

Greater London Boundary Charge

Feasibility Study

January 2022

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1 Introduction

In December 2020 the Mayor asked Transport for London (TfL) to carry out a feasibility study into the potential of a Greater London Boundary Charge (GLBC) for non-London residents. This request stemmed from the recommendations of the independent review¹ as to the options for securing TfL's long-term financial sustainability. The panel concluded that road user charging (RUC) interventions, including a potential boundary charge, could bring substantial policy benefits and should be considered further for those reasons. Such benefits derive from the reduction in traffic and congestion and the improvement in air quality which would be brought about by a charge as well as the investment of revenues raised to deliver the Mayor's Transport Strategy² (MTS) including supporting improved sustainable transport in outer London.

It should be noted throughout the report that the GLBC is not a formal proposal and the study has been conducted as an initial, high level assessment of the potential benefits and challenges of such a charge, as well as an assessment of technical and operational feasibility. The idea of a GLBC should be viewed in the wider context of TfL investigating opportunities for next generation integrated road user charging in line with Proposal 21 of the MTS. The GLBC could play a valuable role in the shorter term to address the issue of the growing cohort of vehicles driving into London each day.

Some preliminary assumptions around scheme design have been made in this study for the purposes of assessment. This is based on initial analysis and allows for a consistent approach throughout the study. The assumptions are indicative only and if plans for a GLBC scheme were to be taken forward, further work would be needed to inform the design of the final proposals. Similarly, at this stage of feasibility assessment, while it is possible to begin to *identify* potential impacts of a charge, it is not possible to comprehensively *assess* the impact of a fully designed scheme, complete with mitigations and complementary measures, since this feasibility study necessarily precedes any proposed scheme design.

Data used in this study include traffic cordon counts and the London Travel Demand Survey (LTDS). A number of additional datasets, including aggregated and anonymised mobile phone data and highway modelling have been used to investigate travel at the boundary, and travel by non-London residents. To identify and evaluate scheme options for a boundary charge, modelling from TfL's demand model MoTiON has been used.

At this feasibility stage, it is not possible to undertake a full Integrated Impact Assessment (IIA) because there is not a full proposed scheme design which includes mitigations and complementary measures (including enhancements to public transport) that the revenue derived from the scheme could provide for. However, we

¹ <https://content.tfl.gov.uk/tfl-independent-panel-review-december-2020.pdf>

² <https://www.london.gov.uk/what-we-do/transport/our-vision-transport/mayors-transport-strategy-2018?intcmp=46686>

commissioned Arup to undertake a preliminary identification of the wider impacts of a GLBC, and this work has informed the study.

Should a proposal to introduce a GLBC be developed in the future, it would be subject to a full IIA of the complete proposed scheme and a consultation would be undertaken to allow stakeholders and members of the public to give their views. Both the IIA and consultation responses would inform any Mayoral decision on whether to proceed to implementation of the scheme, with or without modification. Proposals for a designed scheme would also be reviewed to ensure they are within scope of TfL and the Mayor's road user charging powers and compliant with all other relevant legal requirements and duties including overarching administrative law principles. This is a requirement of any new road user charging scheme.

2 Traffic context

2.1 Why we need to reduce traffic levels

London's road congestion costs drivers, businesses and the UK economy around £4.9 billion³ each year. The MTS clearly sets out the need for traffic reduction in order to achieve the Mayor's vision for London. ⁴[OBJ].

Traffic reduction has multiple benefits. Carbon emissions decrease and air quality improves, which in turn bring benefits in terms of public health. It also sets up a 'virtuous cycle' which leads to greater use of sustainable modes of transport and supports the creation of more pleasant urban environments and safer roads, placing people at the centre of the way we experience streets. This in turn supports inclusivity and social cohesion as well as attracting investment and businesses, leading to wider economic benefits. To achieve these outcomes, London's finite road network must be managed and used sustainably. The sustainable road use objectives below have been developed in line with the MTS, to enable us to achieve MTS objectives:

- To **reduce motor vehicle traffic**, particularly private car trips, and increase sustainable mode share in London, in line with the MTS target of 10-15 per cent traffic reduction across London (including at least three million fewer daily car trips) and 80 per cent sustainable mode share by 2041.
- By reducing motor vehicle traffic, support the **achievement of mode share, road danger reduction and environmental objectives**; and help to reduce congestion and support the efficient movement of traffic.
- To enable the **optimum use of streetspace** for active travel, bus and essential trips such as freight and servicing movements (including emergency services). More effective use of our finite road and kerb space is key to enabling more walking and cycling in our city, improving journey time for essential trips, and appropriate access for goods and servicing vehicles.
- To **reduce carbon dioxide emissions** from motor vehicles contributing to the Mayor's ambition for London to be carbon-neutral by 2030.
- To **reduce air quality emissions** (including non-exhaust emissions) from transport, working towards legal limits for NO₂ and the World Health Organization (WHO) health-based limits for particulate matter (PM_{2.5}).
- To have a **net positive impact on London's economy and businesses**, contributing to green recovery objectives and Good Growth in the longer term.

³ <https://inrix.com/press-releases/2019-traffic-scorecard-uk/>

⁴ The central aim is for 80 per cent of all trips in London to be made on foot, by cycle or using public transport by 2041.

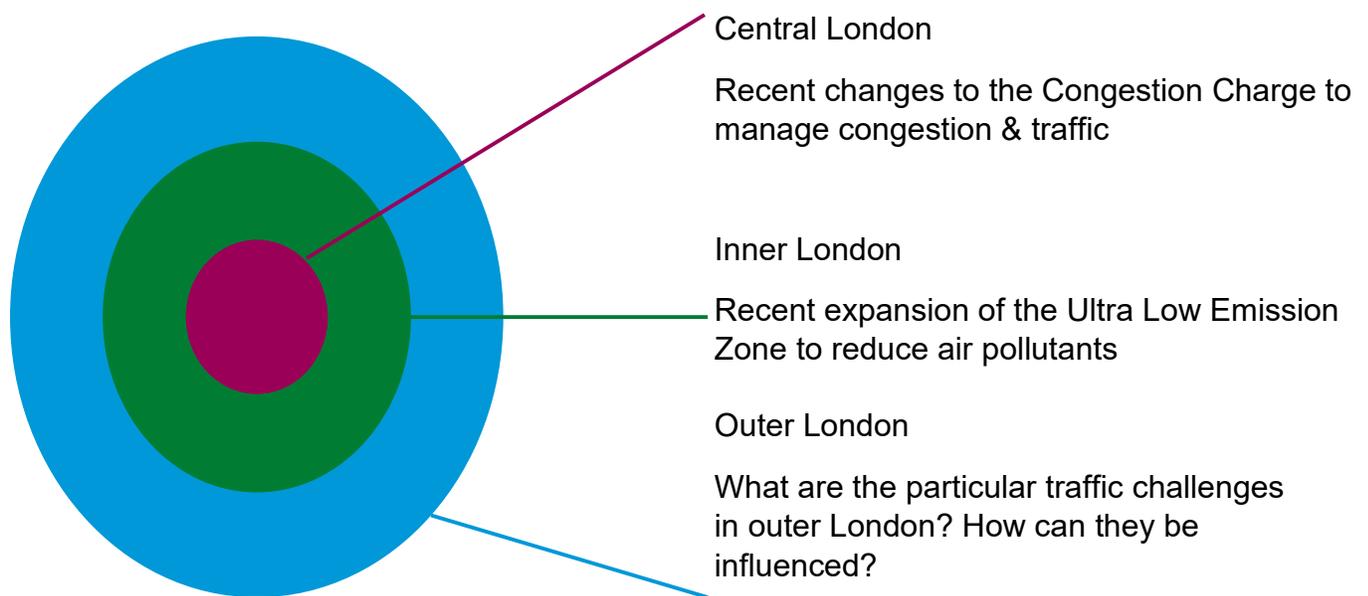
- To support other objectives including Vision Zero and the aspiration for a healthy and inclusive city set out in the London Recovery Programme⁵, and for all Londoners to be supported to achieve the 20 minutes of active travel that is recommended for good health and wellbeing.

Assessing the options to meet the sustainable road use objectives

To understand the policy interventions that could help to achieve MTS objectives, a range of measures have been assessed against their ability to deliver traffic reduction, the wider sustainable road use objectives and other feasibility criteria. This work showed that RUC schemes are key to achieving significant traffic reduction, to contribute towards the MTS objective of reducing motor vehicle traffic by 10-15 per cent.

There is significant regional variation in the transport challenges and existing policies and infrastructure across London. The assessment, therefore, evaluated interventions for their effectiveness / appropriateness in tackling the particular traffic reduction challenges in central, inner and outer London.

Figure 1: Traffic Challenges in London



2.2 Traffic challenges in outer London

The MTS sets out the importance of making more efficient use of the road network and reducing congestion. London’s streets are some of the most congested in the UK, worsening air pollution, delaying vital bus services and freight, and making too many streets unpleasant places for walking and cycling. Long-term changes to lifestyle,

⁵ <https://www.london.gov.uk/coronavirus/londons-recovery-coronavirus-crisis>

including the increasing use of online delivery and a rapidly growing night-time economy have caused changes in travel and congestion patterns in recent years, and while there has been recent disruption to these patterns owing to the pandemic, these are nevertheless likely to remain features in the long-term.

It is clear that this problem is not confined to traditional morning and evening peaks, and that neighbourhoods and town centres across London are affected. The majority of congestion is caused simply by there being too great a demand for limited street space. However, the MTS is also clear that congestion has different causes and impacts in different parts of the city, and that the approach to dealing with it must vary according to local challenges and circumstances.

The data that is summarised in this section clearly indicates differences in traffic flows and cross-boundary trips made inside London compared to those originating outside London. Specifically, while, pre-pandemic, vehicle trips made within London have been falling for some time, vehicle trips across the London boundary from outside London have continued to rise. Since most of these trips - 89 per cent of weekday car traffic - have a destination in outer London⁶, it is useful to focus the analysis on this area.

There is of course uncertainty about future traffic demand in London and for this reason TfL has developed five post-Covid 19 pandemic scenarios of different levels of travel demand (as described in Travel in London 14⁷). In both the Reference Case and Hybrid Forecast scenarios, traffic levels, including car use, return to and, in some areas, increase from pre-Covid-19 pandemic levels. The implication of this is that, while uncertainty remains, there is clearly a need to keep traffic demand in London under review; both in those areas where it has historically been falling and those areas (such as trips entering London) where it had been growing.

To understand the traffic challenges in outer London, the following have been considered:

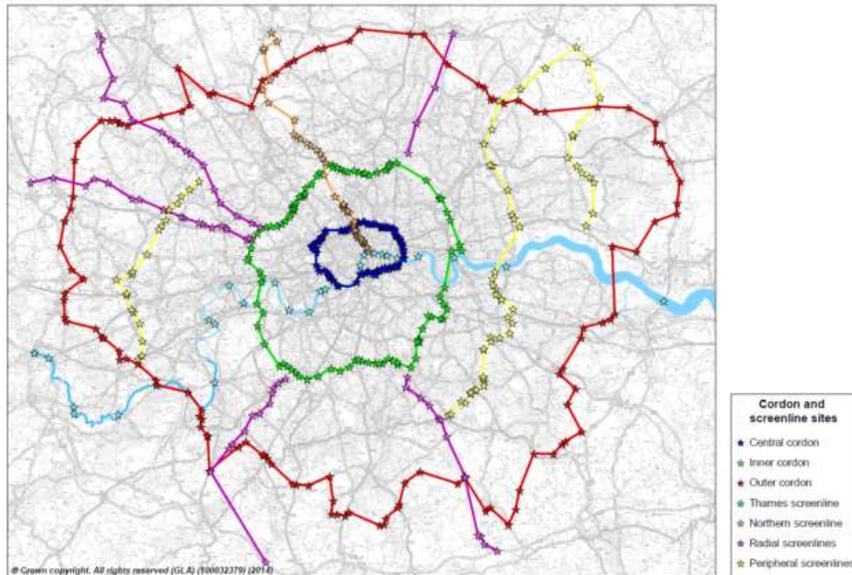
- Traffic entering outer London from outside London
- Overall traffic levels in outer London
- Cross-boundary trips by outer London residents.

⁶ EDMOND data, TfL

⁷ Travel in London 14, TfL, 2021 <https://content.tfl.gov.uk/travel-in-london-report-14.pdf>

In order to shape our response, the trends in vehicle flows in London in recent years have been considered. TfL monitors road traffic flows at screenlines and cordons as shown in Figure 2.

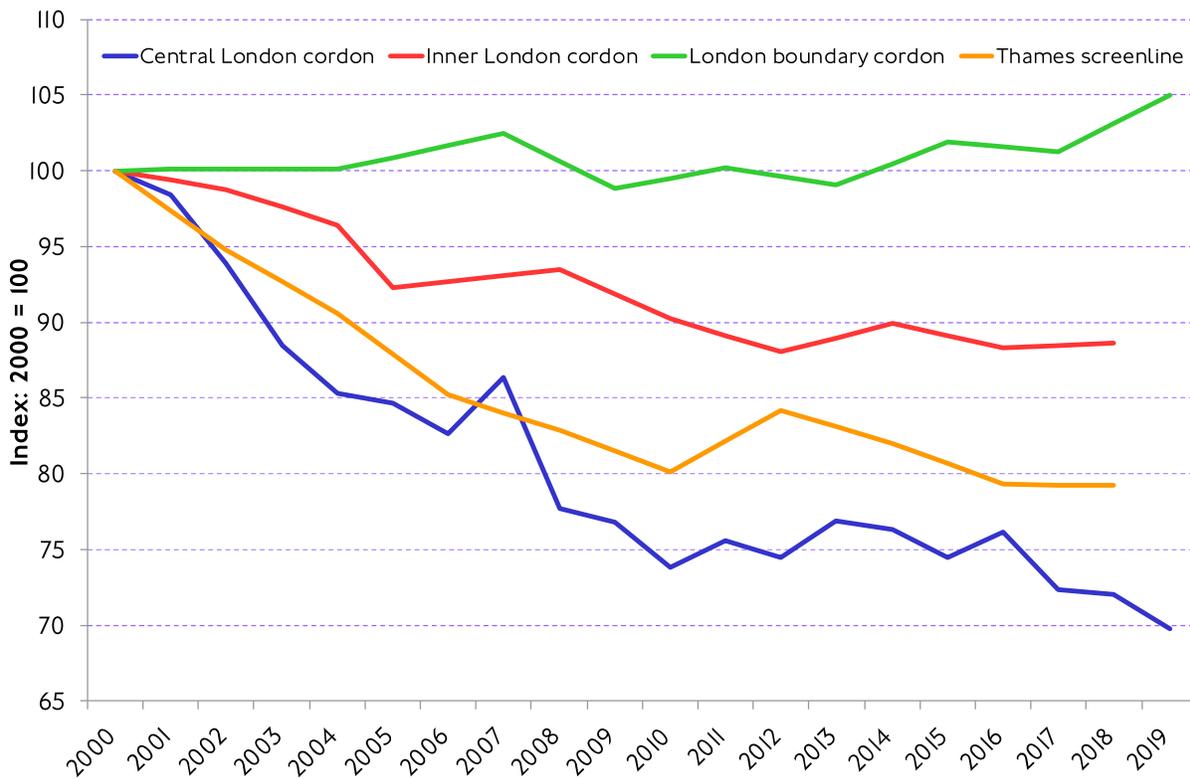
Figure 2: Location of cordon and screenline count sites monitored by TfL survey programme



