Scrappage for Equality

Calls continue to be made for the Government to sponsor a vehicle scrappage scheme to remove the most polluting vehicles from the parc. Previous RAC Foundation research has revealed how hard and expensive it would be to design and deliver a scrappage scheme to achieve a material air quality benefit.

But what if the purpose of a scrappage scheme was to mitigate the impact on low-income households of implementing a clean air zone with restricted, charged access for older vehicles? A social imperative would cast a very different light on the resulting cost-benefit calculation.

The purpose of the analysis in this paper is to look at the potential impact of such a scheme based on proposals developed by the Mayor of London, and seeks to address these questions:

- In Greater London how many commuting trips are made into the defined Ultra Low Emission Zone (ULEZ) area by individuals in ULEZ-incompatible cars and vans who may not be able to upgrade to a compliant vehicle?
- Would the availability of a 'mobility credit' enable these individuals to make the change to public transport?
- Do these individuals have ready access to public transport?

The analysis uses the best readily-available information sources to try to better understand how many low-income individuals would potentially be impacted by the introduction of the London ULEZ in 2019 (looking both at the original proposal for an area bounded by the existing Congestion Charge Zone and its geographical expansion in 2021), and what might be possible with the £2,000 'mobility credit' the Mayor of London put forward in his 2017 proposal to central government.

Considering population statistics, the England Index of Multiple Deprivation (IMD), journey-to-work data, and walking times to rail access points across Greater London, it is estimated there were some 31,400 individuals from the most income deprived areas of the capital who drove into the expanded ULEZ area in a vehicle that would attract a charge and who lived within a walkable distance to a railway station and therefore might be eligible for the mobility credit.

There were some 37,300 more individuals who, although eligible for the credit (based on the assumptions made in this work), don't live within easy walking access of a railway station. Many, but not all, will live on or near bus routes, though not necessarily routes that would serve both their home and their place of work. Others might be eligible to join car clubs, but our analysis of the location of car club spaces suggests the current distribution might not work for low-income areas because they are less likely to be nearby. Furthermore, some clubs have requirements (e.g. credit checks, credit cards) that might exclude low-income persons, even if a car club space was close by. Nor are car clubs currently set up for commuting purposes.

A one-off scrappage payment cannot simply be compared to the annual cost of a travelcard or broader mobility benefit – the calculation needs also to weigh the costs avoided by surrendering car ownership against future years' travel costs.

The picture that emerges, albeit painted with a very broad brush, is that if £63 million in funding (plus administration costs) could be found then a deal could be devised that might work for up to half of the low-income, London-resident commuters using non-ULEZ-compliant cars to get to work. But it suggests that more creative thinking will be needed if the economic hit of the ULEZ is to be mitigated for the majority of London's low-income car commuters.

Anneka Lawson PhD

RAC Foundation

The RAC Foundation would like to thank the Greater London Authority and UK for their kind help with gathering the data necessary for this analysis.

List of Abbreviations

CCZ	Congestion Charging zone
GLA	Greater London Authority
IMD	Index of Multiple Deprivation
LSOA	Lower Layer Super Output Area
TfL	Transport for London
ULEZ	Ultra Low Emission Zone

1 Introduction

In 2017 the Mayor of London published a proposal to central government on the subject of how London would administer a vehicle scrappage scheme if central government were to provide the funding.[1] Three groups were considered under separate sub-proposals – businesses, individuals and taxis. The corresponding key sub-proposals were detailed and costed in the report, and were intended not as mutually exclusive alternatives, but each targeting one of these groups over a two-year period.

Proposal A – payments of £3,500 to scrap up to 70,000 older polluting vans and minibuses and a national leasing guarantor fund, to support charities and small businesses (total cost of £245 million in London).

Proposal B – urban 'mobility credit' valued at £2,000 to help low-income households in cities scrap up to 130,000 polluting cars (£260 million in London).

Proposal C – payments of £1,000, in addition to other incentives, to help scrap up to 10,000 older polluting purpose built taxis (£10 million in London).

The aim of this proposal was not primarily to improve air quality, but to assist those least able to afford to comply with the Ultra Low Emission Zone (ULEZ).

[1] Transport for London (2017). *Proposal for a National Vehicle Scrappage Fund.* Accessed 18 June 2018 from http://content.tfl.gov.uk/proposal-national-vehicle-scrappage-fund.pdf

2 Methodology

This paper, focusing on Proposal B for those living in Greater London, attempts to calculate the number of individuals who might be affected by the introduction of the ULEZ. This was done here by estimating the number of commuting trips, as driver, into or within (a) the currently defined ULEZ (London's Congestion Charging zone (CCZ))[2] and (b) the expanded ULEZ (the North–South Circular road boundary)[3], which are made from the most income deprived Lower Layer Super Output Areas (LSOAs) in Greater London in ULEZ-incompatible cars and vans. "The most deprived" is defined in this paper to mean those living in the lower two quintiles of the income measure of the Index of Multiple Deprivation (IMD) for England.

A number of assumptions have been made in these calculations:

- The most up-to-date information was used where possible – no projections have been made to update this data to the present, or to future dates. The dates and sources for each data class is as follows:
    - licensed cars and vans as at the end of March 2017;[4]
    - commuting trips as driver from Census 2011;[5]
    - income measure from England's IMD from 2015;[6] and
    - population from 2015 mid-year estimates.[7]
- The income measure from the IMD was defined at LSOA level. This measure was assumed to be representative of all individuals resident in that LSOA.
- The walking times of individuals in each LSOA to the closest public transport station/car club spaces was defined as the minimum walking time from/to the population weighted centroid of the LSOA to the public transport station/car club space closest to that centroid. The walking times where calculated by the Google Distance Matrix.[8]
- The public transport stations considered in this paper include only Underground, Overground, Docklands Light Railway, Transport for London (TfL) Rail, tram and other national rail stations within Greater London (i.e. buses and public-use bicycles were not considered, due to the complexity of these network in terms of their interactions with other transport modes).
- LSOAs have been assigned a TfL Travelcard zone based on the Travelcard zone of the closest public transport station (by Euclidean, or crow-fly, distance). Where stations were within more

[2] https://tfl.gov.uk/modes/driving/ultra-low-emission-zone

[3] https://www.london.gov.uk/press-releases/mayoral/ultra-low-emission-zone-to-expand

[4] Provided by Department for Transport.

[5] Provided by the Greater London Authority (GLA) from Office of National Statistics Census 2011 - Method of travel to work data.

[6] Department for Communities and Local Government (2015). English indices of deprivation 2015. Accessed 19 June 2018 from https://www.gov.uk/government/statistics/english-indices-of-deprivation-2015

[7] Office for National Statistics (2016). Lower Super Output Area Mid-Year Population Estimates. Accessed 19 June 2018 from https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationestimates/datasets/lowersuperoutputareamidyearpopulationestimates

[8] Google Distance Matrix API: https://developers.google.com/maps/documentation/distance-matrix/start

than one Travelcard zone, the most central Travelcard zone was assumed for that station (which results in the lowest annual Travelcard cost for travel towards central London from that station).

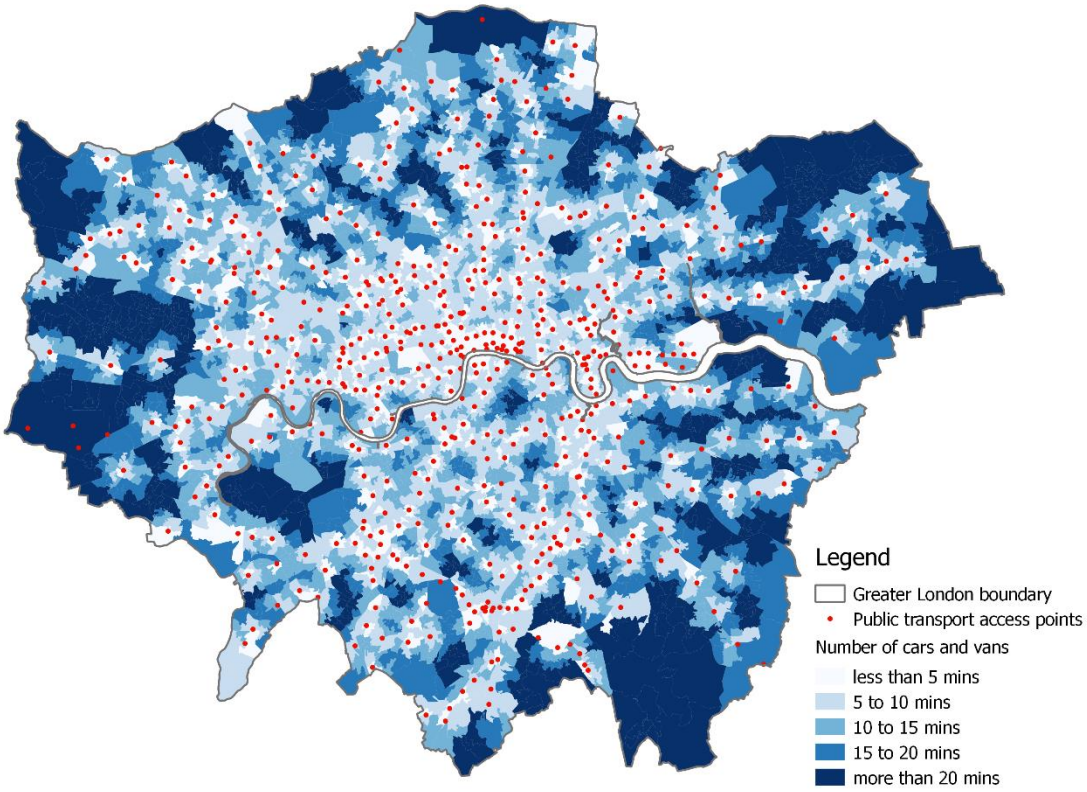
- LSOAs that straddle the boundary of the ULEZ were defined as being within the ULEZ if the population weighted centroid of the LSOA was within the ULEZ.
- Car and van availability in each LSOA was based on the number of licensed cars and vans registered in that LSOA from DVLA data. Car and van availability from the Census was not used (the Census and the DVLA data are not the same).
- The ULEZ compatibility of cars and vans was determined based on the first year of registration where diesel cars and vans are considered compatible from 2015 and petrol cars are considered compatible from 2005.
- The number of commuting trips as driver in an LSOA that were made in ULEZ-incompatible cars and vans was based on the proportion of licensed *ULEZ-incompatible* cars and vans to *total* licensed cars and vans in that LSOA.
- It was assumed that individuals would purchase a TfL annual Travelcard with the mobility credit, using any balance remaining for car club rental. If the cost of purchase of an annual Travelcard for any individual was above that of the mobility credit, it was assumed the individual would not take up the offer.
- Car club space information was obtained from UK for July 2017. Peer-to-peer car clubs have not been included in this analysis.
- Car club hire was assumed to be £8 per hour, with no joining fees.

