

Road Transport Emissions Analysis

January 2022

Method

- This analysis uses emissions data from the London Atmospheric Emissions Inventory 2019 available [here](#).
- Emissions data for all road transport (cars, HGV, LGV, motorcycles, taxis, busses & coaches) for years 2013, 2016 and 2019, at a 1km resolution, has been compiled to give the total emissions for the London zones of Central, Inner and Outer London per year. This has been used to calculate the rate of change.
- In the London Zones analysis the Central Zone is the Congestion Charge Zone and Inner London is up to and including the North South Circular roads.
- The data has also been analysed by borough with the total road transport emissions per year for each borough used to calculate the rate of change. Boroughs are classified as outer and inner as per the London Plan definitions.

Results – London Zones

The new LAEI data shows that emissions from road transport are reducing rapidly in central and inner London, but not so in outer London. Tables 1, 2 and 3 below show road transport emissions of NO_x, PM₁₀ and PM_{2.5} respectively for the LAEI baseline years 2013, 2016 and 2019. The rate of change has been calculated between these baselines and show that:

- For NO_x, emissions reduced in 2019 compared to 2016 by around 43% both in Central and Inner London; whilst the reduction was still significant, but much lower (22%) in Outer London;
- For PM₁₀, emissions reduced in 2019 compared to 2016 by 24% and 19% in Central and Inner London respectively. The reduction in Outer London was comparatively much smaller; around 2.5%;
- For PM_{2.5}, emissions reduced in 2019 compared to 2016 by 34% and 24% in Central and Inner London respectively. The reduction in Outer London was again comparatively much smaller, around 7%.

Table 1. NO_x emissions and rate of change for London Zones

NO _x	Emissions (tonnes / year)			Rate of Change		
	2013	2016	2019	2013 - 2016	2016 - 2019	2013-2019
Central London	1,046	864	495	-17.4%	-42.7%	-52.7%
Inner London	10,350	8,863	5,086	-14.4%	-42.6%	-50.9%
Outer London	14,752	12,750	9,911	-13.6%	-22.3%	-30.8%
GLA	26,147	22,477	15,492	-14.0%	-31.1%	-40.8%

Table 2. PM₁₀ emissions and rate of change for London Zones

PM ₁₀	Emissions (tonnes / year)			Rate of Change		
	2013	2016	2019	2013 - 2016	2016 - 2019	2013-2019
Central London	71	64	49	-9.7%	-24.1%	-31.0%
Inner London	861	817	665	-5.0%	-18.6%	-22.8%
Outer London	1,368	1,324	1,291	-3.2%	-2.5%	-5.6%

GLA	2,300	2,206	2,005	-4.1%	-9.1%	-12.8%
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Table 3. PM_{2.5} emissions and rate of change for London Zones

PM _{2.5}	Emissions (tonnes / year)			Rate of Change		
	2013	2016	2019	2013 - 2016	2016 - 2019	2013-2019
Central London	45	39	25	-14.3%	-34.3%	-43.7%
Inner London	490	443	337	-9.4%	-23.9%	-31.1%
Outer London	778	716	666	-8.0%	-7.0%	-14.4
GLA	1,313	1,198	1,029	-8.7%	-14.1%	-21.7

Results – London Boroughs

The LAEI data shows that there have been large reductions in road transport emissions across London from 2013 to 2019, with the largest proportion of these reductions happening in the period 2016-2019. Tables 4 and 5 below show the rate of change of NO_x and PM_{2.5} emissions by borough. Table 6 shows the number of deaths attributable to pollution per borough, and the proportion of the total population.

The data shows that:

- For NO_x there is a clear trend of the inner London boroughs having the highest rates of reduction in emissions
- For PM_{2.5} the trend is similar with all inner London boroughs having higher reductions in emissions than outer boroughs with the exception of 2 boroughs, Greenwich and Newham, which come slightly further down the ranking, however with the ULEZ expansion we expect to see further improvements in both boroughs.
- For Inner London Boroughs the rate of change of PM_{2.5} was markedly higher between 2016-2019 than from 2013- 2016, for outer London boroughs this difference is not so apparent with the Outer London boroughs lower down the ranking
- Only one borough, Bexley, showed a slight increase in PM_{2.5} concentrations in the latter half of the study period.
- Boroughs with the highest proportion of pollution attributable deaths had some of the smallest reductions in road transport emissions.

The results emphasise that more needs to be done to reduce emissions in outer London boroughs.

Table 4. Road transport NO_x emissions rate of change by borough, ordered by % change 2013-2019.