⁸ Cordon counts are used to measure traffic flows and track traffic trends across a boundary

Cordon count data⁸ shows that since 2000 the number of motor vehicles crossing strategic cordons has fallen for all cordons, with the exception of the London boundary cordon (Figure 3). Since 2001 the number of motor vehicles crossing the central cordon has fallen by 29.1 per cent. Across the inner cordon, the decline has been 10.2 per cent (from 2002). However, flows at the London boundary cordon have experienced a net 4.8 per cent increase between 2001 and 2019, and between 2010 and 2019 traffic crossing the cordon increased by 5.5 per cent.⁹

Figure 3: Daily number of motor vehicles across strategic cordons, 2000-2019

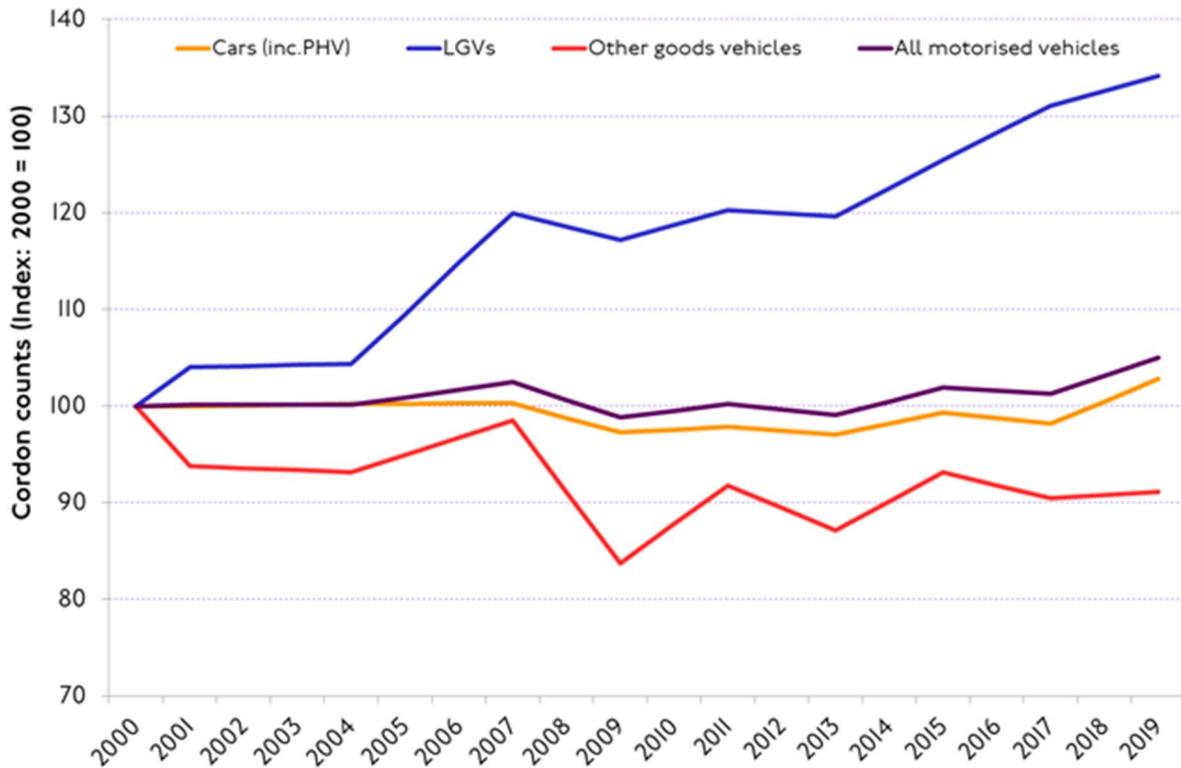


Source: TfL Travel in London 13 report (2020)

⁹ TiL 13, TfL, 2020

Figure 4 shows the trend in vehicles crossing the Greater London Authority (GLA) boundary cordon since 2000. While 78 per cent of vehicles crossing the cordon in 2019 were cars, growth has been strongest in light goods vehicles. Since 2010, the number of cars crossing the boundary cordon increased by five per cent, while the number of light goods vehicles increased by 13 per cent over the same period. Note that the figures for cars include licensed private hire vehicles (PHVs), which cannot be distinguished in this type of traffic count (but does not include licensed taxis, which can be distinguished).

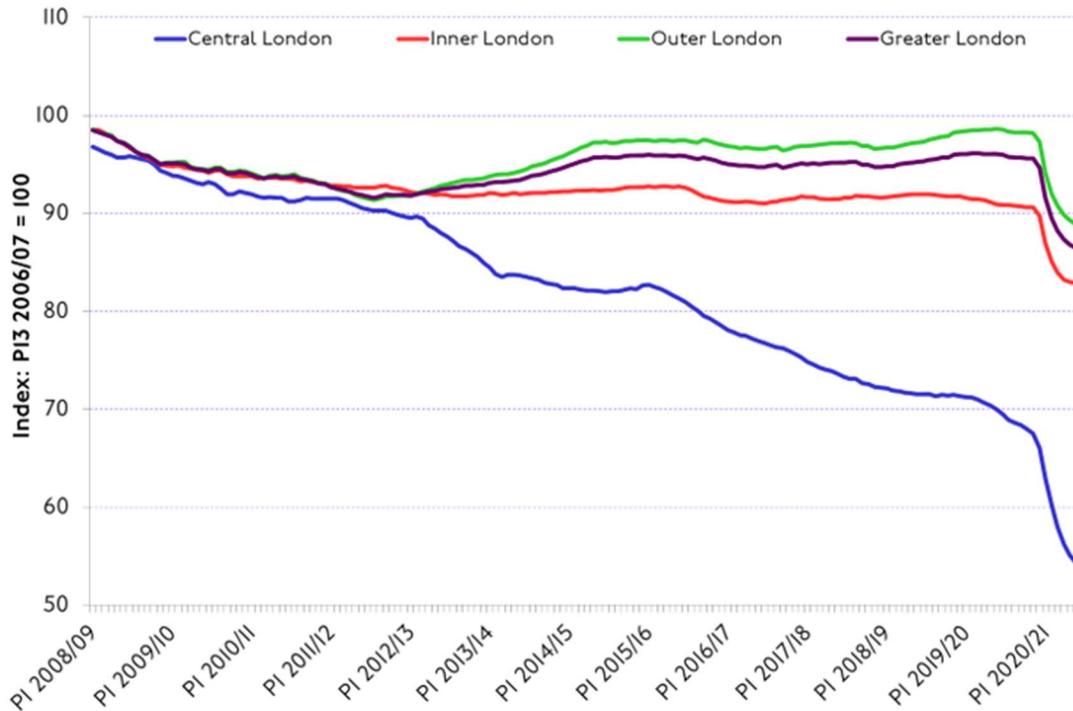
Figure 4: Trend in vehicles crossing the GLA cordon, 2000-2019



Source: Cordon counts, TfL Surface Transport

Figure 5 shows that in recent years, overall traffic flows in outer London had also been increasing (pre- Covid-19 pandemic). The figure also shows the significant changes in flows at the onset of the Covid-19 pandemic. From a low point of around 70 per cent of normal at the start of 2021, inner and outer London traffic volumes have been between 90 and 100 per cent of pre-pandemic levels since mid-May, and by the start of September traffic volumes had largely returned to levels seen in 2019.¹⁰

Figure 5: Trends in London traffic flows

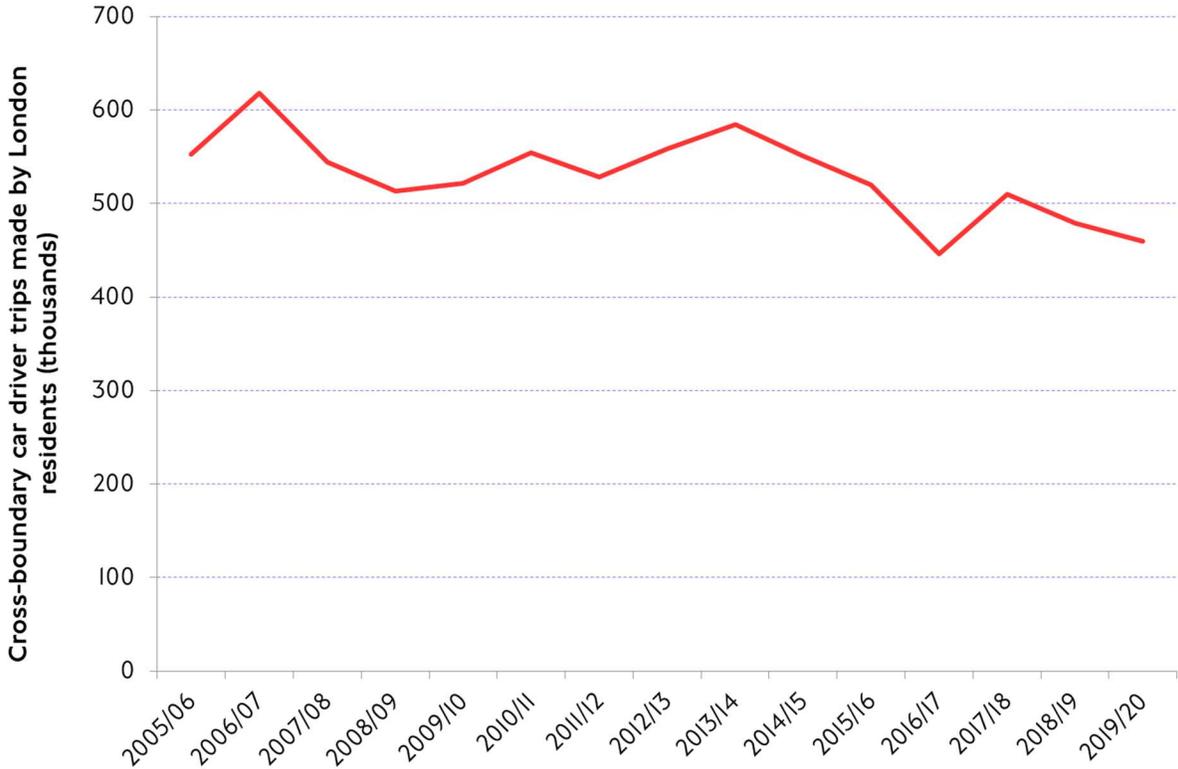


Source: ATC data, TfL Surface Transport

¹⁰ Travel in London 14, <https://content.tfl.gov.uk/travel-in-london-report-14.pdf>

Although car volumes crossing the Greater London boundary and overall traffic flows in outer London have been increasing in recent years, data from LTDS shows that cross-boundary car trips made by Londoners have been declining. Since 2010/11 car driver trips made by London residents which cross the boundary have declined 17 per cent.¹¹

Figure 6: Trend in cross-boundary car driver trips made by London residents between 2005/6 and 2019/20

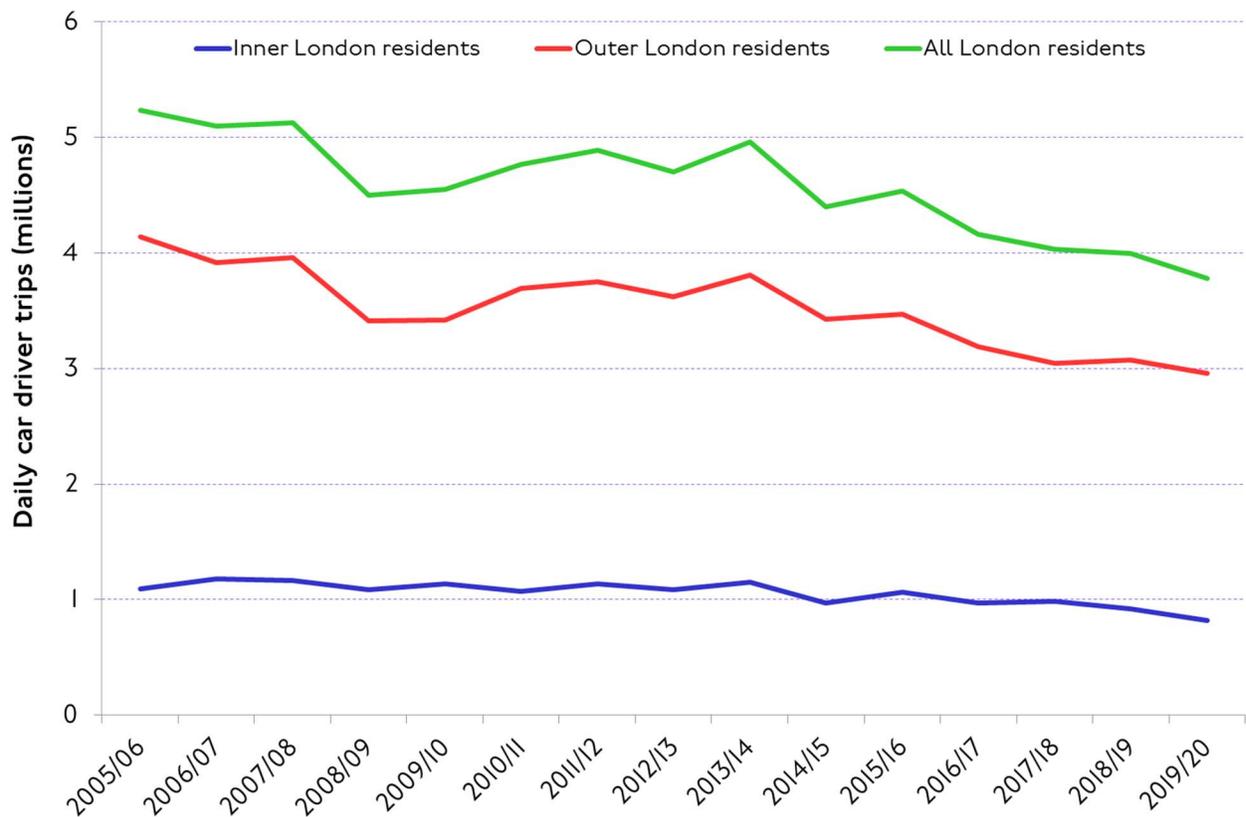


Source: London Travel Demand Survey

¹¹ LTDS (2019/20), TfL

In outer London, private transport mode share declined from 50 per cent in 2005/06 to 43 per cent in 2019/20; and sustainable transport mode share gradually increased over the same period (to 57 per cent in 2019/20)¹². Car driver trips made by outer London residents are also declining (from 4.1 million trips on an average day in 2005/06 to 3.0 million in 2019/20). Car ownership has also seen a small decrease from 69 per cent of residents who owned one or more cars in 2005/06 to 67 per cent in 2019/20.

Figure 7: Decline in car driver trips by London residents



Source: London Travel Demand Survey (LTDS)

¹² <https://content.tfl.gov.uk/travel-in-london-report-13.pdf>

The overall decline in car use by outer Londoners sits in stark contrast with the increasing number of car trips crossing the boundary into London. It indicates that London policies and investment over a number of years to improve public transport and reduce car use and the impacts of car use (including road user charging schemes), together with the effects of land-use policies to concentrate employment in areas well-connected to public transport have been effective in influencing travel behaviour of London residents. However, the benefits of these reductions in car use are being undermined as the resultant freed up road space is re-occupied by increasing numbers of vehicles from outside London, which are not influenced in the same way or to the same extent by London transport policies. To maximise the benefit of London policies aimed at reducing private car use and promoting a shift to sustainable modes, policies should also influence the behaviour and mode choice of those driving into the city.