3 Data

3.1 Access to public transport

Mid-year estimates of population suggest that approximately 3.5 million people over 16 years old lived in LSOAs within a 10-minute walk of a public transport access point in 2015. [7] This number represents 51% of the population of London aged 16 years or older. Figure 3.1 shows these public transport access points and walking times from the population weighted centroid of the LSOA to them.

Figure 3.1: Walking times to closest Underground, Overground, Docklands Light Railway, TfL Rail, tram and other national rail station access point from the population weighted centroid of each LSOA



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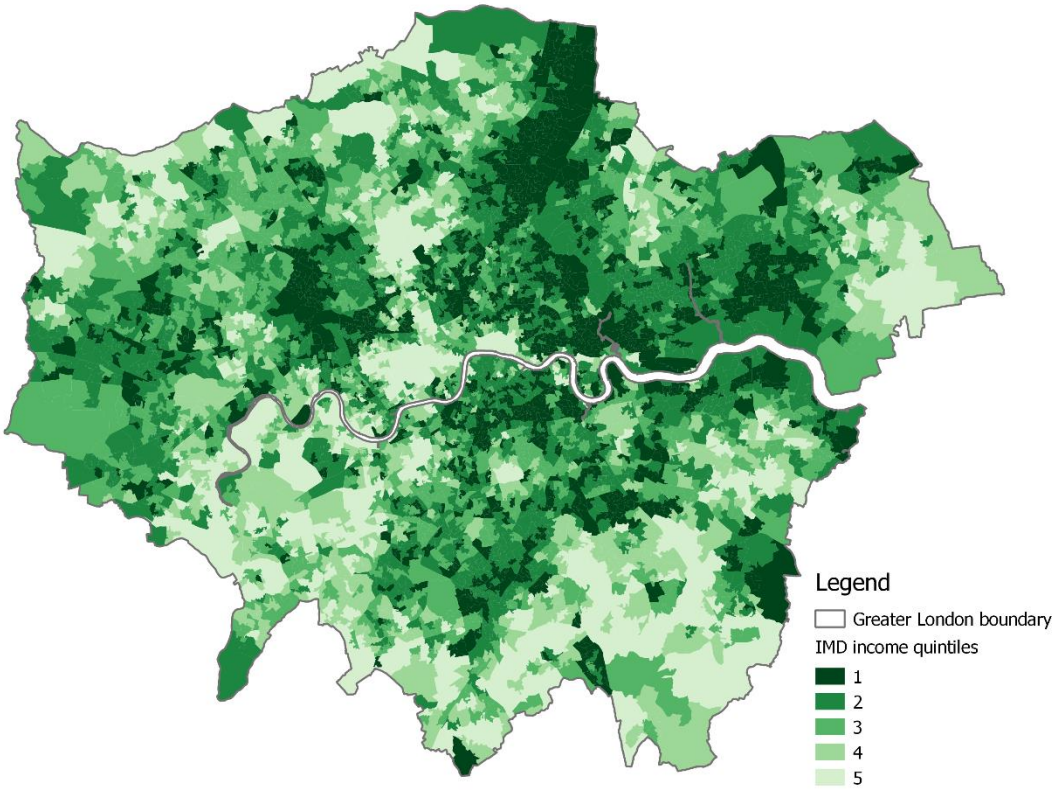
3.2 Index of multiple deprivation

Approximately 3.7 million (55% of all) individuals aged 16 years and older live in the most income deprived (quintiles 1 and 2) LSOAs.[6] Figure 3.2 presents the income measure of the England IMD for LSOAs in London.

Figure 3.2: IMD income measure quintiles by LSOA (where 1 was most deprived and 5 was least deprived)



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3.3 Travel costs

A quarter (25%, 1.7 million) of the population of Greater London live in LSOAs that have been classified as being in zones 5 and 6, and were therefore considered as not taking advantage of the mobility credit under the assumptions made in this paper, as the purchase cost of an annual Travelcard was above that of the value of the mobility credit. Table 3.1 presents the costs of an Annual Travelcard between each zone in Greater London, while Figure 3.3 shows the zone in which each LSOA has been calculated to be

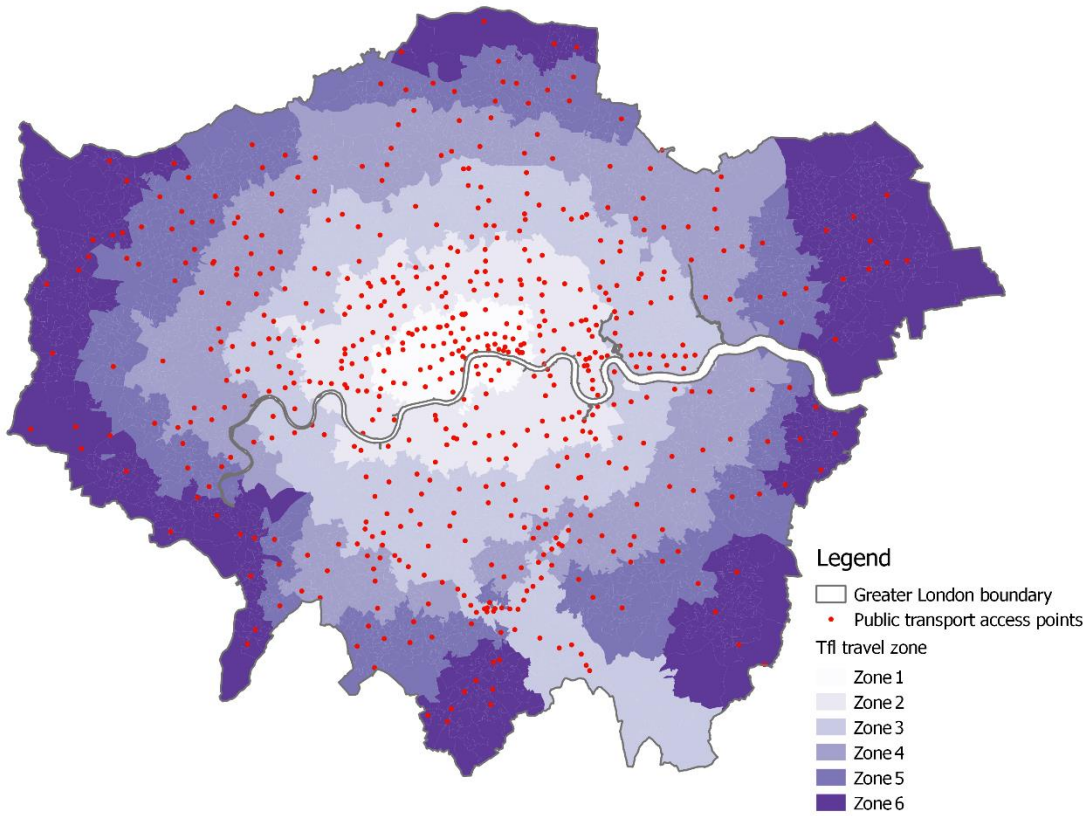
based on the shortest Euclidean (or crow-fly) distance from the population weighted centroid of the LSOA to a public transport access point.

Table 3.1: TfL Annual Travelcard costs between zones

		Destination			
		Zone 1	Zone 2	Zone 3	Zone 4
Origin	Zone 1	£1,364	£1,364	£1,600	£1,960
	Zone 2	£1,364	£1,020	£1,020	£1,128
	Zone 3	£1,600	£1,020	£1,020	£1,020
	Zone 4	£1,960	£1,128	£1,020	£1,020
	Zone 5	£2,328	£1,356	£1,128	£1,020
	Zone 6	£2,492	£1,704	£1,356	£1,128

Source: TfL[9]

Figure 3.3: Approximate TfL Travelcard zone for LSOAs and public transport access points



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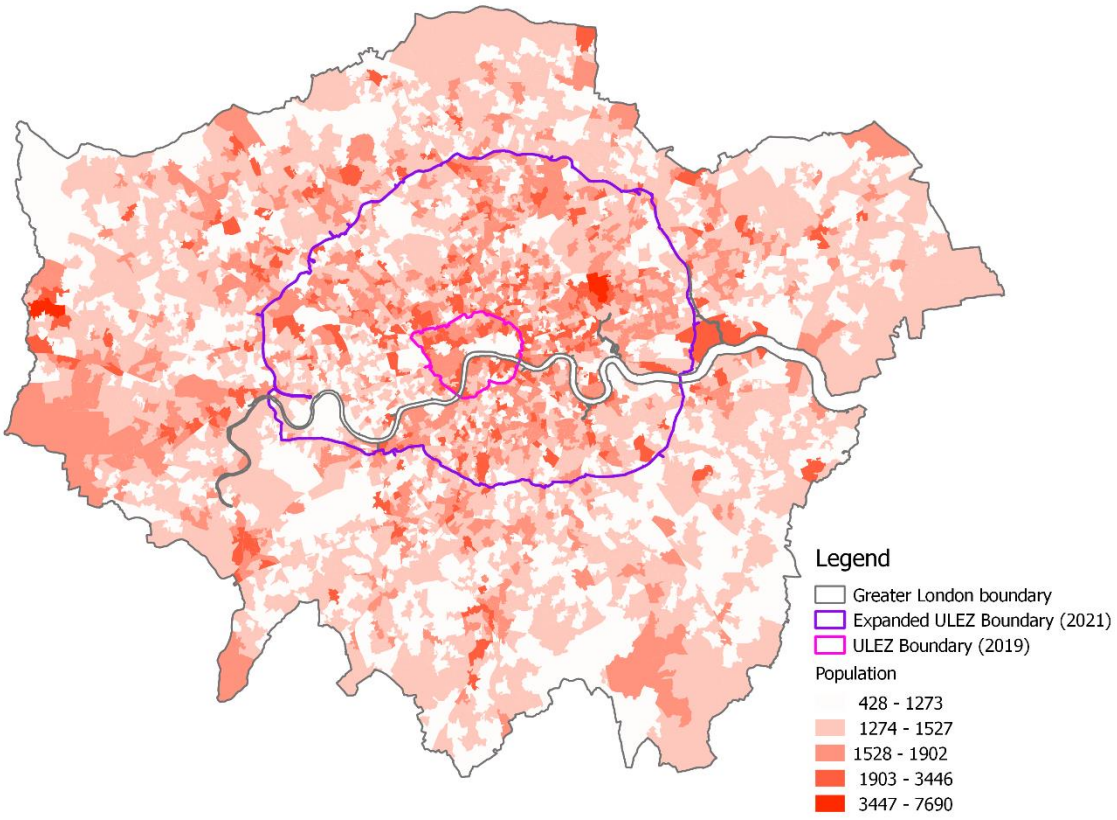
[9] Adult rate prices: All Tube, Docklands Light Railway, London Overground and TfL Rail services and National Rail services in Z1-9: http://content.tfl.gov.uk/adult-fares-2018.pdf

3.4 Population

The total population of Greater London in 2011 was 8.6 million, with an adult population (those aged 16 years and older, the standard meaning of 'population' in this paper unless otherwise specified) of 6.8 million. The adult population of LSOAs in the CCZ was 2.5% of the adult population of Greater London, standing at approximately 169,300. The adult population in LSOAs inside the North–South Circular road boundary was over three million – 44% of the adult population of London. The remaining 3.8 million live in LSOAs outside the North–South Circular roads.

