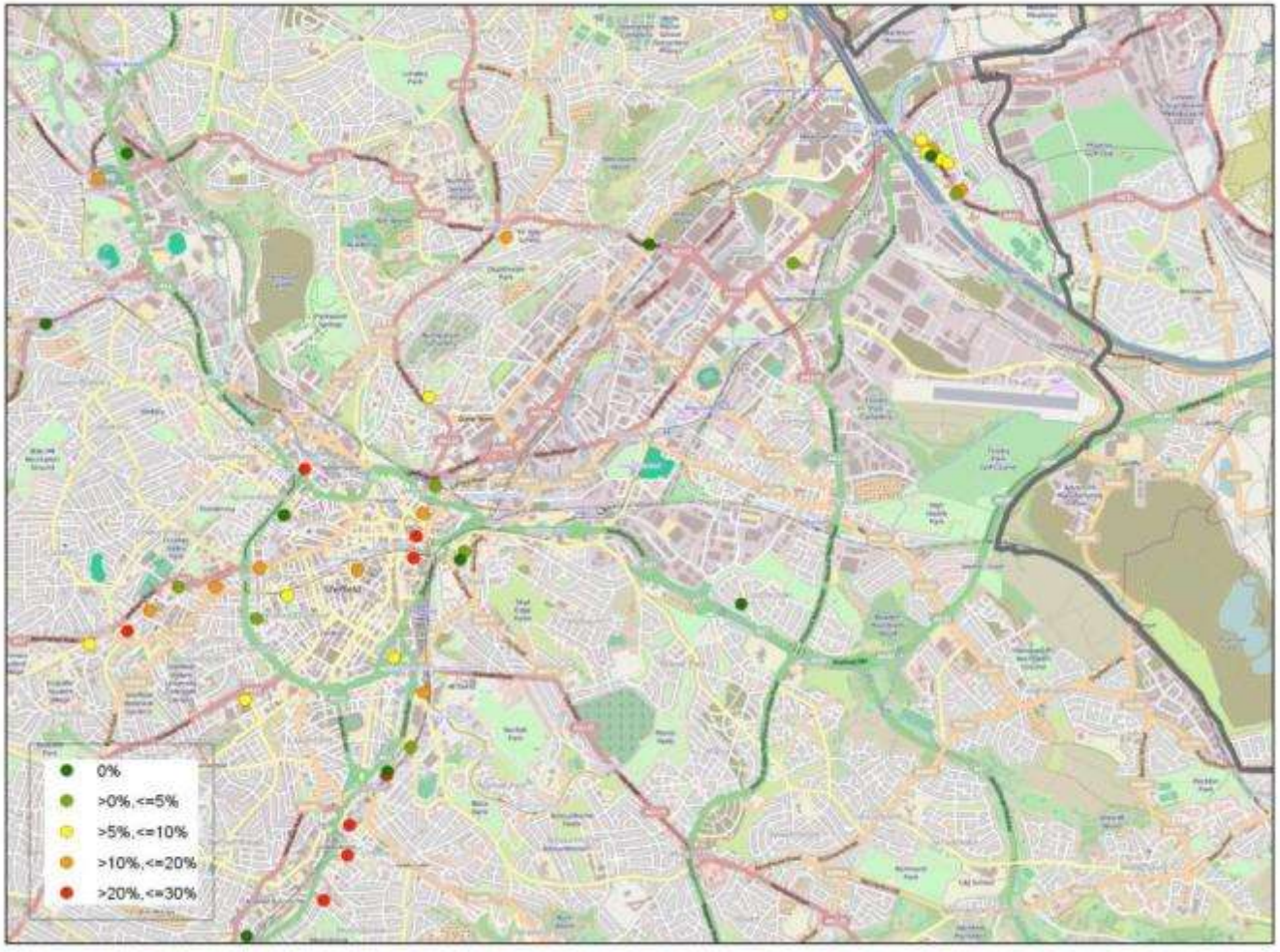








%Reduction in Total NO_2 Concentrations Required (from current levels)



What can we expect from natural fleet renewal by 2015? (Do Minimum Impacts – 2015)

Strategy Year	2015	Description	Option 0 - Do Minimum (2015)