Key:

Inner London	
Outer London	

Borough	NO _x Emissions Rate of Change %		
	2013-2016	2016-2019	2013-2019
City	-15.1%	-47.8%	-55.7%
Hackney	-14.9%	-47.0%	-54.9%

City of Westminster	-16.9%	-45.7%	-54.9%
Southwark	-18.3%	-44.3%	-54.5%
Islington	-16.4%	-43.4%	-52.7%
Camden	-16.2%	-43.4%	-52.6%
Haringey	-13.5%	-45.1%	-52.6%
Lambeth	-20.3%	-39.8%	-52.1%
Kensington and Chelsea	-15.5%	-41.7%	-50.7%
Lewisham	-16.3%	-40.4%	-50.1%
Hammersmith and Fulham	-13.6%	-41.1%	-49.1%
Tower Hamlets	-13.2%	-40.4%	-48.2%
Newham	-10.8%	-37.9%	-44.7%
Waltham Forest	-14.5%	-34.7%	-44.2%
Wandsworth	-17.4%	-32.1%	-43.9%
Brent	-9.1%	-37.3%	-43.0%
Richmond	-10.2%	-33.3%	-40.2%
Ealing	-9.3%	-33.2%	-39.4%
Greenwich	-14.5%	-27.6%	-38.1%
Enfield	-18.0%	-21.7%	-35.8%
Hillingdon	-12.5%	-26.3%	-35.5%
Redbridge	-10.4%	-28.0%	-35.5%
Barking and Dagenham	-12.6%	-25.8%	-35.2%
Barnet	-12.1%	-25.9%	-34.9%
Kingston	-10.5%	-26.9%	-34.5%
Croydon	-15.5%	-22.2%	-34.3%
Sutton	-14.6%	-22.6%	-33.9%
Merton	-14.7%	-20.4%	-32.1%
Hounslow	-10.5%	-23.7%	-31.7%
Havering	-17.4%	-15.4%	-30.1%
Bromley	-12.9%	-17.3%	-27.9%
Harrow	-12.8	-16.8%	-27.5%
Bexley	-13.0	-14.1%	-25.3%

Table 5. Road transport PM_{2.5} emissions rate of change by borough, ordered by % change 2013-2019.

Borough	PM _{2.5} Emissions Rate of Change %		
	2013-2016	2016-2019	2013-2019
City	-14.0%	-40.8%	-49.1%
Camden	-12.6%	-32.1%	-40.6%
City of Westminster	-13.9%	-30.8%	-40.4%
Islington	-10.5%	-29.1%	-36.6%
Southwark	-12.5%	-25.1%	-34.4%
Hackney	-9.3%	-27.3%	-34.1%
Kensington and Chelsea	-12.4%	-22.1%	-31.8%
Haringey	-9.3%	-24.4%	-31.4%

Hammersmith and Fulham	-10.8%	-22.4%	-30.8%
Tower Hamlets	-8.7%	-21.2%	-28.1%
Lewisham	-8.9%	-20.9%	-28.0%
Lambeth	-9.9%	-19.9%	-27.9%
Waltham Forest	-9.3%	-17.8%	-25.5%
Richmond	-7.85	-17.4%	-23.8%
Brent	-5.9%	-17.7%	-22.6%
Wandsworth	-9.1%	-14.2%	-22.0%
Newham	-6.8%	-15.9%	-21.6%
Enfield	-8.7%	-13.9%	-21.4%
Barnet	-7.7%	-14.1%	-20.7%
Ealing	-7.8%	-14.0%	-20.7%
Redbridge	-7.3%	-10.7%	-17.2%
Hillingdon	-6.6%	-11.1%	-16.9%
Greenwich	-6.6%	-10.5%	-16.4%
Sutton	-8.7%	-7.8%	-15.8%
Kingston	-7.3%	-9.0%	-15.6%
Hounslow	-8.1%	-7.8%	-15.3%
Barking and Dagenham	-7.4%	-8.3%	-15.1%
Havering	-12.3%	-3.0%	-15.0%
Merton	-9.6%	-3.2%	-12.4%
Harrow	-5.7%	-5.0%	-10.4%
Croydon	-8.2%	-2.1%	-10.1%
Bromley	-6.95%	-1.8%	-8.5%
Bexley	-6.8%	3.9%	-3.1%

Table 6. Total estimated air pollution attributable deaths¹ and as a proportion of the population, per borough, ordered by the deaths as a proportion of population % for the higher estimate.