Figure 3.4: Resident population aged 16 and over, by LSOA



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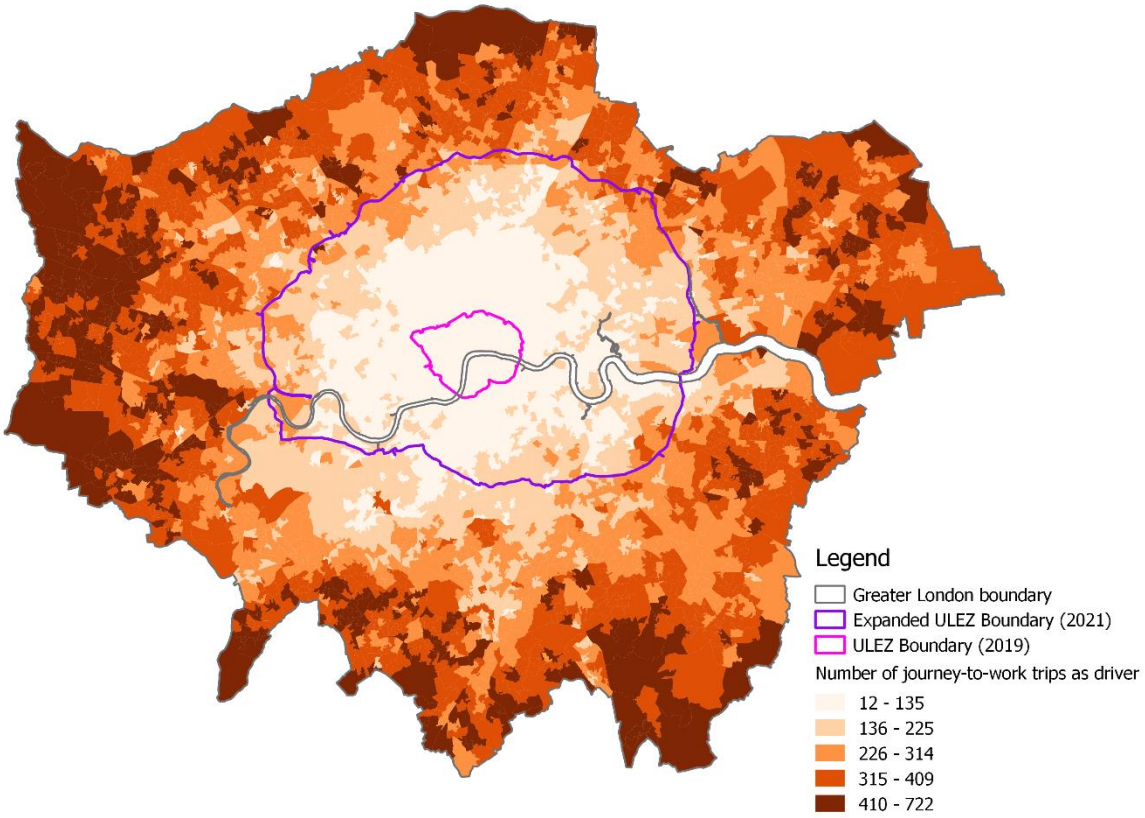
3.5 Journey-to-work trips as driver

The number of commuting trips as driver which had an origin in Greater London came to 1.1 million. The majority of these (*c.*857,000) originated in Outer London (defined here as the area outside the North–South Circular roads). Less than 1% of these trips began within the CCZ.

Figure 3.5: Number of journey-to-work trips as driver generated in each LSOA



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Of journeys beginning in Greater London, over 36,200 (3%) had a destination within the CCZ and of the order of 273,400 (24%) within the North–South Circular road boundary. 97% of the 36,200 journeys originate outside the CCZ (and of course end within it), while 54% of the 273,400 originate outside the North–South Circular road boundary (and end within it). The numbers and percentages of trips into the CCZ and the expanded ULEZ area by LSOA can be found in Figures 3.6 to 3.9.

Figure 3.6: Number of journey-to-work trips as driver generated in each LSOA, with a destination inside the ULEZ (where the ULEZ boundary was defined by the CCZ)

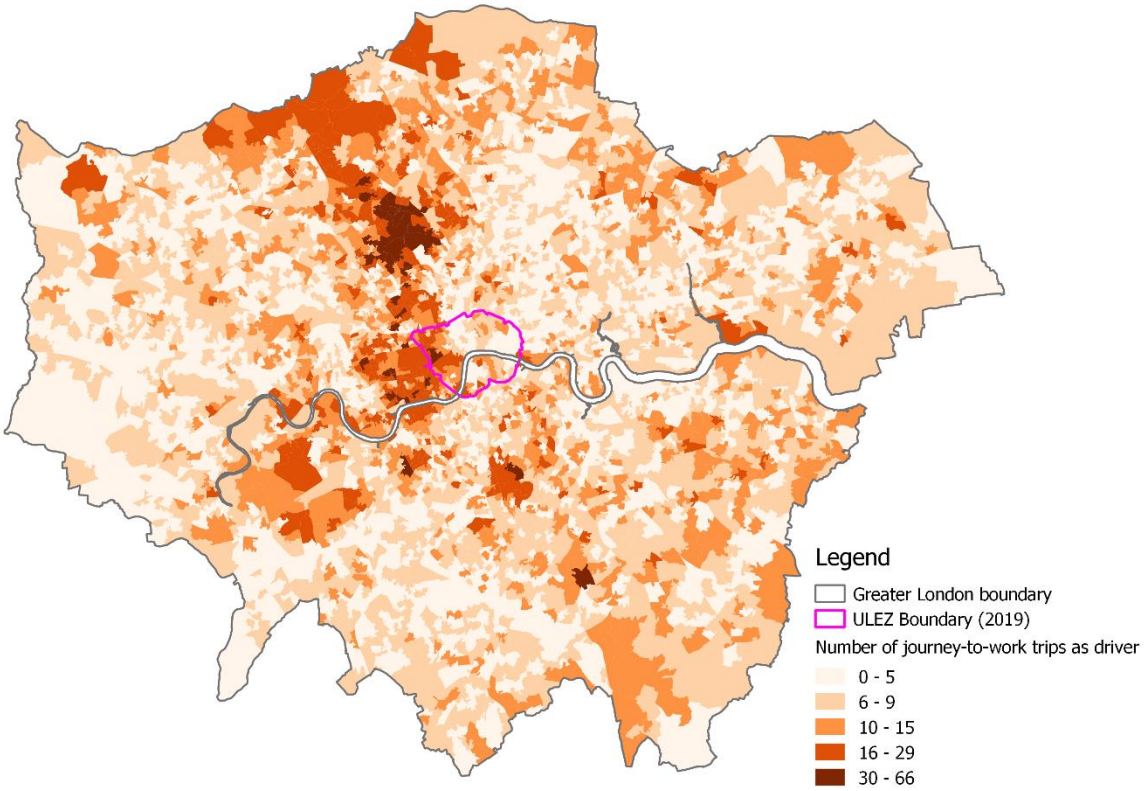

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Figure 3.7: Percentage of journey-to-work trips as driver generated in each LSOA, with a destination inside the ULEZ (where the ULEZ boundary was defined by the CCZ)

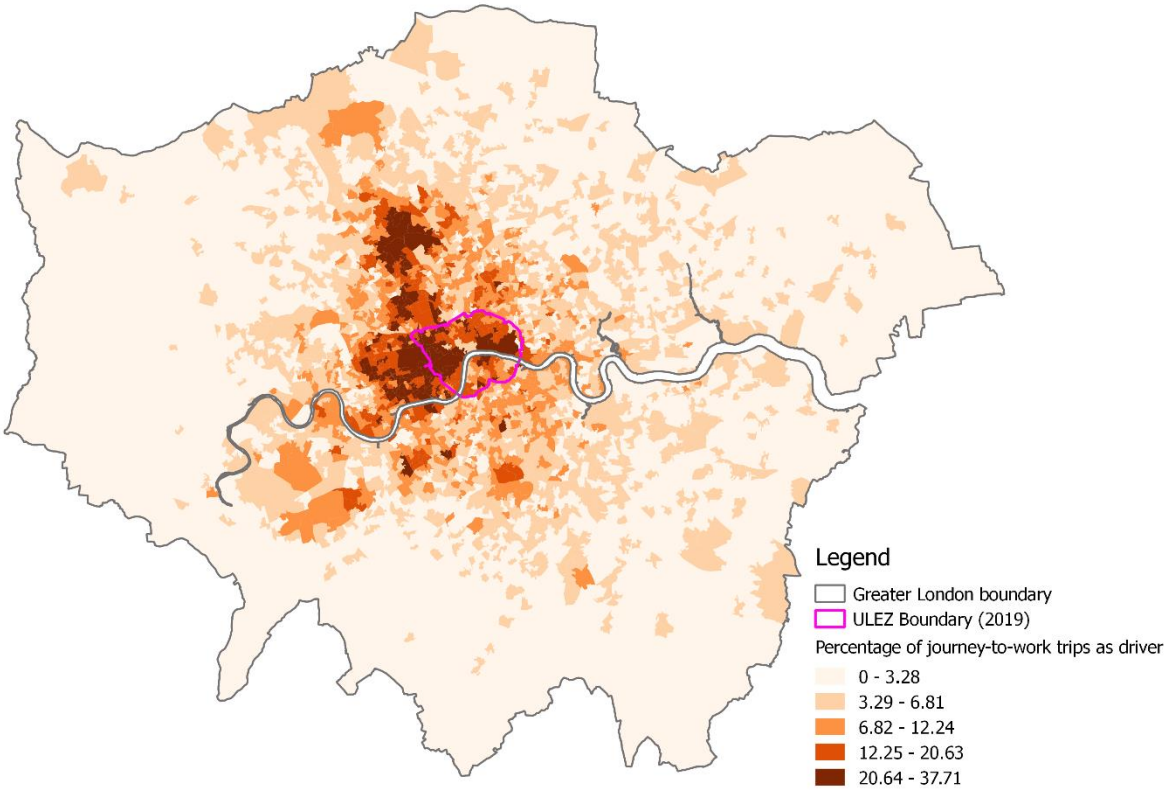

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Figure 3.8: Number of journey-to-work trips as driver generated in each LSOA, with a destination inside the ULEZ (where the ULEZ boundary was formed by the North–South Circular roads)