Traffic reduction policies are complemented by policies to improve air quality, achieve Vision Zero, make freight and servicing safer, cleaner and more efficient and provide high quality walking and cycling infrastructure and public realm.

Further policies aimed at tackling Londoners' car use and increasing the efficiency of the road network will continue to be limited in their effectiveness while there is a growing cohort of vehicles - less influenced by those policies - driving into London each day. The primary objective of a scheme tackling this growing problem at the Greater London boundary is therefore to reduce traffic entering Greater London to support the delivery of the MTS. A GLBC could address and reverse this trend, bringing it into line with the travel trends that have been seen in London (including outer London) and which contribute to achieving the objectives of the MTS.

2.3 The wider RUC context in London

There are currently three RUC schemes operated by TfL in London:

- Central London Congestion Charge (CC)
- Low Emission Zone (LEZ)
- Ultra Low Emission Zone (ULEZ)

The ULEZ expanded to inner London (up to the North and South Circular Roads) on 25 October 2021. A further charge at the Blackwall and Silvertown Tunnels will come into effect once the Silvertown Tunnel opens in 2025. In addition, two schemes not operated by TfL are of interest here: the Dartford Crossing charge (operated by National Highways) and the new Terminal Drop-off Charge introduced by Heathrow Airport Limited (HAL) on 1 November 2021.

Table 1 summarises the key characteristics of these charges.

Table 1: Overview of RUC schemes in London

Charging scheme & area	Vehicles affected & charge level	Hours of operation	Other characteristics
Central London Congestion Charge (Central London)	All vehicles (with some discounts and exemptions) £15 per day	07:00-22:00, 7 days per week (temporary operating hours from summer 2020; from 21 February 2022 hours will be 07:00-18:00, Monday to Friday and 12:00 – 18:00 Saturdays,	The objective of the scheme is to manage traffic and congestion in central London. It was implemented in February 2003.

Charging scheme & area	Vehicles affected & charge level	Hours of operation	Other characteristics
		Sundays and bank holidays)	
Low Emission Zone (Greater London)	<p>Heavier, diesel vehicles (HGVs, vans, buses and coaches)</p> <p>Only vehicles which do not meet the specified emissions standards are liable to pay. The standards are:</p> <p>Lorries, heavy vans (over 3.5 tonnes), coaches, buses and minibuses (over 5 tonnes): Euro VI for NOx and PM £100 charge if vehicle meets Euro IV or V for PM: £300 if does not meet Euro IV for PM.</p> <p>Vans and minibuses up to 3.5 tons: Euro VI (NOx and PM) £100 charge if not compliant.</p>	24 hours/day, 7 days/week	<p>The charge acts as a deterrent to entering London in a vehicle which does not meet the emissions standard, and to encourage a switch to cleaner vehicles and thereby reduce air pollutant emissions.</p> <p>Phased implementation from February and July 2008; standards have been tightened over time, most recently in March 2021</p>
Ultra Low Emission Zone (Central London + expanded to Inner London in Oct 2021)	<p>All vehicles (with minimal discounts and exemptions)</p> <p>Only vehicles which do not meet the specified emissions standards are liable to pay. The standards are:</p>	24 hours/day, 7 days/week	<p>The objective of the scheme is to incentivise a switch to less polluting vehicles in order to reduce emissions and improve air quality.</p>

Charging scheme & area	Vehicles affected & charge level	Hours of operation	Other characteristics
	<p>Motorcycles: Euro 3 (NOx) Petrol cars and vans up to 3.5 tonnes: Euro 4 (NOx) Diesel: Euro 6 (NOx and PM)</p> <p>£12.50 if standard not met</p> <p>Bus coach and minibus over 5 tonnes, vans and lorries over 3.5 tonnes: Euro VI (NOx and PM)</p> <p>£100 if standard not met</p>		<p>Central zone implemented in April 2019. Zone expanded to inner London in October 2021</p>
<p>Blackwall & Silvertown Tunnel Charge</p>	<p>All vehicles (with some discounts and exemptions)</p> <p>Charges likely to vary by time of day, direction of travel and vehicle type. Charges will be confirmed in advance of the scheme opening.</p>	<p>At all times, with peak and off-peak levels</p>	<p>The objective of the user charge is to pay for the scheme and to manage the impacts of the scheme, including environmental impacts.</p> <p>Once the Silvertown Tunnel is open, charges will come into effect at it and the Blackwall Tunnel.</p>
<p>Heathrow Airport Limited's Terminal Drop-off Charge*</p>	<p>All vehicles (with some discounts and exemptions). £5</p>	<p>At all times</p>	<p>The objective of the charge is to offset airport costs, especially in context of losses incurred in the pandemic, and to</p>

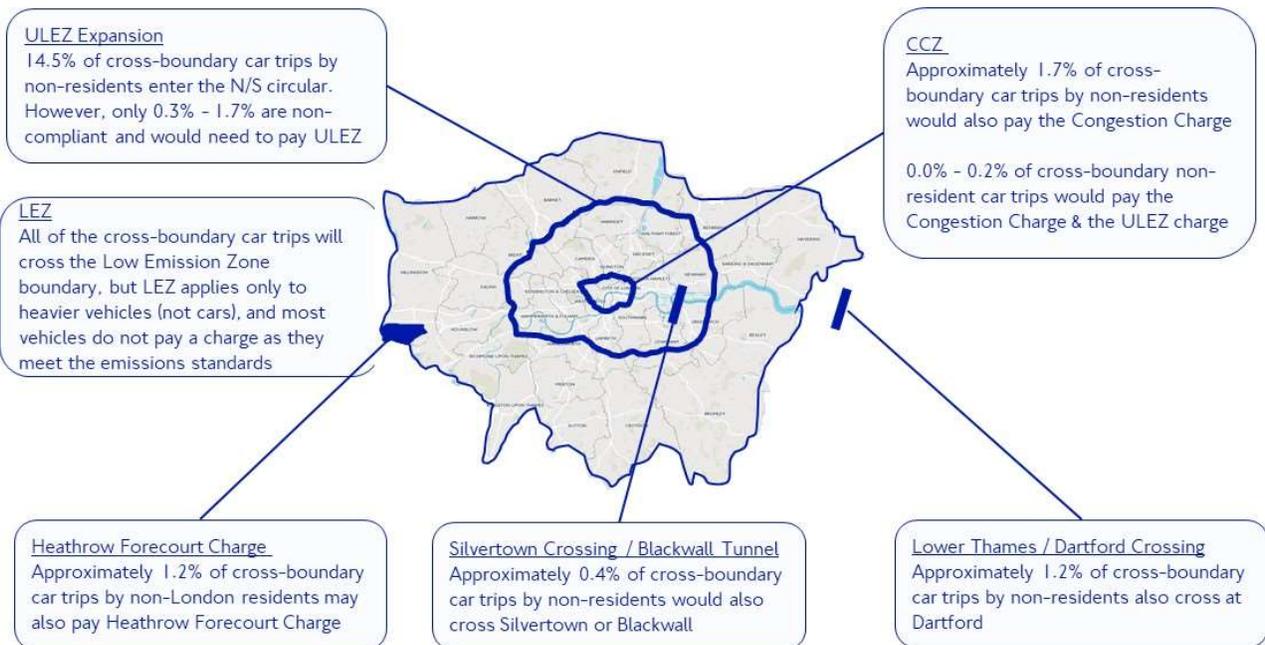
Charging scheme & area	Vehicles affected & charge level	Hours of operation	Other characteristics
			manage environmental impacts.
Dartford Crossing Charge (Dart Charge)*	<p>All vehicles (with some discounts and exemptions).</p> <p>Cars (including trailers), motorhomes and any minibuses that have 9 or less seats (including the driver's seat): £2.50</p> <p>Buses, coaches, vans and other goods vehicles</p> <ul style="list-style-type: none"> • With 2 axles: £3 • With > 2 axles: £6 	06:00-22:00 Mon-Sun incl. bank holidays	The original objective of the charge was to cover the construction costs for the crossings. This was subsequently changed to include an objective to manage traffic demand.

*Not a TfL road user charging scheme, but included as a nearby, relevant example.

It is assumed a GLBC would be charged in addition to these and other existing and planned charging schemes outside London.

Figure 8 indicates the location of existing and planned schemes. It summarises which users and car trips the different road user charging schemes would affect.

Figure 8: Cross-boundary car trips that also enter existing or planned road user charging schemes



The existing RUC schemes have been effective in dealing with local challenges and travel behaviour in London; when the CC was introduced in central London in 2003 congestion was reduced by 30 per cent, and traffic by 15 per cent. The effect of the expanded ULEZ in October 2021 was observed even before it came into effect as people moved to cleaner vehicles in preparation for the expansion. In April 2020, more than 80 per cent of vehicles were compliant, compared to 39 per cent in February 2017 and 61 per cent in March 2019. By the launch of the expanded scheme, this had increased to 87 per cent, and one month on was at 92 per cent.

Proposal 21 of the MTS sets out that TfL will investigate proposals for the next generation of road user charging systems, including schemes which could charge by distance, as well as time of day, area and emissions. These could replace schemes such as the CC, LEZ and ULEZ. More sophisticated road user charging systems could reduce congestion on the road network, support efficient traffic movement and contribute to the achievement of wider policies and proposals in the MTS, including mode share, road danger reduction and environmental objectives including air quality and carbon.

While TfL continues to investigate the appropriate technology for any future scheme that reflects distance, time, emissions, road danger and other factors in an integrated way, the GLBC could play a valuable role in the shorter term to address the immediate and specific issue of the growing cohort of vehicles driving into London each day.

2.4 Role of a potential Greater London Boundary Charge (GLBC)

Based on the analysis outlined above, the challenge of increasing cross-boundary traffic has emerged strongly as a priority to address in order to bring traffic reduction and associated benefits to the area inside the boundary itself, as well as reversing a trend for increasing traffic which is undermining the benefits of other London policies.

Charging for road access to cities is well-established internationally, as well as in London. There are a number of international examples of city boundary style schemes, including low emission zones in Europe (such as Milan, Stockholm and Paris), while road tolls are common for motorways throughout mainland Europe and the rest of the world, with Singapore having a sophisticated variable charging scheme. A case study of the RUC scheme in Oslo which applies charges at a number of cordons at driving routes into the city is provided below to show how a scheme like a GLBC could work in practice (Box 1).

Box 1: Case Study of Oslo's cordon charging scheme

In operation since the early 1990s, the Oslo cordon system currently operates with the dual objectives of financing transport infrastructure while reducing traffic.

How does the system work?

There are 19 Automatic Number Plate Recognition (ANPR) toll points at three cordons – a city boundary ring and an inner and outer ring. This means it is not possible to enter the city without passing a toll point. At the city boundary, the charge is for driving into Oslo only (there is no charge when driving out). At the outer and inner rings, charges are in both directions.

The system operates 24/7 and has differential peak (ca. £2.40) and off-peak (ca. £1.85) charges. Charges vary further by vehicle type, outer and inner rings and emissions. Residents with a disabled parking pass, electric vehicles, buses, emergency vehicles and embassy cars are exempt.

How has the system evolved?

The current system is the result of the implementation of a series of packages. Introduced in 1990, Package 1 had as a purpose to finance transport infrastructure. Revenue generated was in the order of £210 million,¹³ and served to build urban road tunnels, decongest the city centre, improve public spaces and reduce noise, pollution and accidents.¹⁴ A small proportion of the revenue (around 20 percent) was destined for public transportation projects.

¹³ Odeck, J. & Welde, M. Economic evaluation of intelligent transportation systems strategies: the case of the Oslo toll cordon. IET Intelligent Transport Systems, 2010, Volume 4, Issue 3.

¹⁴ Wærsted, K. Road pricing and charging in Norway. 2017: [http://www.trafikk.info/2017-06-08%20Oslo/07%20Road%20Pricing%20and%20Charging%20in%20Norway%20\(Kristian%20Warsted\).pdf](http://www.trafikk.info/2017-06-08%20Oslo/07%20Road%20Pricing%20and%20Charging%20in%20Norway%20(Kristian%20Warsted).pdf)

Package 2 followed in 2001 and increased the toll fee in order to support the financing of a public transport.¹⁵

Significant change came about in 2008, with the implementation of Package 3, which added an outer toll ring in the border of Oslo. Package 3 reflected a desire for the cordon system to have a stronger focus on public transportation finance.

Since 2017, further changes have been introduced to the system:

- Establishment of environmental differentiation,¹⁶ which increased revenue and reduced traffic by approximately five percent (2017).
- Introduction of a charge for electric cars and the establishment of new toll cordon zones to capture revenue from journeys undertaken within the already defined inner city cordon area (2019). These changes reduced traffic by three to five per cent and increased annual revenue by approximately 1.2 billion Norwegian Crowns (around £100 million).

Figure 9 shows the Oslo charging system, showing the different toll cordons: city-centre toll cordon (green lines), the inner city cordon (blue lines) and regional toll cordons (orange lines). Thicker green lines show the toll cordons within the inner-city zone.

Figure 9: The cordon charging system in Oslo



Source: Norwegian Public Roads Administration

¹⁵ Ramjerdi, F. et al. Norwegian Urban Tolls. Research in Transportation Economics, 2004.

¹⁶ Environmental differentiation consists of charging people differently depending on the type of car they own; In Oslo, environmental differentiation was a means of encouraging people to buy more environmentally friendly cars.

It was outlined previously that the GLBC was identified as a potentially impactful measure as the result of preliminary policy analysis. The level of charge that was tested as part of that analysis was a daily charge of £3.50. This indicative daily charge level was chosen having taken into consideration:

- relatively fewer public transport alternatives compared to other parts of London, and therefore a low-level daily charge being more appropriate than a higher charge, such as the Congestion Charge which applies in an area where there are more alternatives to private car use; and
- the need to set a charge which is comparable to the cost of public transport fares in London (further consideration would need to be given to the cost of sustainable transport alternatives outside London as well as the relationship between those costs and the proposed charge level if proposals are taken forward.)

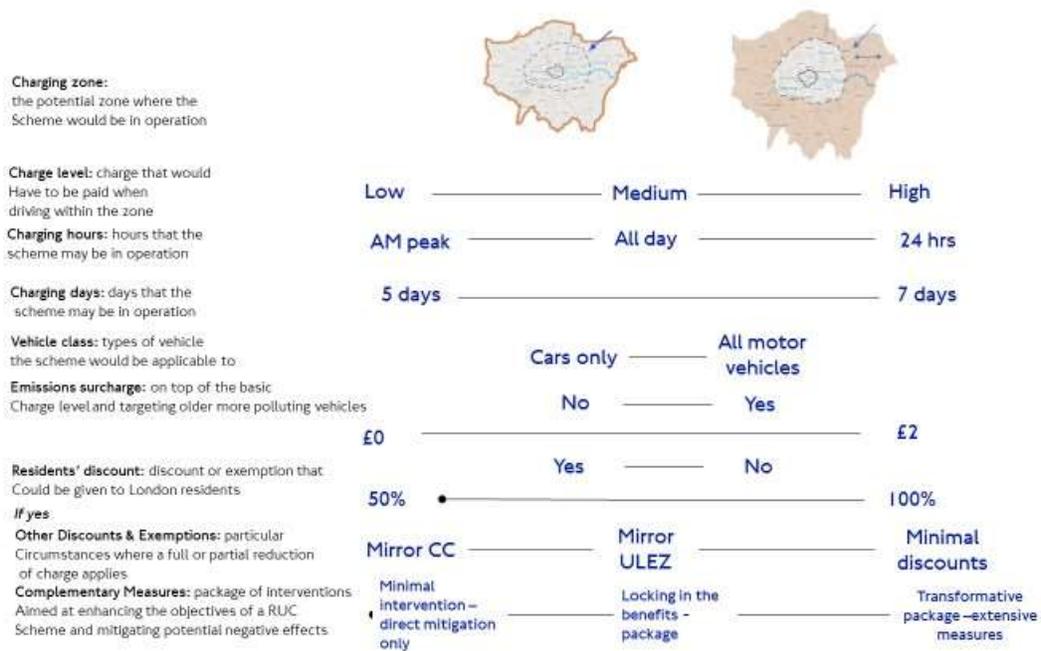
This option, as well as a number of other variables as set out in Chapter 2, were examined to understand the potential impact of different scheme designs on the objective of reducing cross-boundary traffic. In doing this, existing RUC schemes in London, and the Dart charge (as summarised in Table 1 above) were reference points.