Impact of Strategy		Do Minimum		Do Minimum	
Main Vehicle Type	Vehicle Subclass	% Change in NO_x	% Contribution to Total Change in NO_x	% Change in PM_{10}	% Contribution to Total Change in PM_{10}
Car	Private Car - Petrol	-18.3%	-3.3%	-10.9%	-2.0%
	Private Car - Diesel	-4.3%	-1.6%	-23.0%	-8.1%
	Private Car - Other	0.1%	0.0%	0.1%	0.0%
	Taxi_Hackney	2.6%	0.2%	-9.8%	-0.8%
	Taxi_Other	6.3%	0.2%	-15.9%	-0.5%
LGV	LGV	0.8%	0.1%	-19.7%	-3.9%
OGV	OGV	4.3%	0.5%	-13.0%	-0.9%
Bus	Bus_SingleD	4.2%	0.2%	3.1%	0.1%
	Bus_DoubleD	-17.9%	-1.2%	-0.4%	0.0%
Total		-4.9%	-4.9%	-16.1%	-16.1%

How long until natural fleet renewal mitigates NO_x problems? (Do Minimum Impacts – 2020 (**best case scenario!**)

Strategy Year	2020	Description	Option 0 - Do Minimum (2020)			
Impact of Strategy		**Do Minimum**		**Do Minimum**		
Main Vehicle Type	**Vehicle Subclass**	**% Change in NO_x**	**% Contribution to Total Change in NO_x**	**% Change in PM_{10}**	**% Contribution to Total Change in PM_{10}**
Car	Private Car - Petrol	-44.8%	-8.1%	-30.2%	-5.4%
	Private Car - Diesel	-33.1%	-11.9%	-61.9%	-21.9%
	Private Car - Other	0.1%	0.0%	0.1%	0.0%
	Taxi_Hackney	-25.6%	-1.5%	-56.5%	-4.7%
	Taxi_Other	-14.8%	-0.5%	-73.9%	-2.3%
LGV	LGV	-31.0%	-4.8%	-48.4%	-9.5%
OGV	OGV	-51.5%	-5.5%	-37.5%	-2.6%
Bus	Bus_SingleD	-14.3%	-0.5%	-39.3%	-1.3%
	Bus_DoubleD	-30.7%	-2.0%	-44.2%	-2.3%
Total		-34.9%	-34.8%	-50.0%	-50.0%

Why we need an LEZ Strategy

NO_2 annual mean concentration predicted to exceed the EU's 40 µg/m^3 limit for NO_2 at (at least) 40 locations in Sheffield in 2015

Data from Strategy Tool shows that a MINIMUM of 7 years of fleet renewal alone would be required to achieve compliance with this NO_2 limit at all of these sites, assuming:

- **there is no significant net traffic growth over this period**
- **all the other non-traffic sources of NO_2 contribute their corresponding 'fair share' of the required reduction; and**
- **Euro 6/Euro VI performance is as expected and does not deteriorate over time**

Conclusion: further action is required to speed up the reduction in traffic emissions, particularly NO_X/NO_2

Desirable Features of the LEZ

- **Effective – must target vehicles which contribute to current and future emissions**
  - **Significant proportion of current & future traffic**
  - **High emission rate**
- **Efficient:**
  - **= Emission reduction achieved/ the number of vehicles affected**
  - **(but some vehicles spend longer driving in the AQMA than others)**
- **Cost-effective**
  - **= Emissions reductions / (Cost of making the 'bad' vehicles compliant + a fixed component (design, implementation, enforcement etc)**
- **Publicly/politically acceptable ?**
  - **Inversely proportional to the number of vehicles affected?**
- **Deliverable**
  - **Technically-feasible to meet emissions criteria**
  - **Enforceable**
- **Affordable**

Developing the LEZ strategy

Discussions with Key Stakeholders

Pack of different strategy elements provided

- **Impacting different fleets**

Option	Targeting
1	Bus & Taxi
2	Bus & Taxi & Goods Vehicles
3	Switching Diesel to Petrol (all feasible vehicle types)
4	Tackling Diesel Car

- **Different levels of 'enthusiasm'**

Strategy Achievement	Achievement Description
Very Low	0-5% NO_x emission reduction
Low	5-10% NO_x emission reduction
Medium	10-20% NO_x emission reduction
High	20-30% NO_x emission reduction
Excessive	30%+ NO_x emission reduction