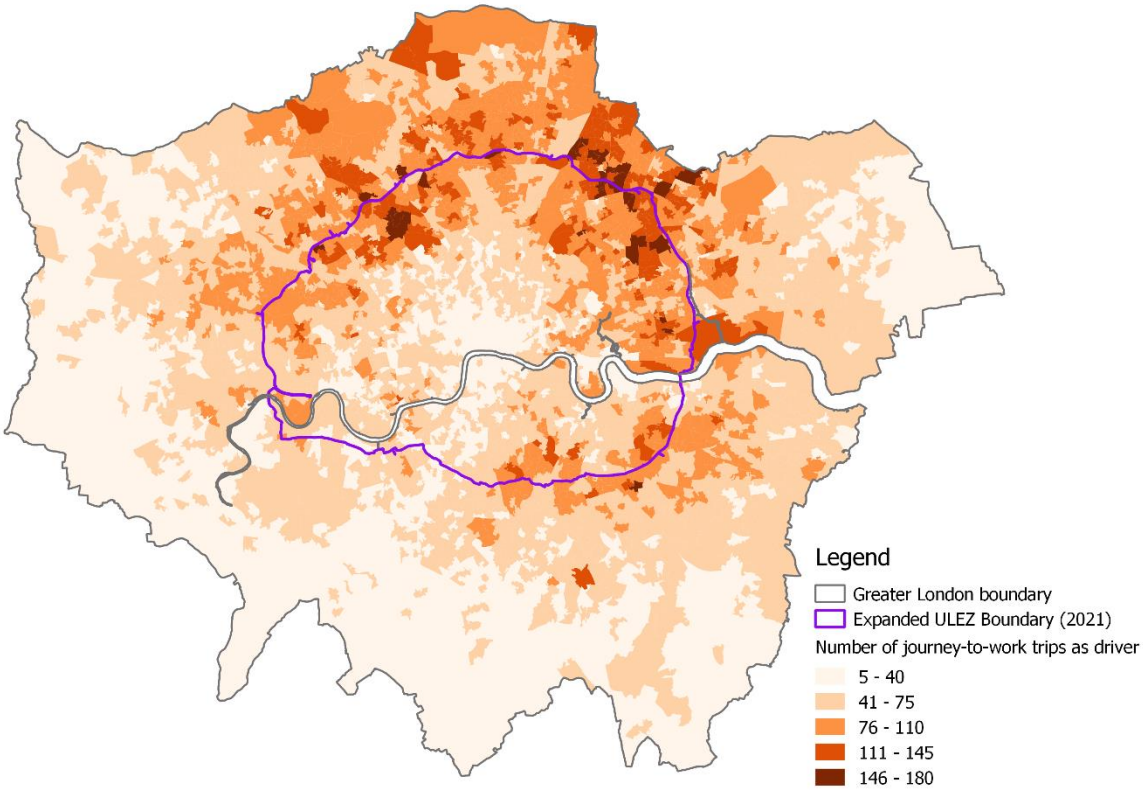

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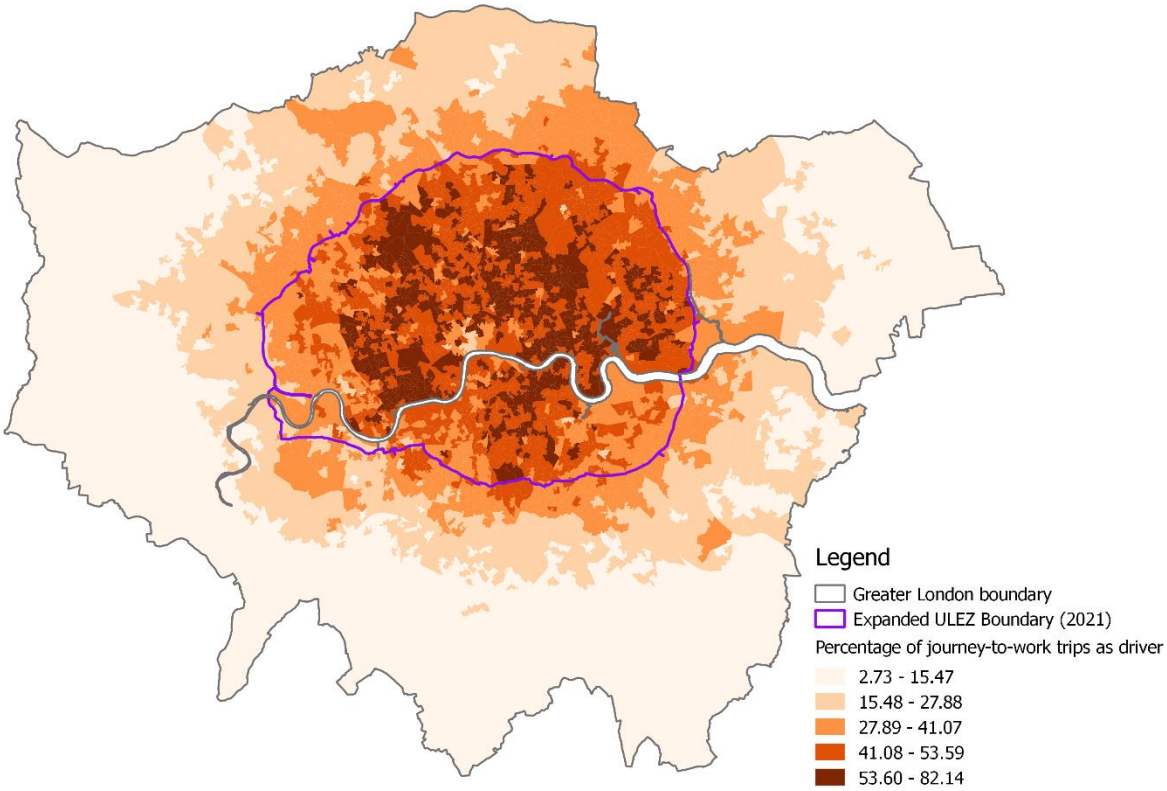
Figure 3.9: Percentage of journey-to-work trips as driver generated in each LSOA, with a destination inside the ULEZ (where the ULEZ boundary was formed by the North–South Circular roads)



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3.6 Licensed cars and vans

Of the 3.9 million cars and vans licensed in Greater London at the end of March 2017, 70% were licensed at addresses in LSOAs in Outer London, 29% in Inner London (here, defined as the LSOAs between the North–South Circular roads and the CCZ boundary) and 1% licensed in LSOAs in central London (here, defined as the CCZ) (Figure 3.10). Of cars and vans licensed in Greater London, 1.6 million (43%) were not compliant with the entry standards for the ULEZ.

When analysed by area of London (Outer, Inner, central), the proportions of all cars and vans which were not compliant with ULEZ entry standards that fell into each area formed a distribution that was similar to that for all cars and vans.

Figure 3.10: Number of cars and vans licensed in each LSOA as at the end of March 2017