3 Defining a scheme

3.1 Options tested

A RUC scheme is made up of a number of different variables. Figure 10 sets out those variables at a high level and potential options to consider within each for a potential GLBC.

Figure 10: List of GLBC scheme variables



As shown in Figure 10, for each scheme variable there is a range of options, each delivering a potentially different impact in terms of scheme outcomes e.g. a higher charge level is expected to lead to a higher level of traffic reduction; or a broader package of complementary measures is expected to facilitate a greater shift from car to more sustainable modes.

A number of options have been considered to understand their potential impacts, but for the purposes of this feasibility study a central option for assessment has also been defined. The key scheme features include a discount or exemption for London registered vehicles, a £3.50 daily charge and a £2 emissions surcharge.

The emissions surcharge supports the continued drive to reduce emissions from road transport in London. While the Mayor’s world-leading programme to tackle poor air quality has delivered significant reductions in emissions from road transport over the last five years, there is still a long way to go. Nitrogen dioxide levels remain above legal limits, and there is work required to reduce particulate matter. The climate emergency has also brought into sharp focus the need to urgently reduce carbon dioxide (CO₂)

emissions and the Mayor has an ambition for London to be a net zero carbon city by 2030.

It is assumed that the existing LEZ boundary would be used, although as shown in Figure 11 this could be a narrow “ribbon-like” charging zone or extend further inwards, covering all of outer London, for example (Figure 12).

3.2 Charging zone

Two broad options for the charging zone have been considered:

- A narrow ‘ribbon’ type zone which follows the line of the Greater London boundary
- An outer London zone which covers the area between the Greater London boundary and the North / South circular roads

Narrow ‘ribbon’ type zone

Chargeable vehicles would be charged on designated roads following the periphery of the Greater London boundary (Figure 11), likely to be based on the existing boundary for the Low Emission Zone which already has its outer boundary at the Greater London border. The area shown on the map is for illustrative purposes only.

Figure 11: Narrow ‘ribbon’ type zone



This option aligns well with the purpose of a charge seeking to reduce cross-boundary traffic. It also has limited interaction with other charges in London, especially for cars, which reduces complexity for drivers.

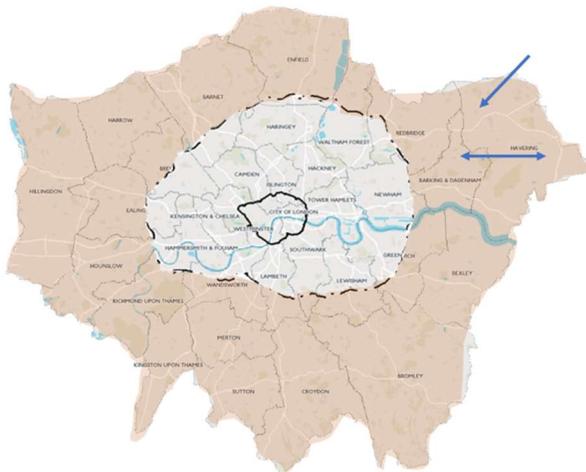
A narrow zone comprised of chargeable roads along the Greater London boundary would not impose a charge for trips made by chargeable vehicles wholly within Greater London on roads other than the chargeable boundary roads (for example, if the vehicle does not exit on the same day as it enters). Consideration would need to be given as to

whether this creates unintended consequences of incentivising vehicles being left inside London for multiple days.

Outer London zone

This zone would cover the area between the Greater London boundary and North and South Circular roads (Figure 12). Chargeable vehicles crossing the boundary and used within outer London would be liable for a daily charge. The deterrent effect of the charge is extended as the daily charge would apply to chargeable vehicles that don't leave London on the day of entry and are used on subsequent days within outer London.

Figure 12: Outer London zone



The charging area would use established boundaries (the outer boundary coincides with the LEZ boundary, and the inner with the expanded ULEZ boundary). Like the narrow, ribbon type zone, it has limited overlap with other schemes (LEZ only). It does however create a charging anomaly in inner London where charges are payable only for polluting vehicles, but not for vehicles (from outside London) contributing to congestion.

Summary

Assessing the two broad charging zone options against the primary objective of tackling cross- boundary traffic, analysis shows there is limited benefit of wider zones when London registered vehicles are assumed to be exempt from the charge.

The narrow ribbon type zone has therefore been assumed as the relevant charging zone in the central option for assessment.

3.3 Central option for assessment

The remainder of the study focuses on the feasibility of a central option for assessment. This is set out in

Table 2. In addition to this central option, the assessment considered a range of variables ('sensitivities') on the scale shown in Figure 10 above. If a scheme were to be

taken forward, these variables would require further testing in order to determine the optimum point on the scale for each variable as part of final scheme design. See Section 4 for further detail.

Table 2: Central option for assessment and option sensitivities

Variables	Central option	Sensitivities
Charging zone	Narrow 'ribbon' type zone	Variations on depth of 'ribbon'
Charge level	£3.50	£2 £5
Emissions surcharge	£2	£0
Charging hours	All day (6am-7pm)	6am-10am 24hrs
Charging days	Monday to Sunday	Monday to Friday
Vehicle class	All motor vehicles	All motor vehicles
Residents' discount (assuming all London registered vehicles would be eligible)	100%	0% 50%
Other Discounts & Exemptions	Buses, coaches and 9+ seater vehicles; Blue Badge holders; Emergency service vehicles; TfL licensed taxis; and designated wheelchair accessible private hire vehicles being used to fulfil a hiring.	
Complementary measures	While the <i>approach</i> to complementary measures is included in this study (Section 6.2), specific measures have not been defined or assumed in the central option for assessment.	

4 Preliminary impacts

4.1 How the impacts have been derived and used

Modelling from the demand model MoTiON has been used to identify and evaluate options for a GLBC.¹⁷ MoTiON provides outputs on the effect of scheme on trip numbers, traffic, congestion and delay. These outputs can be used to assess the scheme against the core objectives.

This work is summarised in this chapter in three broad strands. Firstly, in terms of its impact on the primary objective: reducing traffic entering Greater London to support the delivery of the MTS. Secondly, in terms of its impacts on the sustainable road use objectives, in section 4.9.

Thirdly, the outputs from this modelling have also been used by Arup, who were commissioned to undertake a preliminary identification of the wider impacts of a GLBC as summarised in section 4.10.

For all of these strands, it should be noted that this modelling is based solely on the imposition of a new charge and does not incorporate other important factors such as mitigations, complementary measures and transport measures paid for by scheme revenue.

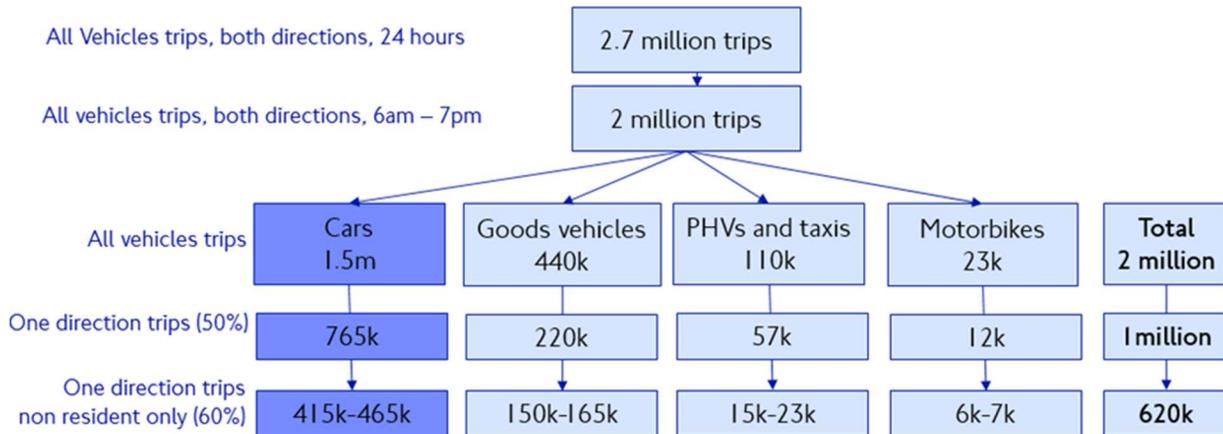
4.2 Traffic impacts of a boundary charge

Volumes of cross-boundary trips

Between 6am and 7pm, there are around two million cross-boundary trips daily of which around 1.5 million (74 per cent) are car trips. Cars make up the majority of cross-boundary trips, followed by vans and HGVs, PHVs* and taxis and then motorbikes. On average, around 60 per cent of cross-boundary car trips are made by non-residents and would therefore be potentially subject to a charge (Figure 13).

¹⁷ It should be noted that there is significant uncertainty around future traffic flows across the Greater London Boundary. The London Atmospheric Emissions Inventory is in the process of being updated to reflect recent changes. Therefore the analysis presented here should be treated as indicative and subject to change.

Figure 13: Cross-boundary trips by vehicle type



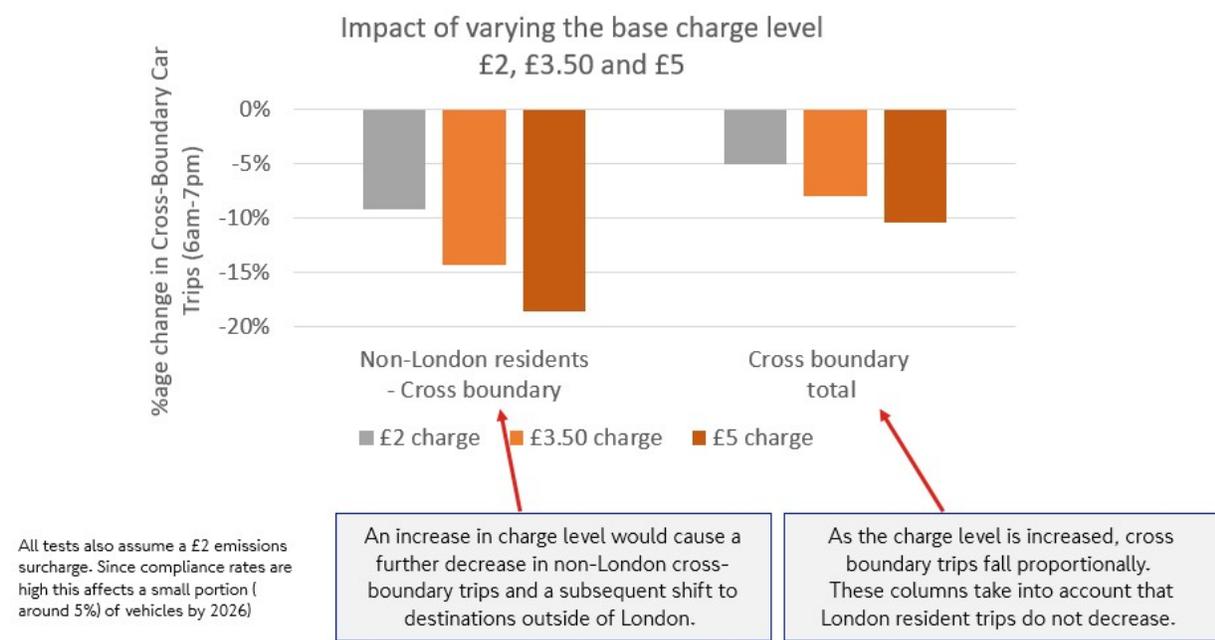
*Note: Whilst cordon count data cannot distinguish between cars and PHVs, additional analysis has been carried out using automatic number plate recognition camera data to determine car / PHV split in this figure and in Figure 15.

Charge level

Demand and assignment modelling was used to model the potential traffic impacts of a £3.50 daily charge. Charges of £2 and £5 were also assessed. Daily charges of £2, £3.50 and £5 reduce total cross-boundary car trips by five, eight and 10 per cent respectively (

Figure 14). All tests also assume a £2 surcharge for vehicles not meeting emissions standards (assumed to be the same as ULEZ standards).

Figure 14: Percentage change in cross-boundary trips by base charge level¹⁸

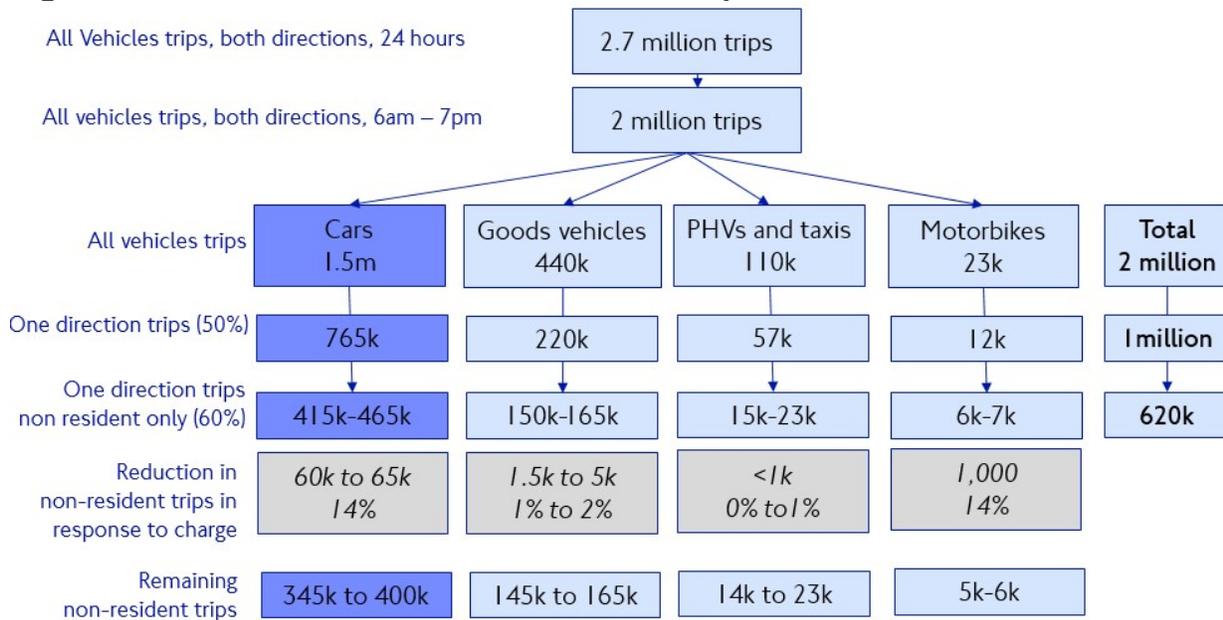


Source: TfL MoTiON

Non-London residents' car trips are expected to reduce by around 14 per cent with a boundary charge. Goods vehicles, PHVs and taxis are likely to be less sensitive to a charge (Figure 15).