Assessing strategy effectiveness & efficiency

- **Trade-off between emissions reductions achieved and number of vehicles affected**
  - **taking account of the fact that certain fleets spend more time driving in the AQMA area than others**
- **Potential for including costs to produce a 'cost-effectiveness indicator'**

Option 1 Bus and Taxi LEZ Strategy Element Results

Option	Strategy Component Description	Effectiveness (Total NOx Reduction)	% Total Fleet Affected	Efficiency (NOx) higher = more efficient
Option 1a - Bus Taxi EuroA	Bus and Taxi Euroclass strategy (low achievement) - Taxi E5+ - Bus E5+	8%	5%	8
Option 1b - Bus Taxi EuroB	Bus and Taxi Euroclass strategy (medium achievement) - Taxi E6 - Bus E6	19%	6%	87
Option 1c - Bus Taxi ERA	Bus and Taxi Emission rate (medium achievement) - proportion of each fleet type affected - 30-40%	12%	2%	90
Option 1d - Bus Taxi ERB	Bus and Taxi Emission rate (medium achievement) - proportion of each fleet type affected - 60-70%	16%	4%	94
Option 1e - Bus Taxi ERC	Bus and Taxi Emission rate (medium achievement) - proportion of each fleet type affected - 75-85%	18%	4%	99
Option 1f - Bus ERCb	*Bus Emission rate (medium achievement separated) - proportion of fleet type affected - 75-85%*	*12%*	*1%*	*158*
Option 1g - Taxi ERCt	*Taxi Emission rate (medium achievement separated) - proportion of fleet type affected - 75-85%*	*13%*	*4%*	*74*

Option 2 Bus, Taxi and Goods Vehicles Strategy Element Results

Option	Strategy Component Description	Effectiveness (Total NOx Reduction)	% Total Fleet Affected	Efficiency (NOx) higher = more efficient
Option 2a - Bus Taxi GVs EuroA	Bus, Taxi, Goods Vehicles Euroclass strategy (very low achievement) - Taxi E5+ - Bus E5+ - Goods E5+	5%	12%	-2
Option 2b - Bus Taxi GVs EuroB	Bus, Taxi, Goods Vehicles Euroclass strategy (excessive achievement) - Taxi E6 - Bus E6 - Goods E6	40%	18%	25
Option 2c - Bus Taxi GVs ERA	Bus, Taxi, Goods Vehicles Emission rate (medium achievement) - proportion of each fleet type affected - 10-25%	14%	3%	26
Option 2d - Bus Taxi GVs ERB	Bus, Taxi, Goods Vehicles Emission rate (high achievement) - proportion of each fleet type affected - 35-45%	22%	8%	26
Option 2e - Bus Taxi GVs ERC	Bus, Taxi, Goods Vehicles Emission rate (high achievement) - proportion of each fleet type affected - 50-65%	27%	10%	28

Option 3 Switching Diesel to Petrol (All feasible vehicle types)

Option	Strategy Component Description	Effectiveness (Total NOx Reduction)	% Total Fleet Affected	Efficiency (NOx) higher = more efficient
Option 3a - Dies-Pet only	100% Diesel Vehicles Switch to Petrol - affecting Car, LGV, Taxi PHV	48%	46%	10
Option 3b - Dies-Pet_CNG	100% Diesel Vehicles Switch to Petrol or CNG/equivalent - Petrol for Car, LGV, Taxi PHV - CNG for Taxi Hackney, OGV, Bus	66%	51%	13

Results can be pro-rated by % Vehicles Switching

Option 4 Tackling Diesel Cars (Private Car only)

Option	Strategy Component Description	Effectiveness (Total NOx Reduction)	% Total Fleet Affected	Efficiency (NOx) higher = more efficient
Option 4a - Diesel Car switch	100% Diesel Cars Switch to Petrol	33%	32%	8
Option 4b - Diesel Car remove	100% Diesel cars removed and not replaced	41%	32%	11

Results can be pro-rated by % Vehicles Switching/Removed

Emerging LEZ Strategy

Based on LEZ Strategy Components

Definition:

Vehicle Technology

- **Bus – 'Best in class' ie Euro VI/CNG/Hybrid**
- **Taxi – Tackling 'worst 50%'**
- **Goods – Tackling 'worst 15%'**