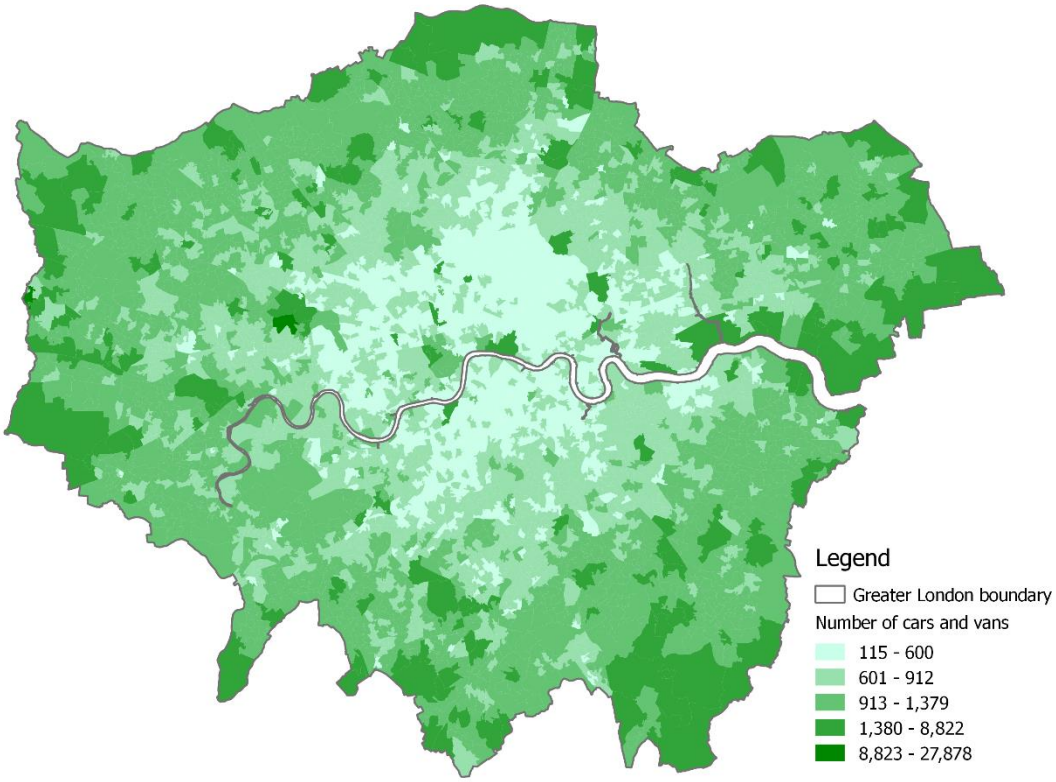

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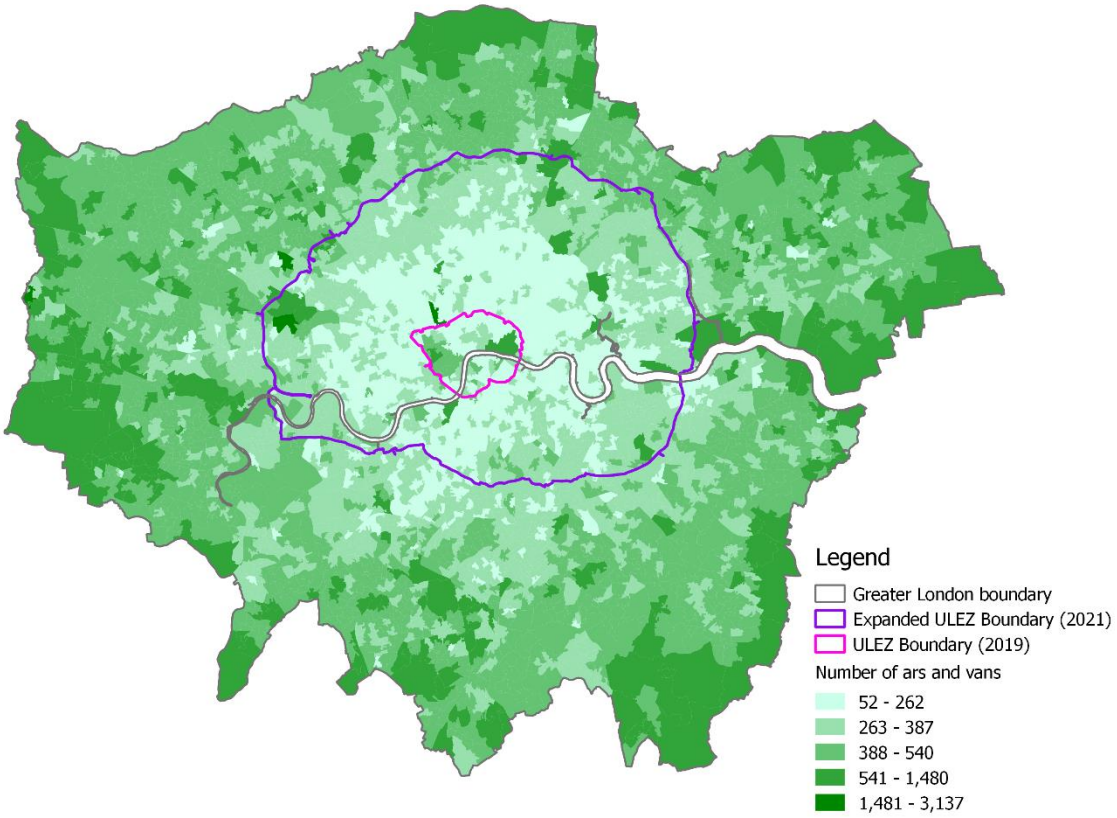
Figure 3.11: Number of licensed cars and vans that were not compliant with ULEZ entry standards licensed to addresses in each LSOA as at the end of March 2017



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3.7 Number of trips to work as driver with a destination inside the ULEZ in a licensed car or van that was not compliant with the ULEZ entry standards

For the first stage of the ULEZ (within the CCZ), it was estimated that almost 15,300 commuting trips as driver by car or van had a destination within it that would face a charge for entry, approximately 42% of the total.

For the expanded ULEZ (within the North–South Circular road boundary), it was estimated that 119,700 trips by car or van have a destination within the ULEZ that would face a charge for entry, approximately 44% of the total.

The recently announced expansion of the ULEZ might result in an almost eightfold increase in the number of trips into the ULEZ by cars and vans that do not meet the entry standards, and would therefore face a charge. The distribution of where these trips originate can be seen in Figures 3.12 and 3.13 for the CCZ and the expanded ULEZ, respectively (this does not take into account any cars or vans that may no longer be in use at 2019 or 2021).

Figure 3.12: Estimated number of trips to work as driver with a destination inside the ULEZ in a licensed car or van that was not compliant with the ULEZ entry standards (where the ULEZ was defined by the CCZ)

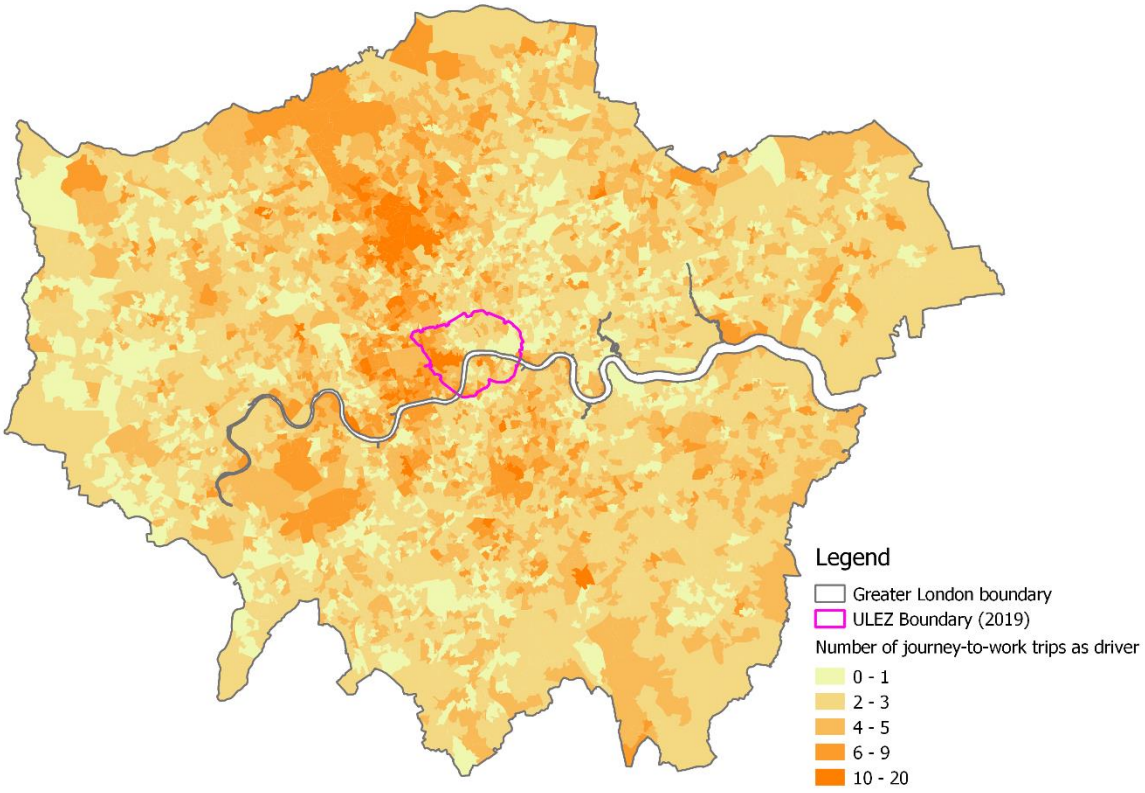

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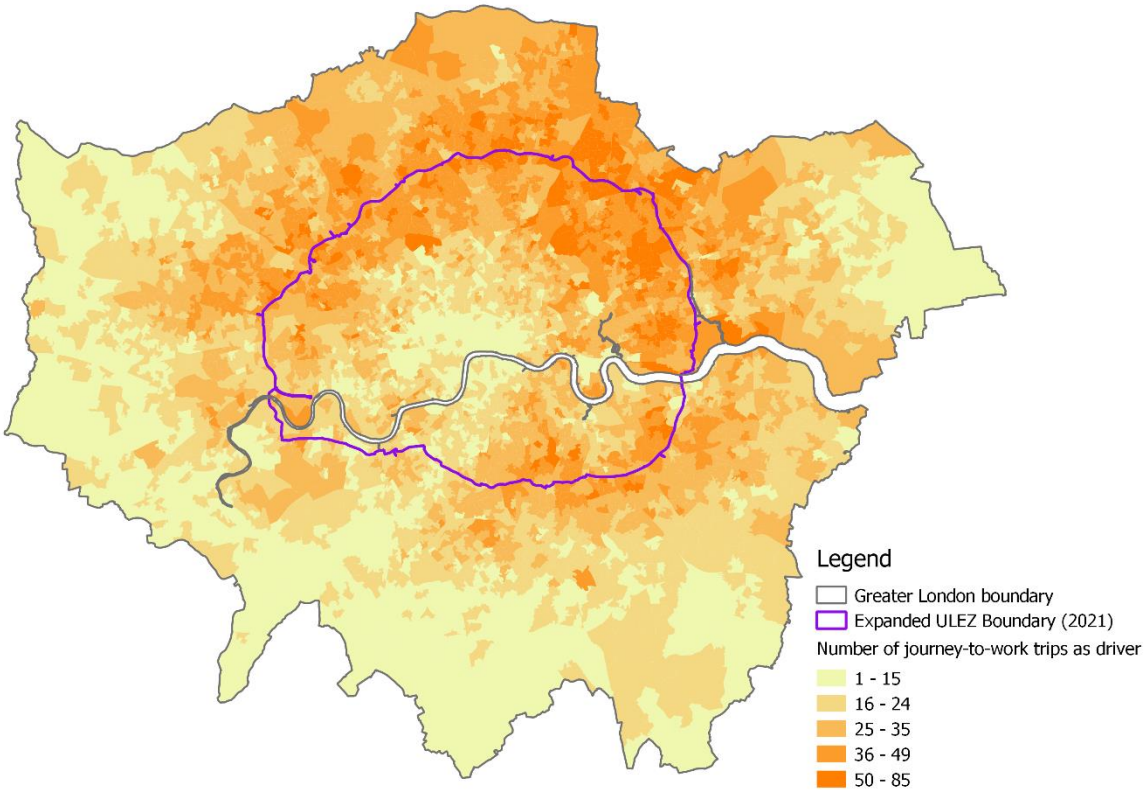
Figure 3.13: Estimated number of trips to work as driver with a destination inside the ULEZ in a licensed car or van that was not compliant with the ULEZ entry standards (where the ULEZ boundary was formed by the North–South Circular roads)



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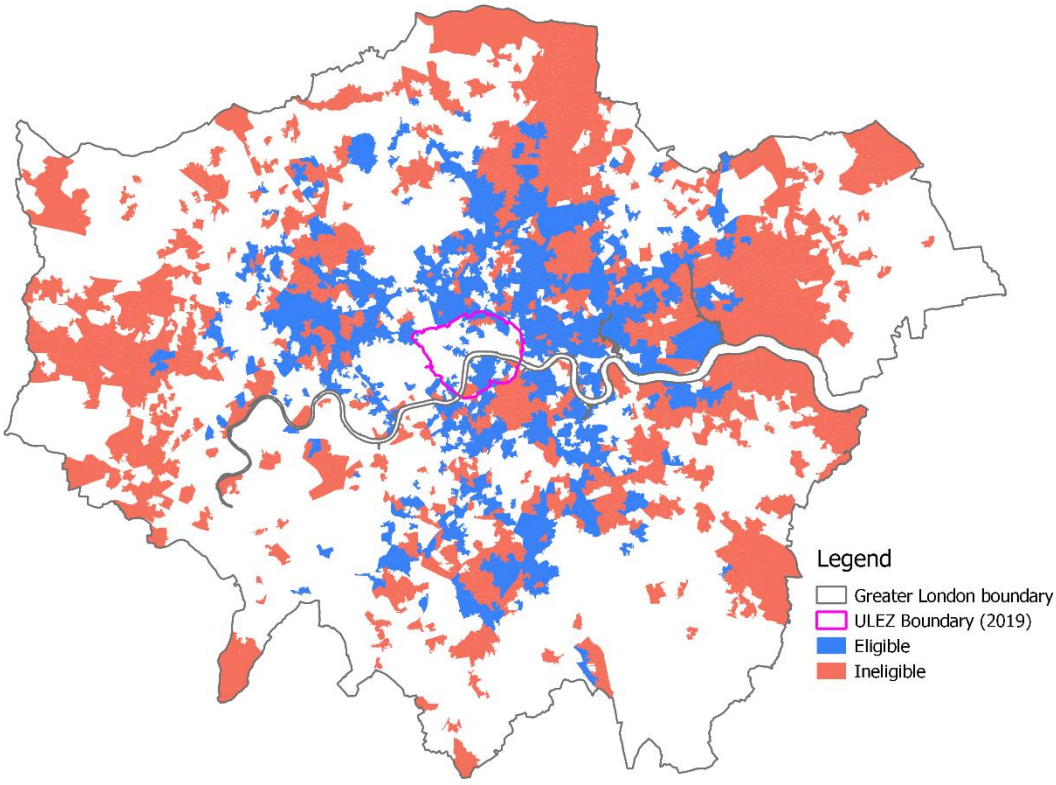
4 Considering Access to Public Transport, Deprivation and Travel Costs Simultaneously for the ULEZ Defined Within the CCZ