¹⁸ % change in cross-boundary trips by base charge level refers to cars only, trips in both directions during 6am-7pm and is based on weekday averages with varying charge levels applied to a ribbon, modelled in 2026.

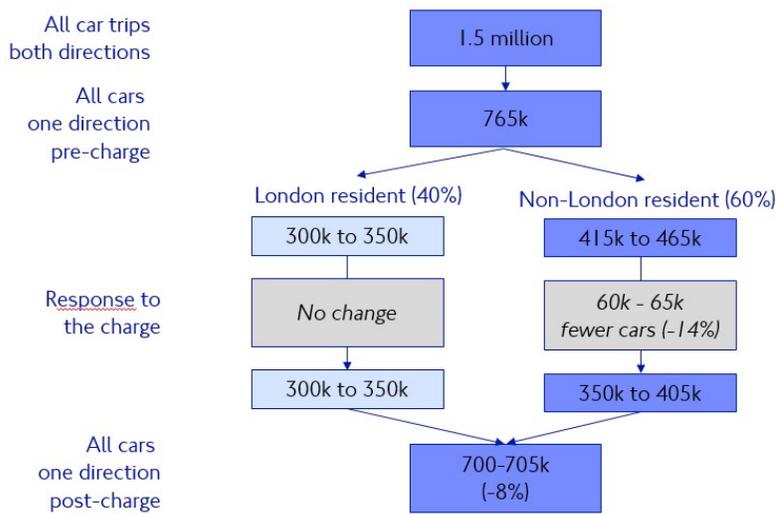
Figure 15: Reduction in non-resident vehicle trips



Total cross-boundary car trips are expected to reduce by around eight per cent, assuming London registered vehicles are exempt. This equates to a reduction of around 60,000-65,000 car trips per charging day in one direction and around 125,000 car trips in both directions (Figure 16). The total reduction of all non-London resident trips (all vehicles) is up to around 150,000 per charging day, in both directions. As set out in section 2.1, reducing traffic and car trips is a key target of the MTS.

Figure 16: Reduction in cross-boundary car trips

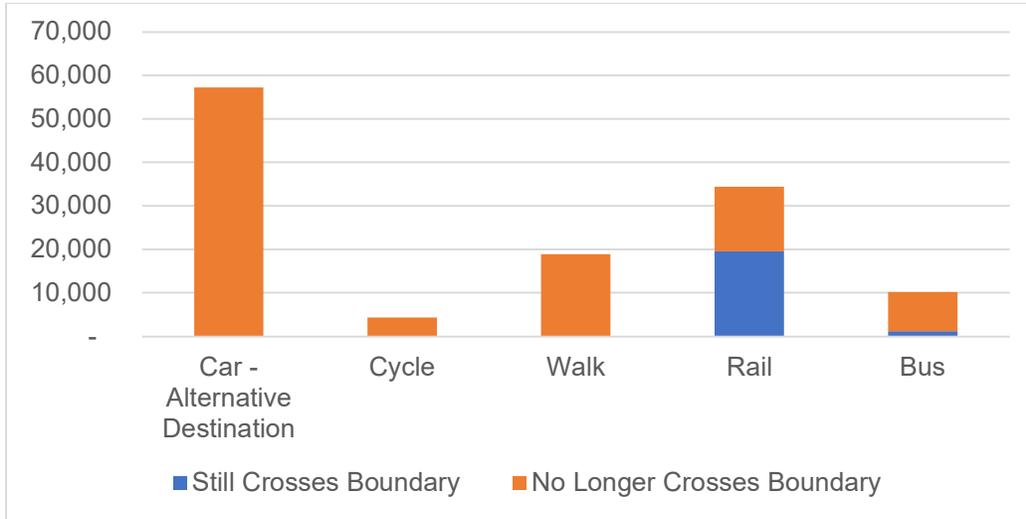
Total cross boundary car trips reduce by c 8%, a reduction of around 60-65k in one direction and c 125k in both directions.



4.3 Mode shift

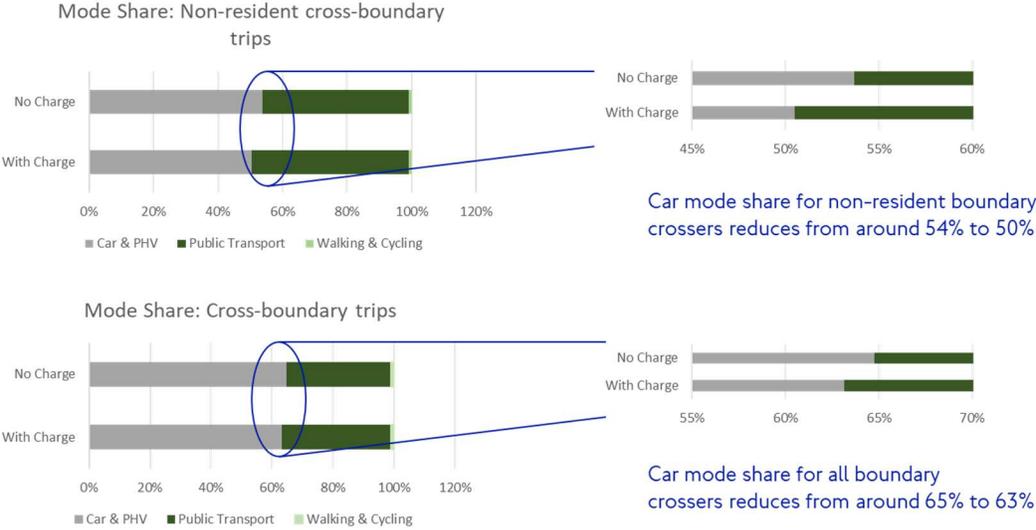
In the central option, the effect of a charge sees around 105,000 trips switching destination and 20,000 trips switching mode to rail and bus (Figure 17). Trips made for discretionary purposes are more likely to switch mode than commuting, business and education. The overwhelming majority of commuting trips to outer London, and to town centres, would still occur (see section on Businesses and Economy in section 4.10 below).

Figure 17: Impact of a charge on car trips



This means that car mode share for cross-boundary trips reduces by around two percentage points (four percentage points for non-residents only) as shown in Figure 18.

Figure 18: Changes in car mode share



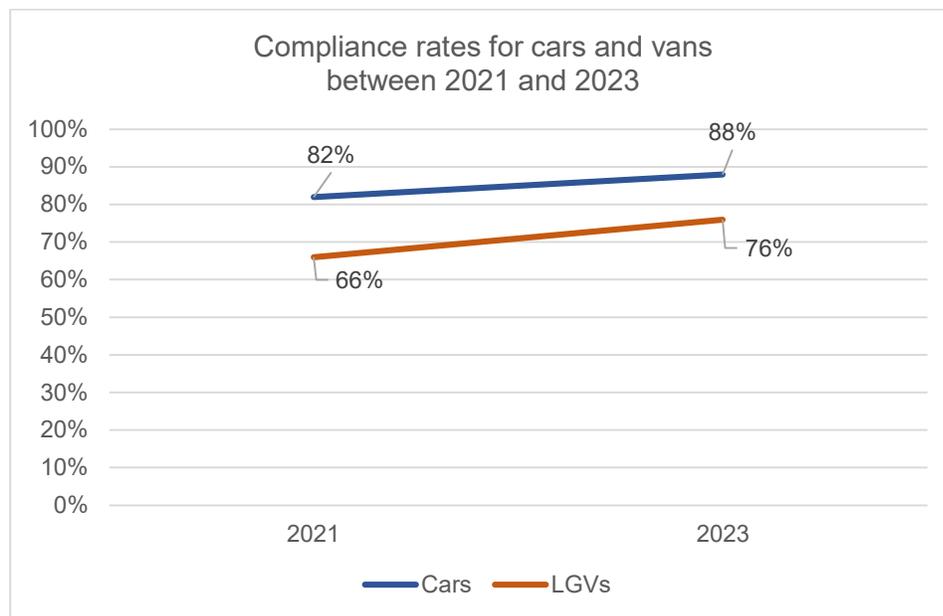
¹⁹ <https://tfl.gov.uk/modes/driving/ultra-low-emission-zone/ways-to-meet-the-standard>

4.4 Emissions surcharge

The central option assumes an emissions surcharge would apply to vehicles that are not compliant with ULEZ standards¹⁹ (as set out in Table 1, for cars and vans these are Euro 4 for petrol and Euro 6 for diesel and Euro VI for heavier vans and lorries). In the central option this is assumed to be a £2 charge applied only to non-London registered vehicles. For further context, the LEZ, which is London-wide and applies only to heavier vans and lorries, the standard is Euro VI for NO_x and PM.

Figure 19, which concerns the expansion of ULEZ in October 2021, shows that in 2021 approximately 82 per cent of cars in outer London were forecast to be compliant with ULEZ standards and this rises to 88 per cent in 2023. For vans the compliance rates were forecast to rise from 66 per cent in 2021 to 76 per cent in 2023. For the purposes of the feasibility study these assumed forecasts were used and in the absence of other data, the rates for non-London vehicles travelling into London are assumed to be similar to those of outer London traffic.

Figure 19: Forecast compliance rates for cars and vans in outer London between 2021 and 2023



Source: Strategic Analysis - TfL

An emissions surcharge could reduce total cross-boundary car trips by non-Londoners by between 6,000 and 10,000 additional trips per day. This effect would reduce over time due to increasing compliance rates.

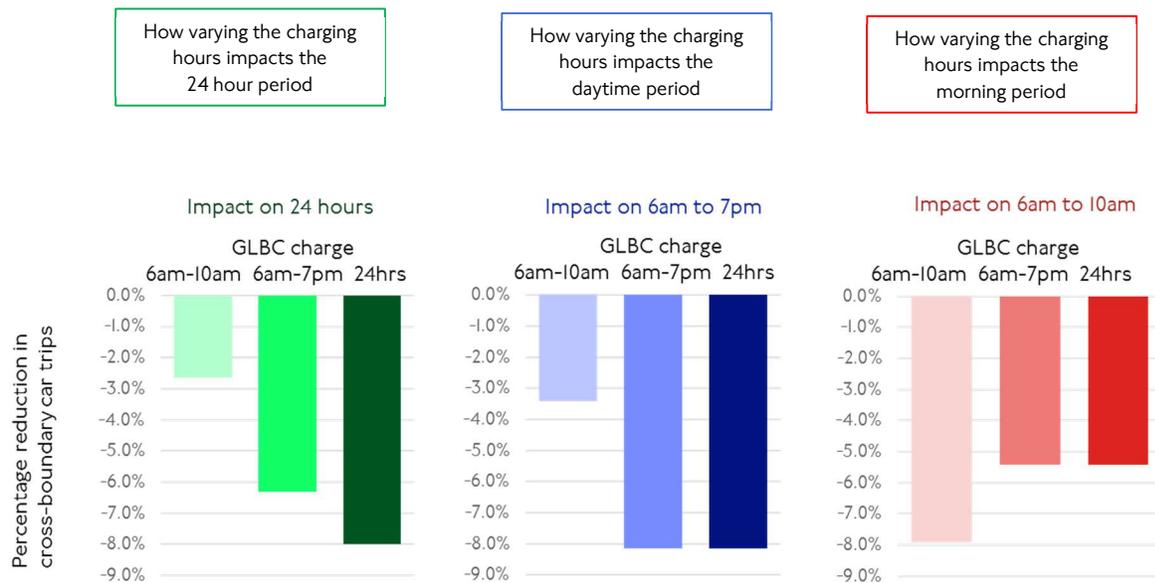
The total volume of cross-boundary vans is about a quarter that of cars and their behavioural response to a daily charge is expected to be lower. Their response to a £2 surcharge is also therefore expected to be low, despite relatively lower compliance rates compared to cars. An emissions surcharge could reduce cross-boundary trips by non-London registered vans by between 600 and 1,700 per day. It is expected that the impact of a £2 emission surcharge for HGVs would be even lower; compliance is already high due to LEZ (so most HGVs would not need to pay the emissions surcharge). Those that aren't compliant would be subject to the significantly higher LEZ daily charge (£100 or £300) and a £2 surcharge is therefore unlikely to result in a behavioural response.

Additionally, since the launch of the expanded ULEZ in October 2021, we can compare observed data on actual compliance levels with the forecasts made prior to scheme launch. Compliance is improving rapidly: currently it is 82.5 per cent in outer London (where the ULEZ does not apply) and in the ULEZ area it has increased by 7.5 per cent to 92 per cent between September and November 2021. London-wide, compliance could be above 90 per cent in outer London by a GLBC potential launch date and legal compliance on NO₂ concentrations may also be close to being achieved with the existing programme. Compliance levels of non-London registered vehicles would need to be considered in more detail if proposals are taken forward, to better understand the impacts of the emissions surcharge (in its assumed form) on drivers and policy outcomes.

4.5 Charging hours

The charging hours in the central option for assessment are 6am-7pm to cover both the morning and evening peaks, and acknowledging, as highlighted in the MTS, that congestion is no longer confined to these times. Sensitivities have also been tested to understand the impact of charging during the morning peak only (6am-10am) and a 24-hour charge. The impacts of these three charge levels are compared in Figure 20. In comparison to a 6am-7pm charge, a 6am-10am charge is less effective in reducing 24-hour boundary crossings but specifically targets morning peak commuters with a higher impact during those hours. A 24-hour charge delivers about the same daily traffic reduction as a charge between 6am-7pm.

Figure 20: Impact on cross-boundary trips by time period



4.6 Charging days

The estimated change in daily cross-boundary car trips at the weekend is higher than the estimated reduction during the weekday, largely due to the higher amounts of discretionary travel at the weekend which tends to be more responsive.

The data available for analysis of weekends is generally more limited; at this stage it has been assumed that at weekends people respond in a similar way as they do during the week. The impact of a charge on weekend traffic as compared to weekday traffic would need to be explored in more detail if proposals are taken forward.