Behavioural Change

- **Car – Switching 10% Diesel to Petrol**
- **Car – 5% Reduction**
- **Goods – 5% Reduction (more efficient driving, Ecostars, smarter routing etc)**

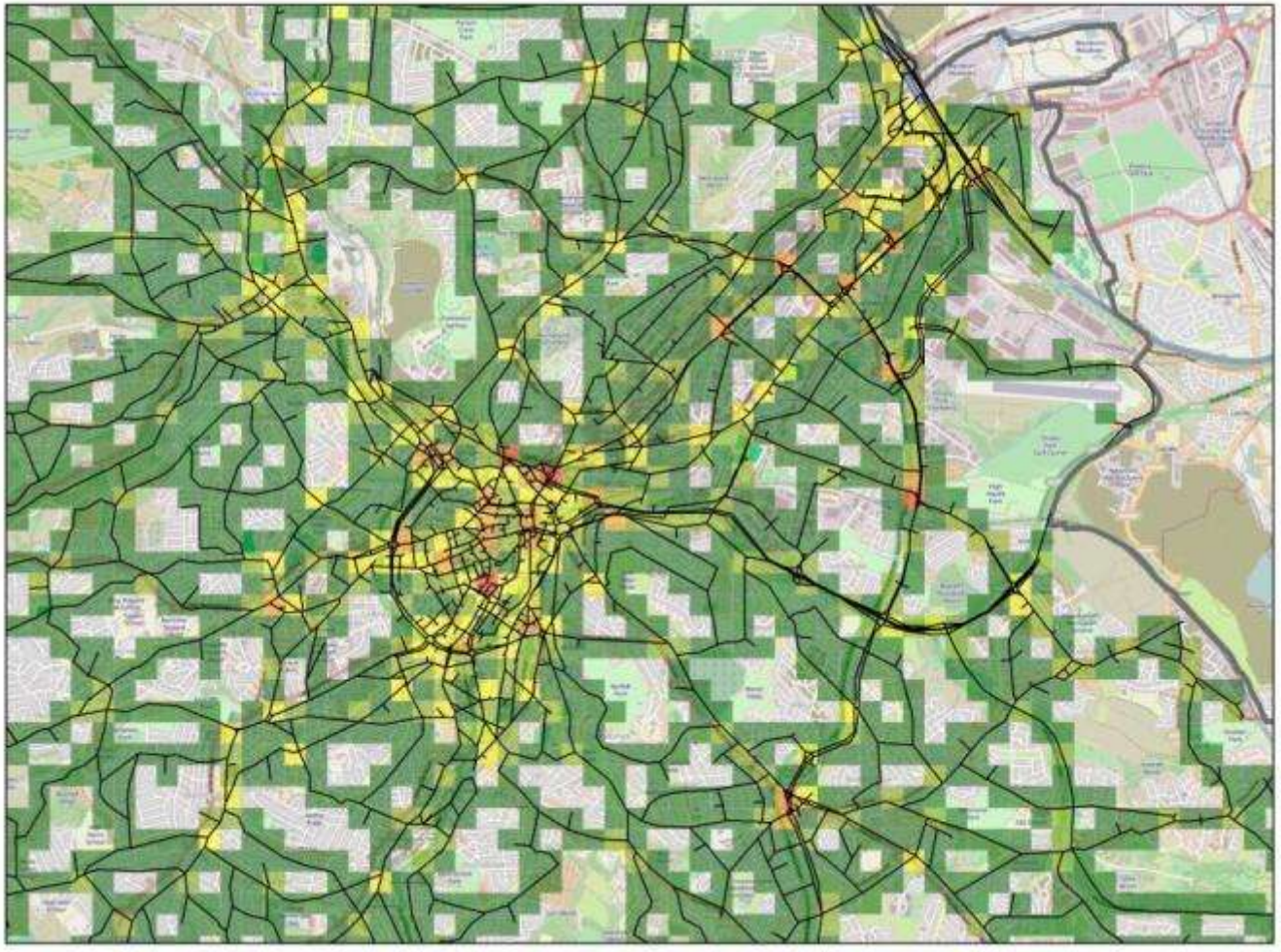
Emerging Strategy Effectiveness

Option	Strategy Component Description	Effectiveness (Total NOx Reduction)	% Total Fleet Affected	Efficiency (NOx) higher = more efficient
EmergingStratA - Targets	Emerging Strategy A - Setting Emission Rate and Euroclass Targets	20%	5%	46
EmergingStratB- Targets&Fleet	Emerging Strategy B - Setting Emission Rate and Euroclass Targets and Fleet Changes	25%	11%	