About 3.7 million adults live in the most income deprived LSOAs in Greater London, 0.5 million of whom drive to work, and just over 16,000 of whom drive to a workplace inside the CCZ. There were 1.8 million cars and vans licensed in these LSOAs in March 2017, and of the order of 830,600 of them (44%) were not compliant with ULEZ entry standards.

Figure 4.1: LSOAs in the lowest two income quintiles of the IMD income measure that meet (blue) and do not meet (red) the criteria to be able to take advantage of the 'mobility credit' (where the ULEZ was defined by the CCZ)



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It was estimated that close to 7,100 journeys to work were made into the CCZ in cars and vans that were not ULEZ-compliant. Of these, approximately 3,100 trips were made by individuals living in LSOAs which make the mobility credit a viable option for them, with over 4,000 not likely to have had this opportunity. Figure 4.1 highlights the LSOAs in the lowest two income quintiles of the IMD income measure that meet and do not meet the criteria to be able to take advantage of the 'mobility credit', while Table 4.1 breaks down the numbers of eligible trips by Travelcard zone.

Table 4.1: Estimated number of journeys to work by origin TfL Travelcard zone, ending inside the ULEZ, made in non-compliant cars and vans registered in the most deprived LSOAs that could otherwise potentially be made by public transport given access to the 'mobility credit'

		Destination: CCZ
Origin	Zone 1	306
	Zone 2	1,419
	Zone 3	946
	Zone 4	477

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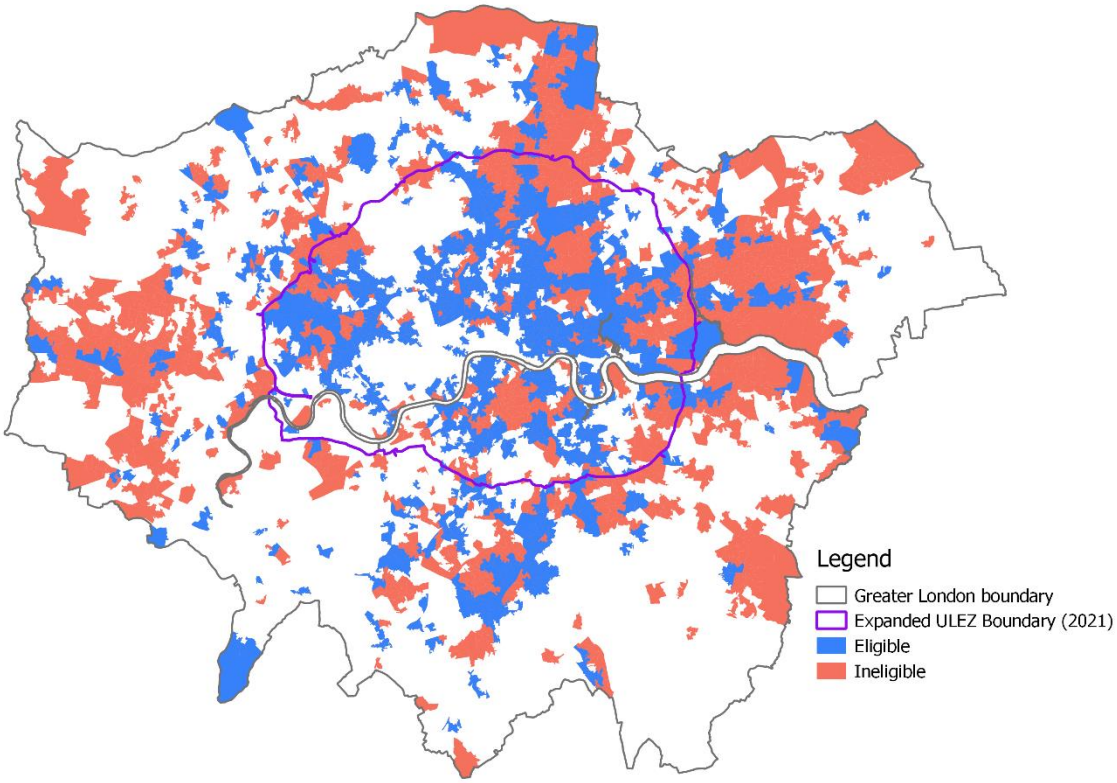
5 Considering Access to Public Transport, Deprivation and Travel Costs Simultaneously for the ULEZ Defined by the North–South Circular Road Boundary

Expanding the ULEZ to the North–South Circular road boundary increases the number of journeys to work by those living in the most deprived LSOAs ending in the ULEZ to approximately 151,100 and the number of trips in non-ULEZ-compliant cars and vans to almost 68,700.

Figure 5.1: LSOAs in the lowest two income quintiles of the IMD income measure that meet (blue) and do not meet (red) the criteria to be able to take advantage of the 'mobility credit' (where the ULEZ boundary was formed by the North–South Circular roads)



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Over 31,400 of these journeys to work ending inside the expanded ULEZ and made in non-compliant cars and vans could potentially be made by public transport, given access to the mobility credit. There were a further almost 37,300 journeys for work where the mobility credit would not be a viable alternative. Figure 5.1 highlights the LSOAs in the lowest two income quintiles of the IMD income measure that meet and do not meet the criteria to be able to take advantage of the 'mobility credit', while Table 5.1 breaks down the numbers of eligible trips by origin and destination Travelcard zone.

Table 5.1: Estimated number of journeys to work by origin and destination TfL Travelcard zone, ending inside the expanded ULEZ, made in non-compliant cars and vans registered in the most deprived LSOAs that could otherwise potentially be made by public transport given access to the 'mobility credit'

		Destination: inside North–South Circular Road boundary			
		Zone 1	Zone 2	Zone 3	Zone 4
Origin	Zone 1	519	618	209	14
	Zone 2	2,699	6,587	2,370	108
	Zone 3	1,577	4,323	4,991	420
	Zone 4	753	1,839	2,047	281
	Zone 5		607	772	97
	Zone 6		277	322	50

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Expanding the ULEZ to the North–South Circular road boundary increases the population resident inside the zone from under 170,000 to more than three million, and increases the number of cars and vans licensed in the ULEZ and not compliant with the ULEZ standards from under 21,800 to almost 520,000. This represents an almost 24-fold increase in the number of cars and vans licensed in the zone. Cars and vans licensed in the most deprived LSOAs will see an almost 33-fold increase, with expansion from over 10,300 to almost 340,000.

The estimated number of journeys to work ending in the expanded ULEZ would increase from almost 15,300 to nearly 119,300 – of the order of an eightfold increase in the number of trips affected. For those living in the most deprived LSOAs, this increase was almost tenfold – from over 7,100 to almost 68,700 non-ULEZ-compliant journeys to work.

6 Car Club Rental

Of the 3,100 individuals that would be likely to take up the mobility credit for trips into the ULEZ defined by the CCZ, 2,600 lived in LSOAs with a car club space within a 10-minute walk of the population weighted centroid.

For the ULEZ defined by the North–South Circular road boundary, of the 31,400 that could take up the offer of the mobility credit, approximately 23,600 lived in LSOAs with a car club space within a 10-minute walk.

Figure 6.1 shows each car club parking space and walking times from the population weighted centroid of the LSOA to them. Tables 6.1, 6.2 and 6.3 presents breakdowns of the number of hours of car club rental that would be possible depending on origin (and destination) zone and the numbers of individuals that may use the balance on their mobility credit for car club rental for the CCZ and expanded ULEZ, respectively.

The current distribution of car club parking spaces across the area of London is as yet neither large nor uniformly distributed. As shown in Figure 6.2, for the LSOAs with a population weighted centroid within the North–South Circular road boundary:

- the proportion of the most deprived LSOAs within shorter walking distances of a car club space is lower than in the least income deprived LSOAs (for walking times less than 5 mins this is 55% in quintile 1 (most deprived) compared to 72% in quintile 5 (least deprived);
- but there remain many LSOAs (at all levels of income deprivation) that are a great distance from car club space locations.

For car clubs to meet the increased demand after the introduction of the ULEZ there would need to be large expansion in terms of vehicles locations, including to areas that, as yet, may not offer a compelling business case to the industry.