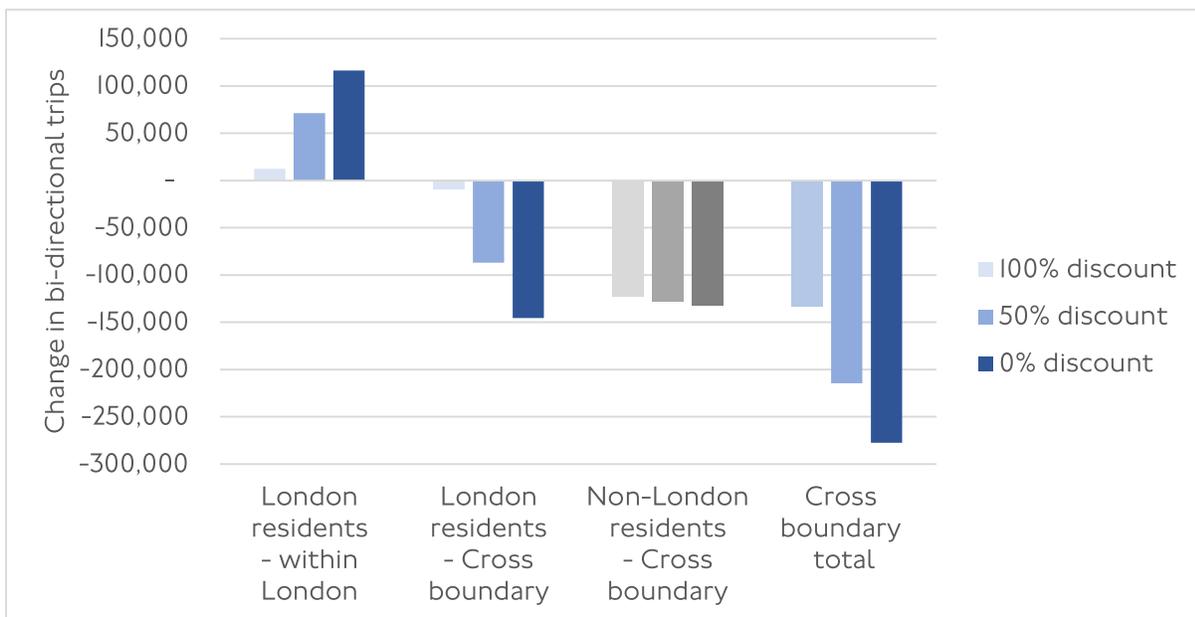
4.7 Response of London residents

The central option assumes an exemption from the charge for cars registered at a London address and where the owners satisfy residency criteria that their principal place of residence is within London. Two levels of discount were tested:

1. 100 per cent discount i.e. £0 daily charge and £0 emissions surcharge (central option)
2. 50 per cent discount i.e. £1.75 daily charge and £1 emissions surcharge

If there was not a discount for London residents (i.e. residents also paid a full charge), there could be approximately 150,000 fewer cross-boundary car trips by London residents. However, it is likely that some of these trips will change destination to within London and therefore it could have the effect of increasing resident car trips that end in London.

Figure 21: Response of London residents to a £0, £1.75 and £3.50 daily charge



Source: TfL cordon counts and MoTiON

4.8 Response of other vehicle types

HGVs and vans

Goods vehicles have multiple uses and whether a £3.50 charge (plus £2 emissions surcharge if applicable) would be significant enough to change travel behaviour will likely depend on the purpose of the trip. Given the average daily cost of operating a van for commercial or work purposes is around £175 and at least £260 for HGVs, for most purposes the relatively small additional cost is unlikely to prompt a behavioural response.

Out of the 165,000 van trips into London each day, it is estimated that around one to three per cent of van trips would change behaviour. A 100 per cent discount for London registered vans would reduce this to around one to two per cent.

Out of the 55,000 HGV trips into London each day, it is estimated that under one per cent would change behaviour.

The modest scale of response to a charge for goods vehicles is in line with research and practice. The lower response seen for HGVs is because they are seldom used for non-work purposes, generally travel further, cost more to operate and carry more than vans.

Between 65 and 95 per cent of the van response is from private or recreational use. This is due to these trips being more likely to be price sensitive and able to change time, mode, route or destination. For example, someone using their van for a personal trip is more likely to change behaviour than someone using their vehicle to carry building materials for work.

Given the modest response to a charge from goods vehicles, particularly HGVs from a £3.50 daily charge, consideration would need to be given as to the appropriate level of charge for commercial vehicles. A higher charge may be more likely to create an incentive for some businesses to make changes which would support efficient use of road space and potentially reduce costs, by seeking further opportunities for consolidation to reduce the number of vehicles entering London.

Consideration would need to be given to the eligibility of commercial vehicles for a London residents' exemption to avoid any unintended consequences of increasing numbers of vehicles being registered in London in order to avoid the charge. The legal implications of a charge which applies to some but not all commercial vehicles are also to be explored further.

Private Hire Vehicles (PHVs)

PHVs may have a lower response rate to a £3.50 daily charge when undertaking journeys for work purposes²⁰. As a known fixed cost, it could be incorporated into hire rates in the same way as other costs such as fuel, insurance and vehicle maintenance. A proportion of the boundary charge cost might therefore be passed to the passenger but at a level that would be unlikely to be significant in the cost of the hire given the number of journeys each day it would be spread across. When the PHV Congestion Charge exemption was removed from PHVs other than those which are wheelchair accessible, operators responded in different ways including passing on additional charges to passengers, increasing hire rates or increasing vehicle rental costs for

²⁰ In this context, 'work purposes' means fulfilling a booking, rather than using the vehicle as a private car. Subject to the definition of the Londoner resident exemption, some PHV drivers may be exempt from paying a charge for work and/or personal trips.

drivers. A lower level charge, however, may be more easily absorbed in operating costs. Further engagement with stakeholders would be required to understand the impacts on the PHV industry if proposals are taken forward for further development.

Taxis

Taxis make up about one per cent of cross-boundary trips and for the purpose of the feasibility study are considered to be exempt from paying the charge.

The role of taxis and PHVs in providing an accessible transport service for people with disabilities would need to be considered further in the development of any future scheme proposals.

Other vehicles (motorcycles, buses, coaches, emergency vehicles)

Volumes of these vehicles are comparatively low. Detailed analysis of the impacts on these vehicle types will need to be undertaken as part of detailed scheme design if proposals are taken forward.

4.9 Wider impacts of the scheme

The traffic impacts set out in Section 3.8 also lead to a range of wider impacts which support the sustainable road use objectives (Section 1.1).

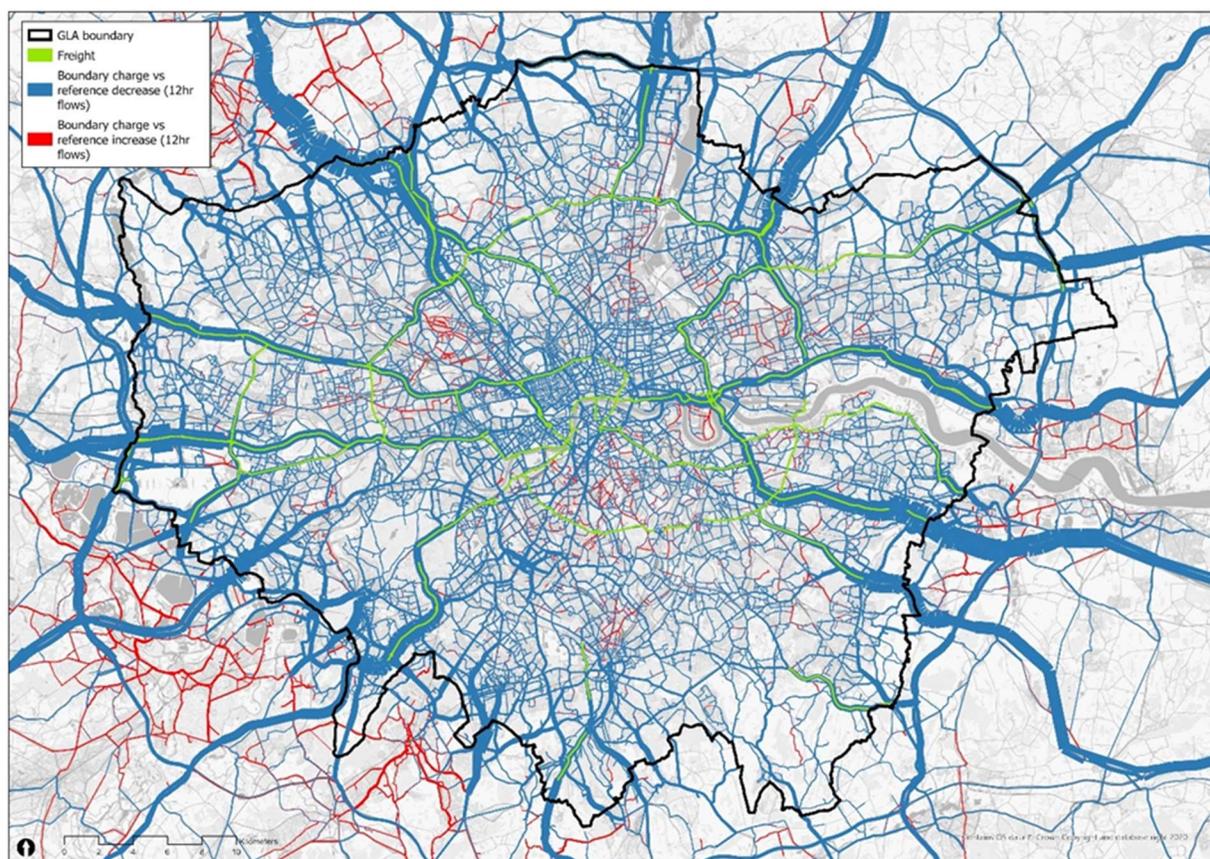
Optimum use of street space

The highest volume changes are on strategic routes such as motorways and the Transport for London Road Network (TLRN) but also on some local roads across the boundary.

Traffic reduction on key strategic routes as a result of a GLBC could result in greater efficiency for freight trips. Routes such as the A13, A3, A2 and A20 have greater than 60 seconds journey time improvement. As large numbers of London and non-London residents use these arterial routes, relieving traffic (albeit by a small amount) will impact a considerable number of journeys. It also helps to free up capacity for freight movements as they are often on routes with delay and congestion hotspots.

Without a GLBC, strategic routes are expected to see more significant increases in delay. While there is scope for goods vehicle activity to be done in different ways there is also a need to ensure that essential freight can move around the network efficiently.

Figure 22: Change in traffic volumes (7am-7pm) with GLBC on key strategic freight routes



Source: TFL, City Planning

A GLBC would also help free up road space for walking and cycling, although is less likely to reduce traffic on routes that have been identified as key routes for cycling as these are often quieter and more local routes. This does not mean that it is not possible to encourage walking and cycling, or that reducing traffic on main roads is not important to encourage cycling. By creating space on the arterial routes, this means there could be more viable alternatives for other car traffic to redistribute to if more minor routes are used for sustainable modes e.g. Low traffic Neighbourhoods (LTNs).

Most cross-boundary trips are not walkable, firstly because of distance but also because the crossing of the boundary is often a motorway or major A-road with no parallel walking route. However, a GLBC could boost local walking as people consider local and walkable alternatives to cross-boundary car travel. Complementary measures play an important role in maximising these potential benefits and would need to be considered in detail if a scheme was being taken forward.

Modelled results with a charge showed that around 30 per cent of those that change mode or destination chose to walk to a different local destination as opposed to paying the charge.

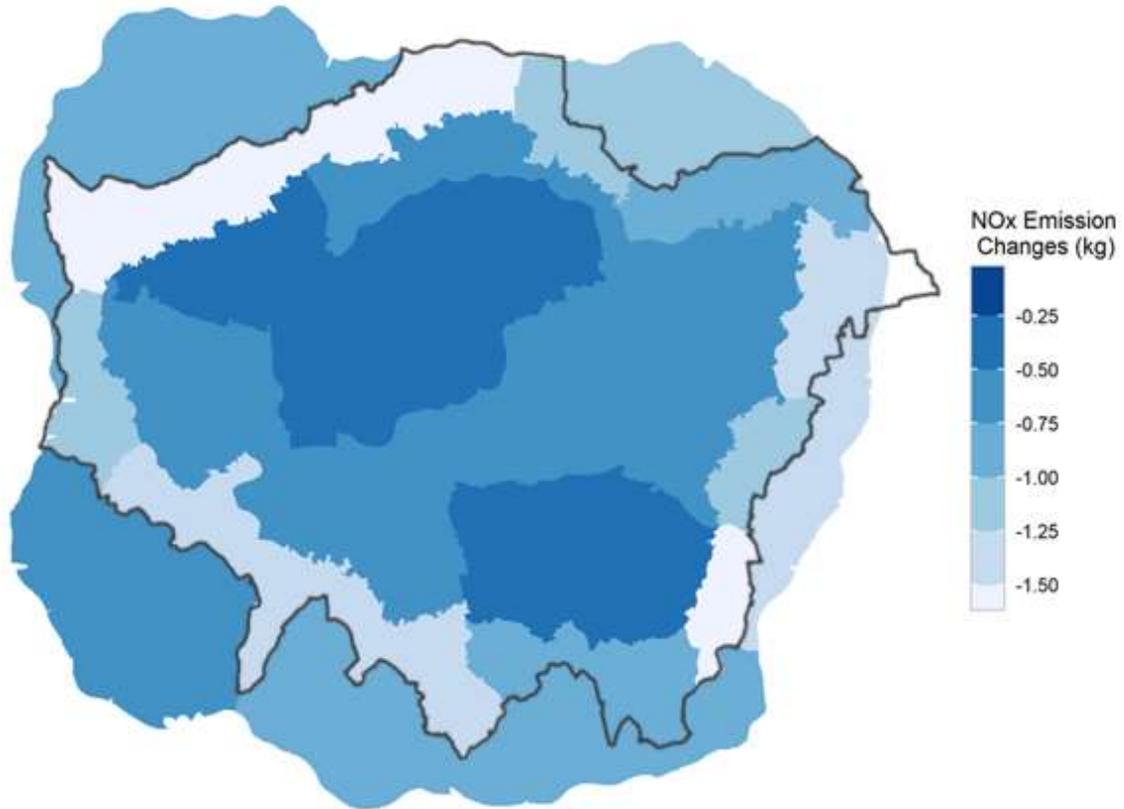
Air quality and carbon

A GLBC would reduce emissions from cars and vans in London by about 0.7 per cent. Annual emissions reductions for a scheme in 2023 are expected to be around 50 tonnes of NO_x, 9 tonnes of PM₁₀, 5 tonnes of PM_{2.5} and 27,000 tonnes of carbon dioxide (CO₂). The largest percentage decrease in car and van emissions occurs in outer London. Emissions on the TLRN and Strategic Road Network are expected to reduce by 0.9 per cent and 0.7 per cent respectively. This means the scheme contributes positively to improving air quality on the TLRN, where air quality concentrations tend to be higher due to higher traffic flows, and where the majority of remaining NO₂ exceedance sites are expected to be after the expansion of ULEZ in 2021.

A GLBC would primarily be aimed at reducing cross boundary vehicle trips into London but would deliver a secondary benefit of reducing emissions and potentially contribute to meeting legal limits earlier than might be expected by reducing emissions in the last remaining hotspots. If emissions were the primary objective of the scheme, the case for exempting residents would need to be re-assessed.

Figure 23: Annual percentage emissions savings for cars and vans

Emissions savings - Car and Vans
Annual emissions savings NOx (kg)



Source: TfL City Planning

Vision Zero and safety

A GLBC would contribute positively towards Vision Zero and road danger reduction by reducing traffic on strategic roads with the highest road speeds in London and reducing the overall probability of collisions due to lower traffic volumes. The traffic reduction is largely concentrated in outer London and on the more strategic roads.

London's economy and growth

The impact on London businesses will depend on whether they can still freely access non-London labour, goods and services and customers. Around 99 per cent of all commuting trips to outer London would still occur.

For town centres around 97 per cent of trips would still occur. For those town centres that are more dependent on non-London trips, complementary measures will be important in supporting and encouraging a shift to sustainable modes.

Although the extra cost of travelling to town centres for shopping or recreational purposes as a result of the charge could mean fewer of these types of trips into London, the lower traffic levels, less noise and cleaner air in town centres could benefit London and non-London residents. These more pleasant areas could attract people back and, combined with improvements of street space efficiency, mean access by sustainable modes could be more of a realistic option.