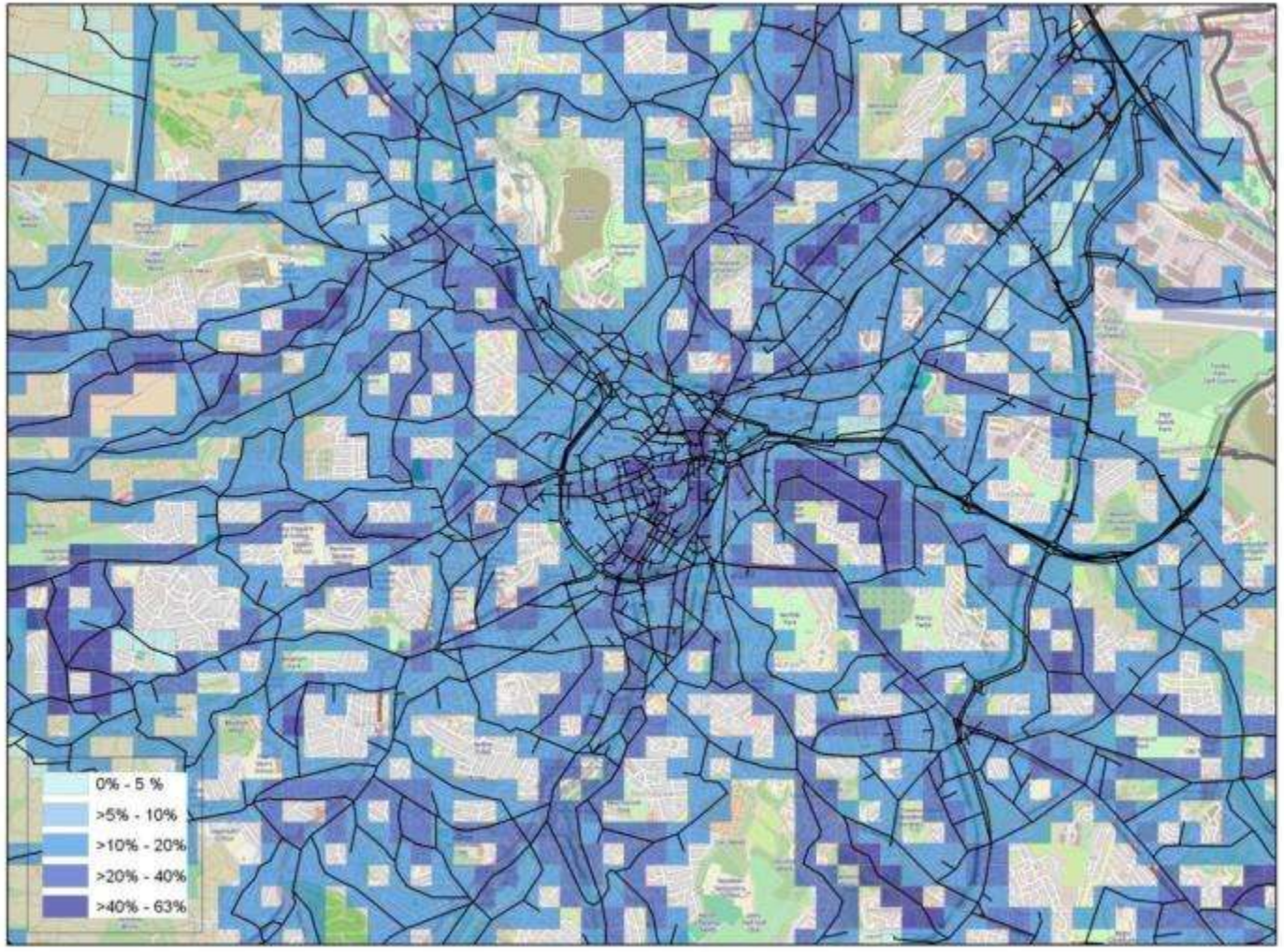
Impact of Emerging LEZ Strategy – ENEVAL 2012 NO_X