Furthermore, for these individuals who would receive the mobility credit some clubs have requirements (e.g. credit checks, credit cards) that might exclude them, even if a car club space was close by. There were over 1.5 million adults in the UK without a bank account in 2015/16.[10] Over half of those in the *Understanding Society* wave 4 questionnaire asked why they did not have a current account answered "no money, little money to put in an account".[10,11]

[10] Karen Rowlingson and Stephen Mckay (2017). Financial inclusion annual monitoring report 2017. Accessed 19 July 2018 from https://www.birmingham.ac.uk/Documents/news/15518-CHASM-Report-Stage-4.pdf

[11] http://doc.ukdataservice.ac.uk/doc/6614/mrdoc/pdf/6614_wave4_questionnaires.pdf

Figure 6.1: Walking times to closest car club space from the population weighted centroid of each LSOA

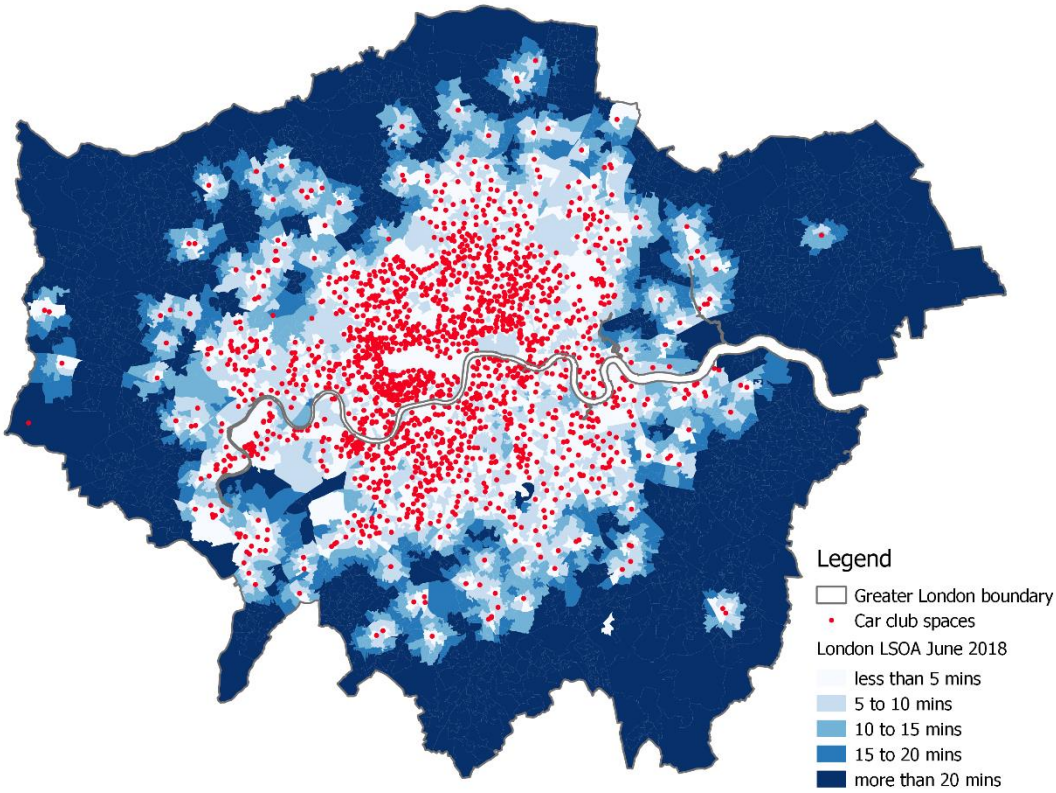

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Figure 6.2a: Time to the nearest car club space from LSOA population weighted centroid and the number of car club spaces in each LSOA with a population weighted centroid within the North–South Circular road boundary by England IMD income measure

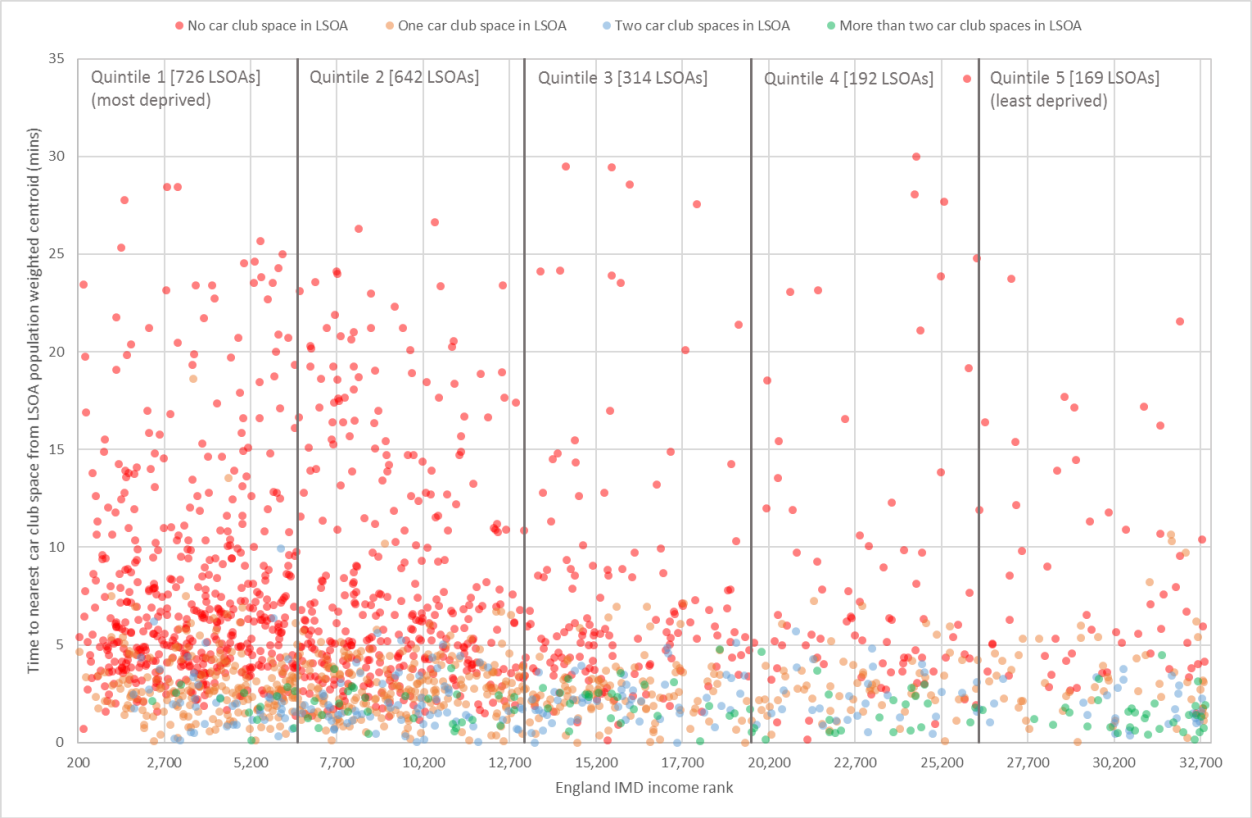

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Figure 6.2b: Time to the nearest car club space from LSOA population weighted centroid and the number of car club spaces in each LSOA with a population weighted centroid within the North–South Circular road boundary by England IMD income measure with no car club space

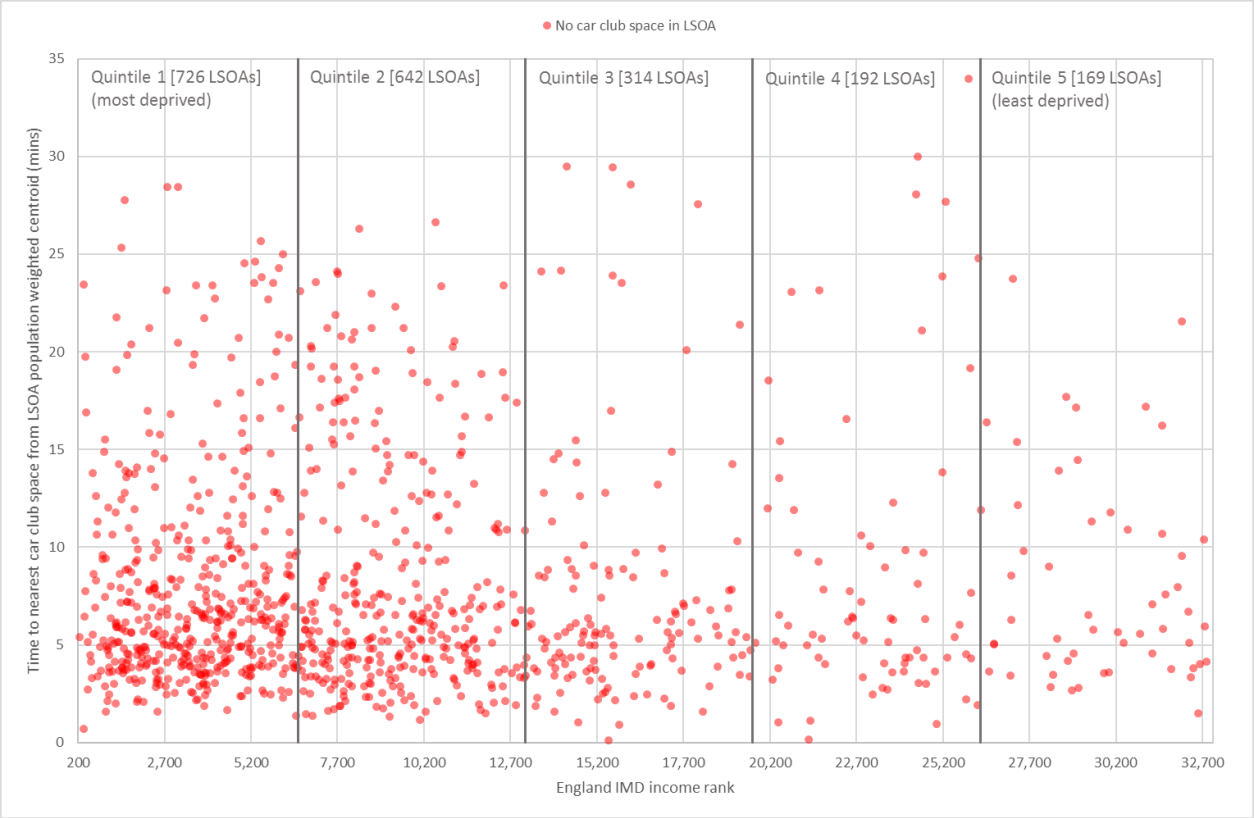

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Figure 6.2c: Time to the nearest car club space from LSOA population weighted centroid and the number of car club spaces in each LSOA with a population weighted centroid within the North–South Circular road boundary by England IMD income measure with one car club space