The impact on town centres is modest (around two to four percent reduction in car travel for most affected town centres). This is in the main because car catchments tend to be within Greater London.

4.10 Preliminary identification of wider impacts of a charge

In considering the feasibility of a GLBC the potential impacts of a charge have been identified to inform a decision about whether it would be beneficial to introduce this kind of scheme in London. An IIA would typically be done on a fully designed scheme to ensure impacts have been identified, understood, considered and where possible mitigated in final proposals.

Although it is not possible to conduct an IIA without a fully developed scheme with, for example, a clearly defined package of mitigations, complementary measures and an understanding of what the net operating proceeds of a scheme would fund,²¹ Arup was commissioned to undertake an initial exercise to identify the impacts of a £3.50 charge for non-Londoners.

If proposals are taken forward, the issues identified as part of Arup's exercise would need to be considered in more detail, discussed with stakeholders and inform potential proposals for consultation. Once full scheme proposals, including complementary measures and a plan for applying net proceeds, have been developed, these would then be subject to a full IIA and public and stakeholder consultation.

The findings of Arup's initial identification of impacts are set out below. They are appropriate to this early feasibility stage and should not be considered to be a comprehensive assessment of impacts. The report highlights issues arising from an additional charge to drive that would need to be considered when developing full scheme design. In the findings below, 'Outside London' refers to a 10km ring around the outside the GLA boundary, and 'Inside London' refers to a 10km ring inside the GLA boundary. Appendix 2 is a list of the stakeholder organisations which Arup engaged with as part of this work; as set out in section 6.4, further engagement and consultation would be required if the boundary charge were to be progressed to a proposal, and also at the stage of any formal consultation.

²¹ Any new TfL charging scheme must include a statement of TfL's proposed general plan for how it would apply the net proceeds of the scheme.

People and equalities

Inside London

There would be benefits to London residents from any traffic reductions. This benefit could be felt disproportionately by groups such as older and younger people, people from diverse backgrounds, disabled people and those with long-term health conditions, and people living in deprived areas, particularly on busy roads or near to the Greater London boundary. In particular, traffic reductions would deliver better air quality, reduced noise, safer roads and a better environment for walking and cycling. In addition, traffic reductions would also benefit self-employed van drivers, taxi and PHV drivers.

There is the potential for negative impacts to Londoners where they are dependent on visitor travel from non-Londoners who currently drive. These impacts could arise from the affordability of the charge for visits made from outside London to provide care and support services. This could affect older people, disabled people, people from BAME backgrounds, those living on a low income and in deprived areas and families expecting or with young children. In particular, the impact on visitor travel and the resultant impact on the provision of informal care would need to be carefully considered in developing proposals to minimise any impacts on disabled people, carers and those in need of care.

While the forecast reduction in cross-boundary traffic would be significant overall, the changes would be focused on the roads immediately crossing and leading to the GLA boundary, with reductions diminishing away from those. Localised improvements in air quality and road safety would nonetheless have a positive impact on health.

A charge could impact community cohesion within existing communities close to the Greater London boundary if it makes cross-boundary travel more difficult, particularly where the boundary is not aligned with the M25 and communities span across the boundary. This would affect people living on both sides of the boundary and would need to be carefully considered in developing proposals and mitigations (e.g. public transport enhancements) to minimise impacts on local communities and make cross-boundary travel by other modes as easy as possible.

Outside London

For those who need to make cross-boundary trips more frequently, for example due to work, education, to use specialist services or to visit friends and family or provide caring responsibilities, the impacts could be greater.

There is a potential risk of some negative impacts arising from the need to pay the potential charge, switch mode, change destination or cancel a trip. Some groups are more likely to be affected. For example, a potential negative impact has been identified for some disabled people (primarily those not eligible for a Blue Badge who are assumed to qualify for a 100 per cent discount), people living on a low income, shift

workers, key workers, carers, and professional drivers. In addition, some groups may find switching to public transport challenging, for example people with autism and learning disabilities. As with those living inside London, these potential impacts would need to be carefully considered as part of scheme development so that they can be minimised.

Older and younger people, people from ethnic minorities, disabled people and those with long-term health conditions, and people living in deprived areas may particularly benefit from traffic reduction. Therefore, any forecast changes in traffic volumes would positively impact these groups. Those who choose to pay the charge would also benefit from any reductions in journey times, congestion, or improvements to journey time reliability. Professional drivers who are driving most of the day have the potential to benefit the most from these improvements.

A charge would have the greatest deterrent effect on discretionary trips, which are nevertheless important for health and wellbeing. It could therefore have some negative impact on access to services and social connections for those outside London. A charge could directly affect those on lower incomes who might find it more difficult to afford a charge, or to find an affordable alternative, and could introduce barriers to access for a range of services and opportunities which influence health and wellbeing. This will need to be carefully considered in developing proposals to minimise any adverse impacts on health and wellbeing through mitigations and measures to make cross-boundary trips by other modes as easy as possible.

A charge is forecast to encourage a small shift towards more active forms of transport, which would generate some positive impact on physical activity. Initial forecasts also indicate a reduction in traffic on roads close to the Greater London boundary which would generate some localised improvements in air quality, traffic noise and road safety which would benefit health.

Environment

Inside London

The forecast changes to travel patterns would have some positive impact on air quality; effects would be expected to occur most notably close to the boundary. These effects are described in section 4.9, and include reductions to NO_x, PM_{2.5} and PM₁₀ and CO₂. Local air quality impacts would need to be reviewed in detail to understand impacts from the change in trips at different locations. There would be a negligible impact on biodiversity and architectural cultural heritage assets inside London as designated sites for these focus areas are generally located away from the boundary.

The estimated reduction in traffic would not generate a perceptible improvement to background noise levels.

Outside London

Initial forecasts indicate changes to travel patterns which would generate improvements to air quality near the boundary and a potential marginal decline in air quality close to major trip attractors outside London if trip destinations were switched to these locations; this would need to be assessed in further detail as part of scheme development in order to minimise any such potential impacts. As is the case inside London, the impact on biodiversity and architectural cultural heritage assets outside London is assessed as negligible as designated sites for these focus areas are not located close to the boundary or major trip attractors. The estimated changes to traffic patterns would not perceptibly alter background noise levels.

The forecast reduction of car trips each weekday in the study area is small when compared to total carbon from vehicle trips, but nevertheless makes a useful contribution to carbon reduction targets.

Businesses and economy

Inside London

Overall, the London economy is likely to remain largely unaffected by the charge with slight positive and negative impacts depending on the sector and the location. There could be some benefits in terms of reduced journey times, especially around the boundary.

A charge could lead to some negative business and economic impacts across sectors related to the leisure economy. A charge is expected to lead to a reduction in discretionary trips, which would be more likely to change destination than mode. Town centres or businesses operating in sectors related to the visitor and night-time economy may see a small decline in demand from non-London residents. The extent to which this will happen is likely to depend on the current share of non-London cross-boundary trips by car, which varies depending on the London destination, and the ability of people to travel to areas by other modes of transport. These businesses could also benefit from small productivity increases resulting from reduced congestion. A more detailed assessment of these potential impacts on different sectors would need to be undertaken should the scheme be taken forward in order to minimise potential impacts.

A charge could also lead to some negative impacts for employees in essential public services. There is a lack of comprehensive recent data on modes of travel by essential public service workers, although a report from 2016 stated that more than half of employees in blue light services were living outside London²². The charge could have a negative impact on commuters driving to work, particularly those travelling to locations

²² A 2016 report prepared by London Chamber of Commerce and Industry (LCCI) stated that 54 per cent of London's emergency services frontline personnel lived outside London.
<https://www.londonchamber.co.uk/LCCI/media/media/Reports%20and%20Surveys/Living-on-the-Edge-Housing-London-s-Blue-Light-Emergency-Services-Report.pdf?ext=.pdf>

with low public transport connectivity. In the medium to long term, this could make it more difficult to retain / attract workers in this sector in London. Should the scheme be taken forward, further work would need to be undertaken to understand more about these commuting patterns, non-car alternatives and potential mitigations that could be put in place to make travel by other modes as easy as possible.

Businesses in transport dependent sectors (such as manufacturing and construction, for example) and small and medium-sized enterprises (SMEs) in London are likely to be largely unaffected if their vehicles are eligible for a 100 per cent discount and may only be marginally affected if their suppliers increase their costs to cover the £3.50 charge or if demand from non-London consumers declines.

Most students do not cross the boundary as education centres and universities tend to have a relatively small resident catchment area, with students living nearby and likely to have alternative modes of transport. A charge is unlikely to affect the education sector inside London overall. It is unclear how much some schools or education centres may depend on non-London students, but the impact is expected to be marginal as alternative transport options are generally available within London.

Overall, a neutral impact would be expected on most businesses including SMEs, transport dependent sectors, taxis and PHVs, non-office workers, the education sector, coaches and consumers, as they would either be exempt, not cross the boundary or be subject to marginal impacts, with the potential to also benefit from localised reductions in traffic.

Outside London

A charge is assessed as being likely to have some negative impacts on specific businesses depending on their sector and size, particularly businesses operating in transport dependent sectors, SMEs, taxis and PHVs. Initial assessment shows that most cross-boundary car trips for business purposes would continue to be made compared to the baseline, suggesting businesses may choose to absorb the additional cost. The ability of businesses to deal with this is likely to be highly context-specific, and it is possible that particularly in areas close to the boundary there could be negative localised impacts. The administrative costs of dealing with the charge are also a factor to consider, which SMEs in particular may be less able to deal with. This would need to be carefully considered in developing proposals to minimise impacts on businesses.

Commuters, including non-office workers and those who provide essential services, could experience negative impacts since the daily cost of the charge would amount to a greater proportional increase in transport costs over a year. Initial forecasts show that many commuters would continue to cross the boundary by car. Again, this will need to be investigated in more detail if proposals are taken forward, in order to minimise the impacts. Consideration will also need to be given to the way in which commuting patterns for some workers may change in response to the pandemic. Increased home working may help to offset some increased costs of commuting.

Businesses outside London could benefit from localised congestion improvements which could lead to small improvements in productivity, especially those operating in transport dependent sectors. There could also be some positive impacts on businesses outside of London related to the leisure economy for instance on those businesses located in town centres or associated with the visitor economy.

The impact on essential public services is likely to be negligible as most would be exempt or would not cross the Greater London boundary. There is likely to be an overall negligible impact on schools and nurseries as only a minority of school trips travelling into London would be affected. Universities and higher education centres outside London are not likely to be affected as both London and non-London residents (including students and workers) would not be exposed to the charge.

At an aggregate level, a charge is likely to lead to a neutral impact on the economy outside London and consumers.

5 Implementation considerations

5.1 Policy and legislative context

The local and national policy context

A GLBC would directly support London policies and fit within the context of wider national policy. This section provides a summary of the most salient policies; it is not a comprehensive list.

Mayor's Transport Strategy (MTS)

The MTS is the principal policy tool through which the Mayor exercises his responsibilities for the planning, development, provision, and management of transport to, from and within London.

The current MTS, published in 2018, has three key strands: Healthy Streets and Healthy people²³; a good public transport experience; and new homes and jobs. In terms of London's streets, it sets out these priorities:

- More people using active, efficient and sustainable modes of travel, with the central aim for 80 per cent of all trips in London to be made on foot, by cycle or using public transport by 2041
- Vision Zero for road danger – all deaths and serious injuries from collisions to be eliminated from London's streets by 2041
- 3 million fewer private car trips by 2041
- 20 minutes of active travel for everyone by 2041
- Zero emission transport network by 2050²⁴
- 10 per cent less freight in central London in the AM peak by 2026

TfL may only apply the net proceeds of a RUC scheme for a “relevant transport purpose”, that is, any purpose which directly or indirectly facilitates the implementation of any policies or proposals in the MTS.

The MTS is of direct significance to RUC schemes in London. A RUC scheme may only be made if it appears desirable or expedient for the purpose of directly or indirectly facilitating the achievement of any policy or proposal set out in the MTS. There is also a requirement that a RUC scheme must be in conformity with the current MTS. It is usual for the MTS to refer to all the RUC schemes which are in place given their significance

²³ TfL has adopted the Healthy Streets Approach to improve air quality, reduce congestion and help make London's diverse communities greener, healthier and more attractive places to live, work, play and do business. Health is put at the centre of our decision making, helping everyone to use cars less and to walk, cycle and use public transport more.

²⁴ In his 2021 manifesto Sadiq Khan sets a more ambitious target for London to be carbon-neutral by 2030

to the achievement of the MTS. An MTS revision is likely to be required if development of proposals for a GLBC are progressed.

Revision of the MTS requires public and stakeholder consultation and an integrated impact assessment (encompassing as a minimum the required strategic environmental and equality impact assessments). The pre-publication draft of the MTS must be laid before the London Assembly pursuant to the required statutory procedure.

The London Plan

The London Plan (2021)²⁵ is the statutory spatial development strategy for London. In it, the Mayor sets out a social, economic, environmental and transport framework for the development of the Capital for the next 20-25 years.

With regards to transport, the plan supports transport schemes and proposals which facilitate the strategic objective of 80 per cent of all London trips made by cycle, walking or public transport by 2041, as set out in the MTS. It also promotes the use of the Mayor's Healthy Streets Approach, especially with regards to reducing car dominance as well as vehicle noise and emissions, goals to which the GLBC would directly contribute.

Specific policies in the London Plan promote the use of car-free and car-lite neighbourhoods (via maximum parking provision standards) and the integration of sustainable transport with spatial planning, especially increased housing provision, to enable 'good growth'.²⁶

London Environment Strategy

The London Environment Strategy²⁷ (LES, 2018) sets out how London will address the challenges related to poor air quality and climate change as well as improving green infrastructure, addressing noise pollution and transitioning to a low carbon circular economy.

Other local policies and strategies

The objectives of the MTS are translated into a number of TfL action plans (Vision Zero; Walking; Cycling; and Freight and Servicing) and into boroughs' Local Implementation Plans (LIPs).

The objectives are also reflected in other Mayoral strategies including the London Environment Strategy (LES) and the Mayor's Health Inequalities Strategy.²⁸

²⁵ <https://www.london.gov.uk/what-we-do/planning/london-plan/new-london-plan/london-plan-2021>

²⁶ 'Good Growth' is summarised in the London Plan as 'growth that is socially and economically inclusive and environmentally sustainable'.

²⁷ https://www.london.gov.uk/sites/default/files/london_environment_strategy_0.pdf

²⁸ <https://www.london.gov.uk/what-we-do/health/health-inequalities/london-health-inequalities-strategy>

In 2018, the Greater London Authority (GLA) published 'Zero Carbon London: A 1.5°C Compatible Plan',²⁹ which presented a range of energy system scenarios for London consistent with a 2050 net-zero target. In 2020, the Mayor of London, Sadiq Khan, committed to set a target for London to be a net zero carbon city by 2030, which was reconfirmed by the Mayor's 2021 Manifesto.