Impact of Emerging LEZ Strategy – ENEVAL 2015 Do Minimum NO_X

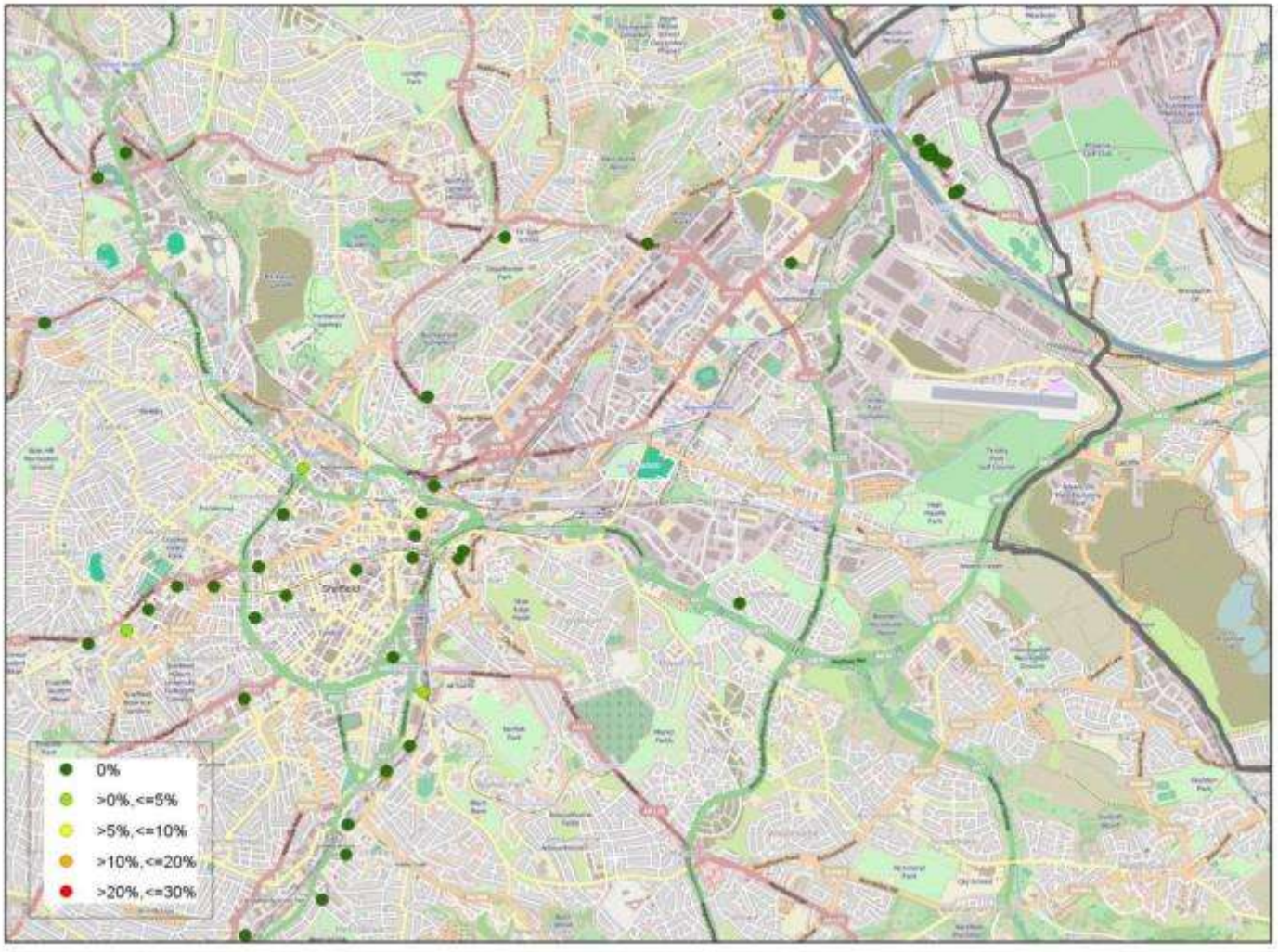
Impact of Emerging LEZ Strategy – ENEVAL 2015 Do Something NO_X