Borough	Attributable deaths in 2019		Population		Deaths as a proportion of total population	
	Lower estimate	Higher estimate	Total Population	Population aged 65+	% of population - lower estimate	% of population - higher estimate
Havering	149	178	260600	47600	0.057	0.068
Bexley	139	162	251900	41100	0.055	0.064
Bromley	172	204	334600	58700	0.051	0.061
Sutton	101	118	208900	31600	0.048	0.056
City	4	4	7800	1300	0.051	0.051
Barnet	177	201	400700	57500	0.044	0.050
Croydon	168	196	394000	53400	0.043	0.050
Hillingdon	135	155	312500	41500	0.043	0.050
Richmond upon Thames	86	98	200300	31200	0.043	0.049
Kensington and Chelsea	70	77	159700	25100	0.044	0.048

¹https://www.london.gov.uk/sites/default/files/london_health_burden_of_current_air_pollution_and_future_health_benefits_of_mayoral_air_quality_policies_january2020.pdf

Enfield	142	164	340200	44500	0.042	0.048
Kingston upon Thames	76	87	181200	25000	0.042	0.048
Merton	87	100	211000	26400	0.041	0.047
Ealing	147	165	358400	45200	0.041	0.046
Redbridge	124	142	309000	38300	0.040	0.046
Harrow	102	118	257500	39800	0.040	0.046
Hounslow	114	128	280600	33500	0.041	0.046
Barking and Dagenham	84	97	214900	20100	0.039	0.045
Greenwich	113	129	288000	30500	0.039	0.045
Brent	133	149	338700	40300	0.039	0.044
Hammersmith and Fulham	74	83	189100	20400	0.039	0.044
City of Westminster	100	110	256000	31400	0.039	0.043
Camden	99	109	253900	31000	0.039	0.043
Islington	90	100	239800	21500	0.038	0.042
Lewisham	111	127	312700	29200	0.035	0.041
Waltham Forest	102	116	286000	30000	0.036	0.041
Wandsworth	115	129	327800	31200	0.035	0.039
Lambeth	112	126	336300	27200	0.033	0.037
Southwark	109	121	324700	26600	0.034	0.037
Haringey	90	101	286400	27800	0.031	0.035
Hackney	86	96	284100	21100	0.030	0.034
Newham	98	111	355800	26400	0.028	0.031
Tower Hamlets	88	97	319400	20000	0.028	0.030

Health

- There are over 500,000 Londoners on the asthma register and more than half of these people (c.297,000) live in outer London.
- Of the 1.08 million over 65's in London, almost twice as many (c.695,000) live in outer London than inner London.
- A recent report² by Imperial College London found that the greatest number of deaths attributable to air pollution were in outer London boroughs, mainly due to the higher proportion of elderly people in these areas, who are more vulnerable to the impacts of air pollution. The boroughs with the highest air pollution related deaths in 2019 (as a proportion of the total borough population) were Havering, Bexley, Bromley and Sutton, boroughs which have some of the lowest rates of change in road transport emissions.

Inequalities

- Over the study period the gap between the annual average NO₂ concentrations between the most and least deprived areas reduced from 7.6 µg^m-³ in 2013 to 3.8 µg^m-³ in 2019, a reduction of 50%³.
- Analysis showed that the Mayor's tough air quality measures will help improve air quality so that the difference would narrow considerably further, with the gap reduced by 71% by 2030⁴

²https://www.london.gov.uk/sites/default/files/london_health_burden_of_current_air_pollution_and_future_health_benefits_of_mayoral_air_quality_policies_january2020.pdf

³https://www.london.gov.uk/sites/default/files/air_pollution_and_inequalities_in_london_2019_update_0.pdf

⁴https://www.london.gov.uk/sites/default/files/les_exposure_rpt_final2-rb.pdf

- A recent study⁵ has shown that areas of London where people from mixed or multiple ethnic groups were more likely to live were also more likely to have higher levels of NO₂ (16-27% higher), and PM_{2.5} (5-10% higher) than those areas where white residents were more likely to live.
- The study showed that mainly as a result of the Mayor's tough measures, including ULEZ, the difference in exposure between these areas is expected to reduce by 85 per cent by 2030⁶.
- This new analysis shows however that significant differences in the rate of improvements still remain, and more work is needed to further reduce emissions and hence pollution levels and the health inequalities that result from unequal exposure to air pollution.

ULEZ

- The central London ULEZ has been successful and it, along with the Mayor's other policies including cleaning up the bus and taxi fleets, helped drive the large reductions in road transport emissions in Inner London
- Analysis estimated that by the end of 2019 NOx emissions in the central zone had reduced by 35% compared to the no ULEZ scenario⁷

⁵ https://www.london.gov.uk/sites/default/files/air_pollution_and_inequalities_in_london_2019_update_0.pdf

⁶ https://www.london.gov.uk/sites/default/files/les_exposure_rpt_final2-rb.pdf

⁷ https://www.london.gov.uk/sites/default/files/ulez_ten_month_evaluation_report_23_april_2020.pdf