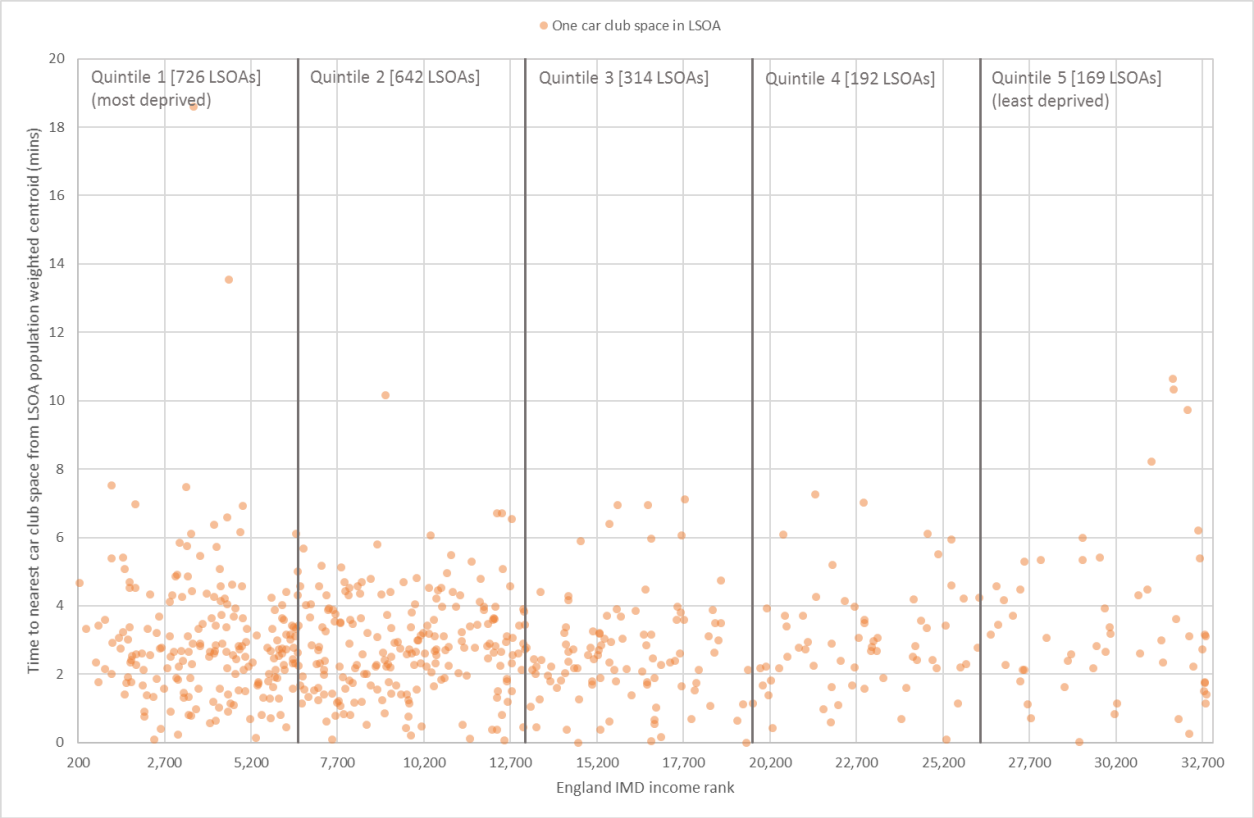

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Figure 6.2d: Time to the nearest car club space from LSOA population weighted centroid and the number of car club spaces in each LSOA with a population weighted centroid within the North–South Circular road boundary by England IMD income measure with two car club spaces

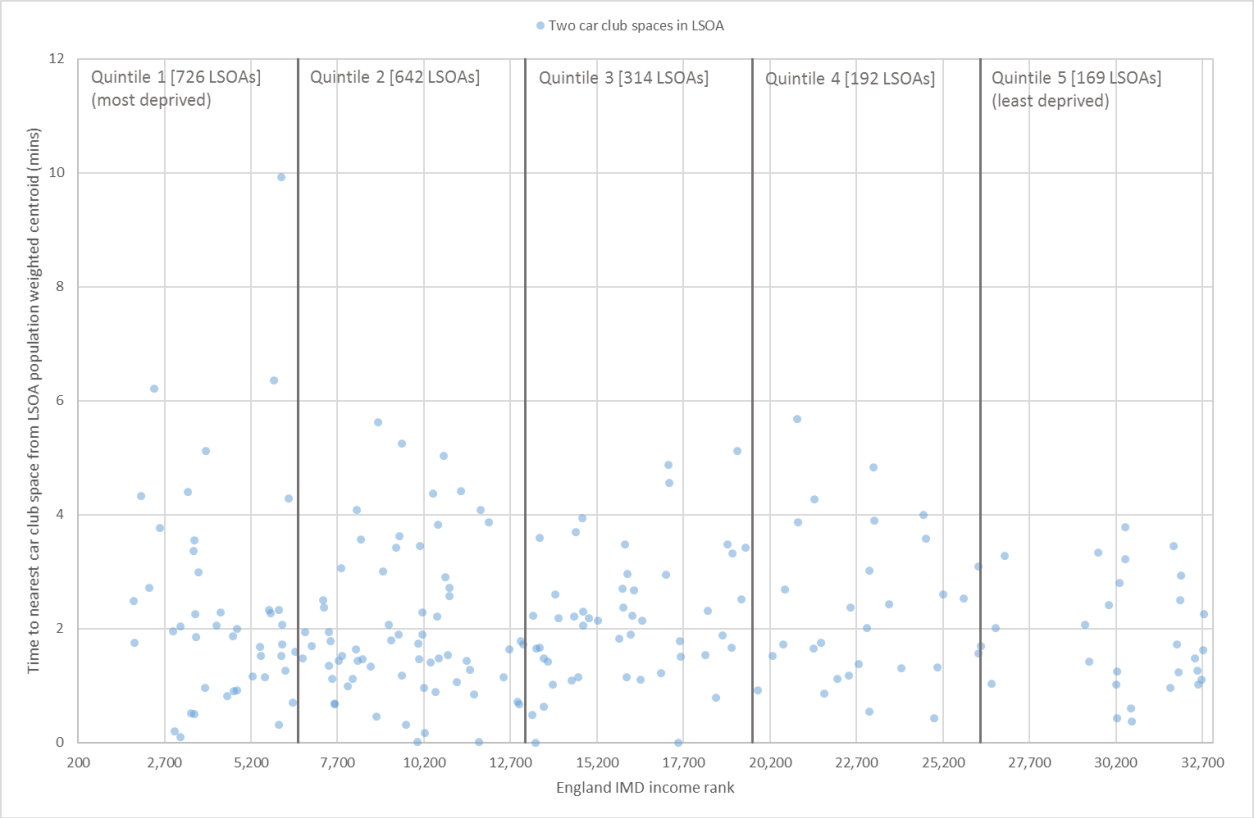

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Figure 6.2e: Time to the nearest car club space from LSOA population weighted centroid and the number of car club spaces in each LSOA with a population weighted centroid within the North–South Circular road boundary by England IMD income measure with three or more car club spaces

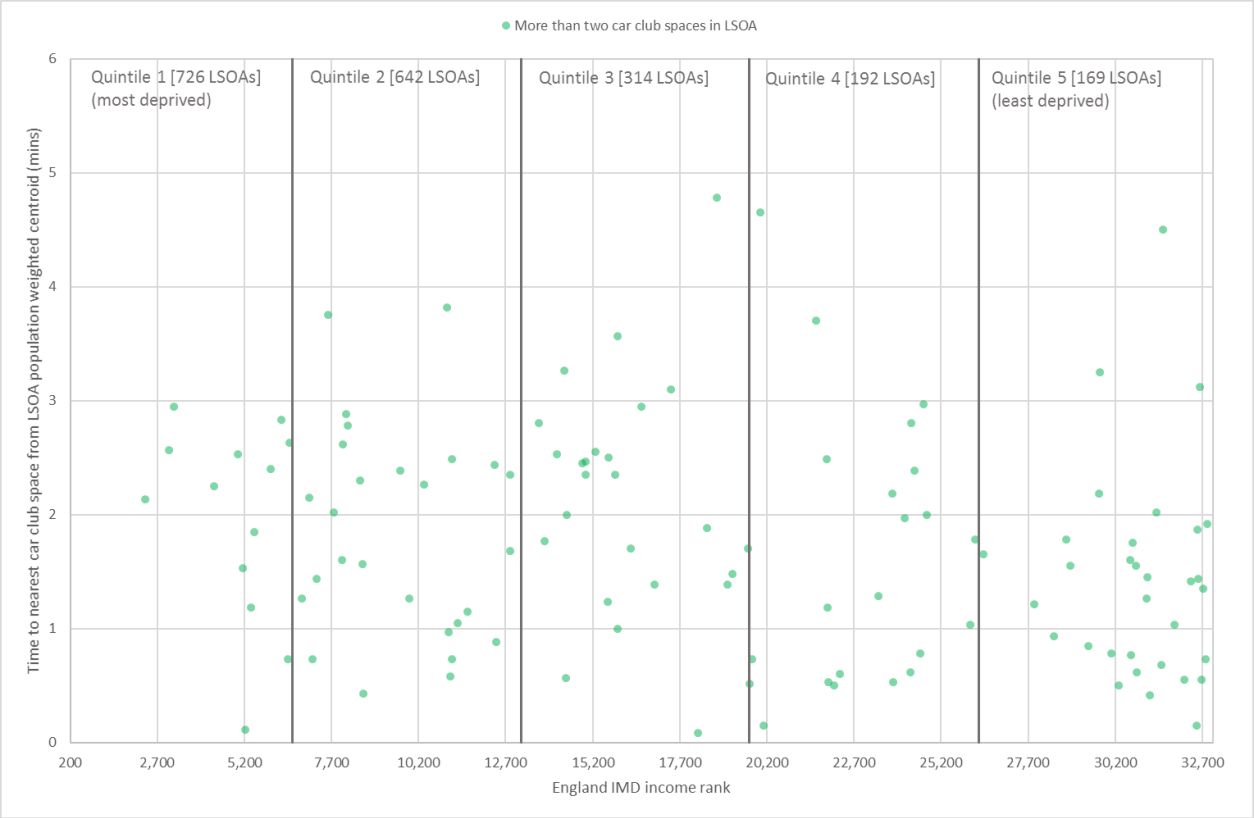

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Table 6.1: Estimated number of hours of car club rental available after the purchase of a TfL Annual Travelcard with the 'mobility credit'

	Annual Travelcard cost	Hours of rental	Estimated number of journey-to-work trips ending in the ULEZ (CCZ) made in non-ULEZ-compliant cars and vans
Zone 1	£1,364	79.5	306
Zone 2	£1,364	79.5	1,383
Zone 3	£1,600	50	688
Zone 4	£1,960	5	235

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Table 6.2: Number of individuals eligible for the mobility credit living in the most deprived LSOAs within a 10-minute walk of a car club space, broken down by origin and destination Travelcard zone

		Destination: inside North–South Circular Road boundary			
		Zone 1	Zone 2	Zone 3	Zone 4
Origin	Zone 1	519	618	209	14
	Zone 2	2,647	6,421	2,304	108
	Zone 3	1,145	3,206	3,347	326
	Zone 4	366	873	1,007	146
	Zone 5		139	136	19
	Zone 6		26	14	<5

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Table 6.3: Estimated number of hours of car club rental available after the purchase of a TfL Annual Travelcard with the mobility credit, broken down by origin and destination Travelcard zone

		Destination: inside North–South Circular Road boundary			
		Zone 1	Zone 2	Zone 3	Zone 4
Origin	Zone 1	79.5	79.5	50	5
	Zone 2	79.5	122.5	122.5	109
	Zone 3	50	122.5	122.5	122.5
	Zone 4	5	109	122.5	122.5
	Zone 5	–	80.5	109	122.5
	Zone 6	–	37	80.5	109

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