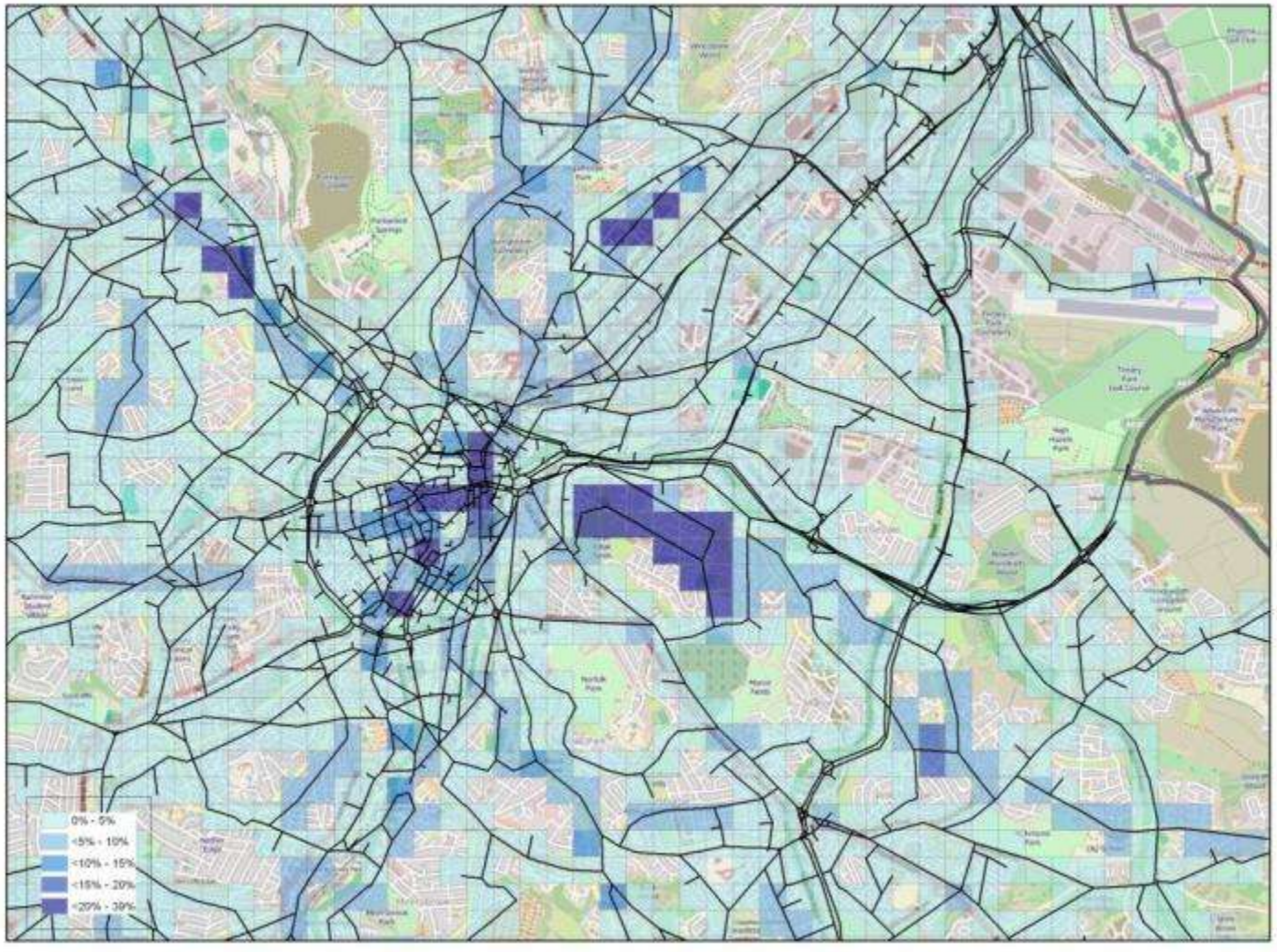
Impact of Emerging LEZ Strategy – ENEVAL 2015 DM vs DS NO_X % Reductions



Impact of Emerging LEZ Strategy – 2015 additional reductions required post strategy – assumes other sectors match transport's contribution



Impact of Emerging LEZ Strategy – ENEVAL 2015 DM vs DS PM_{10} % Reductions



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