National policy on air quality and carbon

The Transport Decarbonisation Plan (TDP)³⁰ (published July 2021) and the Net Zero Strategy³¹ (published October 2021) are relevant to RUC schemes. The Transport Decarbonisation Plan sets out six strategic priorities: reducing carbon in a global economy; accelerating modal shift to public and active transport; decarbonisation of road vehicles; decarbonising how we get our goods; place-based solutions; and making the UK a hub for green transport technology and innovation. As well as cars and vans, it sets out its ambition for zero emission HGVs and the plan to consult on phasing-out the sale of new conventionally fuelled powered two- and three-wheeled vehicles. In the Net Zero Strategy, Government sets out how it plans to meet the UK's legally binding emissions targets out to 2050. The strategy includes a range of policy measures alongside funding to support the UK's transition to net zero and reconfirms Government's 2030 commitment to end the sale of new petrol and diesel cars, and the 2035 commitment that all cars must be fully zero emissions capable.

At the 2021 United Nations Climate Change Conference (COP26) the issue of carbon reduction was given more urgency and new targets were set for the UK and other countries that were in attendance at the 12 day event. Specifically, there was a Zero Emission Vehicle Campaign aiming to dramatically increase the pace of the global transition so that globally all new cars and vans are zero emission by 2040, or by 2035 at the latest for leading markets. Numerous countries and cities signed up to this campaign including the UK, Canada and India. Additionally, the Zero Emission Vehicles Transition Council launched its 2022 action plan with a focus on discussing how to accelerate the pace of the global transition to zero emission vehicles.

In spring 2021 the Transport Committee issued a Call for Evidence for its Inquiry on zero emission vehicles and road pricing.³² Its remit is to consider the implications of the end of Internal Combustion Engine (ICE) vehicle sales, how to accelerate the shift to zero emission vehicles and the implications for lost tax revenue (from vehicle excise duty – VED). The increasing loss of revenue from VED as the proportion of zero

²⁹ https://www.london.gov.uk/sites/default/files/1.5_action_plan_amended.pdf

³⁰ <https://www.gov.uk/government/publications/transport-decarbonisation-plan>

³¹ <https://www.gov.uk/government/publications/net-zero-strategy>

³² <https://committees.parliament.uk/call-for-evidence/351/zero-emission-vehicles-and-road-pricing/>

emission vehicles in the fleet increases, coupled with loss of revenue from fuel duty – amounting to almost £40bn annually by 2024/25³³ – is a pressing problem.

National policies on active travel

In 2020, the Government put in place a range of policies which support active travel and seek to promote walking and cycling. While this took place in the context of the immediate need to respond to the Covid-19 pandemic, the approach extends beyond that period and signals greater commitment to sustainable modes at a national level. The National Planning Policy Framework (NPPF) 2019³⁴ states that in making local plans, authorities should ensure that 'opportunities to promote walking, cycling and public transport use are identified and pursued'.

Gear Change: A Bold vision for Cycling and Walking³⁵ sets out how increased use of these modes has a wide range of benefits including to public health and wellbeing, the economy and air quality and climate change. It mandated streetspace reallocation and a hierarchy of users, with active travel at the top. The Government also announced the creation of Active Travel England to oversee a £2bn programme in the UK over the life of this Parliament. The TDP sets out the aim that half of all journeys in towns and cities will be cycled or walked by 2030.

In July 2021, the government made further changes to the Network Management Guidance³⁶ setting out that it continues to expect local authorities to take measures to reallocate road space to people walking and cycling. The intention is to have “a lasting legacy of safer, greener travel”. It states that the focus should now be on devising further schemes and assessing Covid-19 schemes with a view to making them permanent. The assumption should be that they will be retained unless there is substantial evidence to the contrary. Authorities should also be considering how to introduce further active travel schemes, building on those already delivered.

TfL and the Mayor's powers to introduce a scheme

TfL has broad powers to establish and operate RUC schemes in respect of roads in Greater London. Those powers enable a GLBC as described in the central option to be

³³ [Budget 2020](#), cited in House of Commons Briefing Paper (Road Pricing) CBP 3732, 2020

³⁴ https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/810197/NPPF_Feb_2019_revised.pdf

³⁵

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/904146/gear-change-a-bold-vision-for-cycling-and-walking.pdf

³⁶ <https://www.gov.uk/government/publications/reallocating-road-space-in-response-to-covid-19-statutory-guidance-for-local-authorities/traffic-management-act-2004-network-management-in-response-to-covid-19>

established, subject to correct procedures and decision-making processes being followed.

RUC statutory procedure requires that:

- a charging scheme must be contained in an order made by the charging authority (TfL) which must be submitted to, and confirmed by, the Mayor (with or without modification) before it can have legal effect.
- the Mayor may consult on or may require TfL to consult on the proposed scheme, consider objections to proposals or hold a public inquiry.
- the Mayor may issue guidance on the discharge of RUC functions which TfL is required to have regard to. Mayoral Guidance was issued in 2007 and is still in force. It contemplates several different scenarios in which a RUC scheme might be established or amended and sets out the Mayor's expectations as to whether, amongst other things, TfL should consult on proposed changes, the length of any consultation period and publicity requirements.

5.2 Defining the charging zone

TfL's RUC powers are exercisable in respect of all Greater London roads which the public have access to (trunk roads are only chargeable with the Secretary of State's consent). The scheme must specify the charging area and the roads within it which are chargeable. These roads then form the charging zone.

Defining the charging area for the GLBC (or other RUC schemes) should follow these boundary principles, which match those for TfL's existing RUC schemes:

- as far as possible avoiding gaps between the Greater London boundary and the charged zone;
- ensure no chargeable roads are defined outside the Greater London boundary (RUC powers are not exercisable over non-London roads);
- provide drivers with the opportunity to divert away from the charged zone at, or close to, the point of entry (this will potentially lead to short incursions inside an otherwise 'regular' boundary);
- avoid charge free 'islands' (ensure roads outside the zone can be reached without passing through the zone);
- allow minor adjustments to boundary to ensure practical signing and camera placement; and
- include all public roads inside the charged zone.

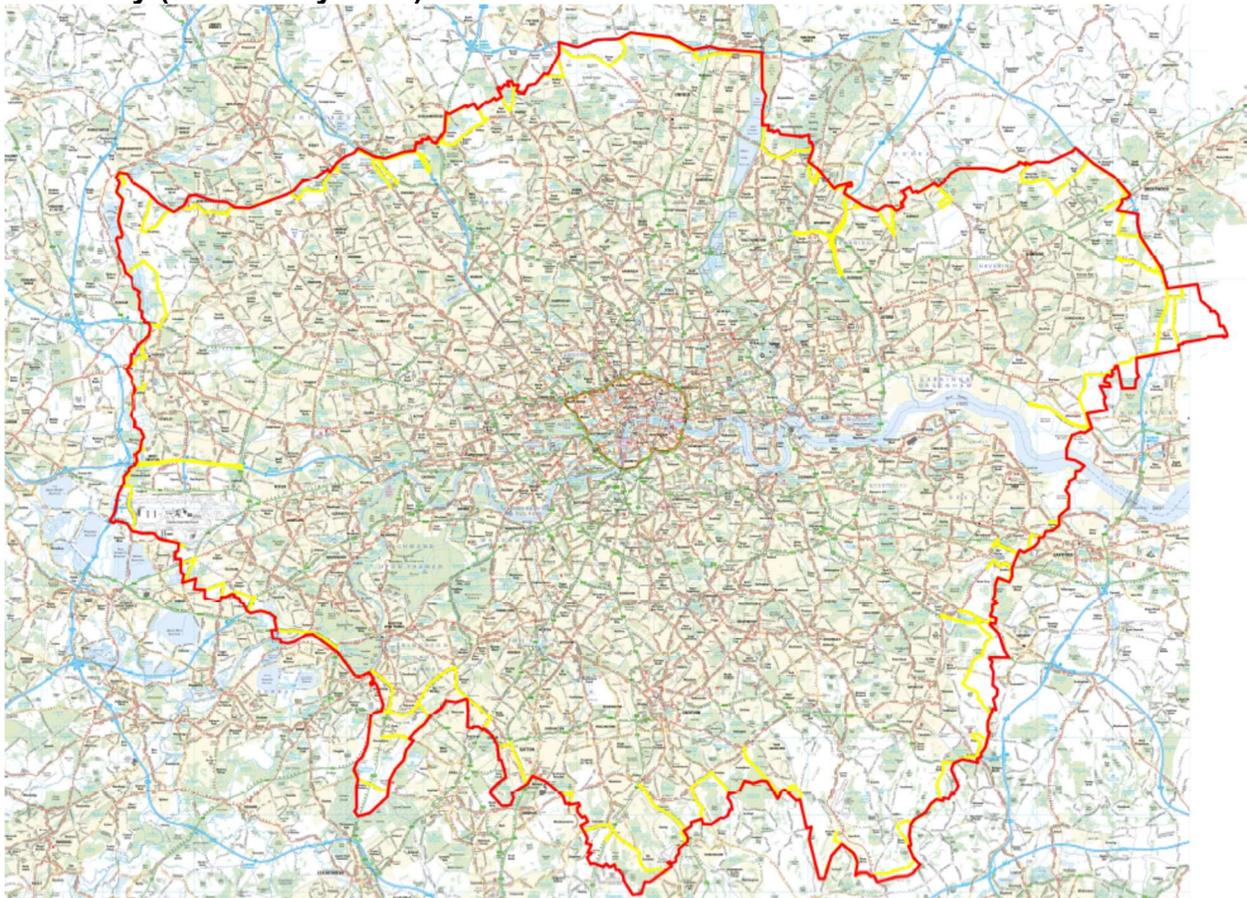
There are a number of road layouts that require particular consideration in defining the boundary of the charging zone including cul-de-sacs, one-way systems / gyratories and out-of-scope roads (i.e. some sections of motorway).

Potential boundary

The existing LEZ boundary closely matches the Greater London boundary and would be a logical boundary for the purposes of the GLBC (Figure 24). The zone is signed, and awareness of its location is likely to be well understood by those who cross the boundary regularly and particularly by commercial drivers whose vehicles need to meet the LEZ standard or pay a daily charge.

There may be additional camera and signage required to use this boundary for a scheme covering all vehicle types, and challenges of installation would need to be considered when assessing the cost and implementation timescales of a potential scheme. Complexity of installation could impact the size and depth of the zone in some locations.

Figure 24: The GLA boundary (shown here in red) is slightly outside the LEZ boundary (shown in yellow)



5.3 On-street considerations

Signing the charging zone

Despite advancements in technology and real-time information available to drivers, traffic signs remain an integral requirement of any road user charging scheme. Traffic signs provide crucial messaging:

- to indicate a charging scheme in advance, so drivers can make route choices;
- to provide boundary information, so drivers have a last chance to avoid the charge;
- to indicate the precise boundary;
- to act as a reminder to pay;
- to indicate the crucial aspects of the scheme (although only very limited messaging is possible to safely convey to drivers of moving vehicles);
- for non-24-hour schemes, provide exit information so drivers can assess whether they have left the zone before a charge kicks-in;
- to provide for data protection requirements (so that drivers are aware their images are being captured); and
- to ensure robust and legally sound enforcement can take place.

It is envisaged that entry and exit signs would be required on the boundary of the GLBC when capturing vehicles in both directions. Although locations would coincide with existing LEZ signs, additional signs may require replacement posts and foundations. Additional or newly designed signage may also be required to ensure that information about both LEZ and the GLBC are clearly signed and can be understood by drivers.

Camera warning signs would be required on the boundary of the GLBC. Advance information signing would also be needed.

Camera infrastructure

Enforcement of the scheme would use ANPR cameras to capture images of vehicles travelling on designated roads. Existing networks of cameras have been positioned to capture contraventions of the current charging schemes: CC, LEZ and ULEZ. Cameras are also used to enforce the Direct Vision Standard (DVS) safety permit scheme for HGVs. Good camera coverage is particularly important given that a high proportion of payments are now made automatically by AutoPay accounts.

TfL has a well-established track record and contracts in place for the installation and operation of camera charging systems. This is scalable and existing principles would be applied to the GLBC.

Approvals for on-street infrastructure

As the scheme design progresses, consideration will need to be given as to what approvals, if any, are needed to install on-street infrastructure (signage and camera equipment). Cooperation and joint working between TfL and the relevant local

authorities may be required to ensure that the relevant infrastructure is in place for the effective operation of the scheme. Joint working from an early stage with all relevant partners would be essential.

5.4 Operational considerations

Enforcement of the scheme

TfL has an established process in place for the civil enforcement of its existing RUC schemes. ANPR cameras capture number plates of vehicles as they drive within charging zones and these images are compared against the list of payments made for specific Vehicle Registration Marks (VRMs). Where no payment has been made within a specified time period, and the vehicle is not subject to a 100 per cent discount or exemption, a Penalty Charge Notice (PCN) is issued. Prior to PCN issue, a manual visual check is carried out to confirm the contravention. The enforcement process is set out in law and includes a procedure for challenging the PCN.

The current level of a PCN for the CC and ULEZ is £160, which is payable within 28 days and is reduced to £80 if paid within 14 days. It is assumed that the PCN level for a GLBC scheme would be consistent with those in place for the CC and ULEZ at the time of scheme go-live.

This overall approach works well and is understood by drivers. It is similar to other enforcement processes for civil driving offences such as unauthorised parking. In order to make the system understandable and to reduce costs associated with introducing new systems, it is recommended that a similar approach be adopted for a GLBC.

Back office: managing payments, registrations for accounts and discounts

TfL has long-established processes in place for the back-office elements of RUC schemes, such as taking payments, registering and managing accounts and the administration of discounts and exemptions.

As set out in Section 3 it has been assumed in the central option for assessment that Londoners would not pay the full charge which could entail more than three million vehicles and drivers being registered for a 100 per cent discount (if registration is the means by which such a discount is administered).

It is assumed that a similar level of verification to that required for the CC resident discount would be required: proof of residency and vehicle registration, but there are potential options whereby certain vehicles could be registered automatically, using existing DVLA datasets for example. Privacy and data protection implications will need to be considered.

Further work would need to be done on the definition and scope of a residents' discount/exemption, for example whether it is available beyond private individuals, to businesses and organisations. Depending on final scheme design, a new process may be needed to cater for commercial vehicles.

Privacy and data protection

The implementation of a GLBC would require the processing of personal data through the use of cameras to collect VRMs as well as the administration of accounts, payments (including enforcement and debt recovery) and discounts/exemptions.

As with all projects and activities involving personal data, this would require compliance with all aspects of data protection legislation, including the UK General Data Protection Regulation (UK GDPR), Data Protection Act 2018, and where relevant (in the case of processing data about EU residents), the 'EU' GDPR. In particular, the principles of privacy by design and default and data minimisation must be incorporated from the very outset and reflected, for instance, in decisions about how the scheme is charged for and enforced, camera density and location, how discounts/exemptions are administered, how long personal data is retained and how techniques such as anonymisation and pseudonymisation can be used.

There are also Human Rights Act 1998 considerations to take into account in relation to the extended use of surveillance cameras to identify a vehicle's location or movements and the right to a private life.

In developing a scheme proposal for a GLBC there are a number of data protection and privacy matters which would need to be taken into account. Data Protection Impact Assessments (DPIA) would be required to identify, assess and (where appropriate) mitigate, any privacy risks identified. Different risks would apply to different aspects of the scheme, for example those relating to on-street camera surveillance would differ from those relating to account registration and administering various discounts and exemptions. For this reason, it may be appropriate to do several smaller DPIAs over time, each focusing on a specific area or topic. Public consultation or focus-group engagement would need to cover privacy-related questions. The outcomes of this would be reflected in the DPIA.

The key aspects relating to a GLBC which would need to be covered are:

- Privacy related concerns relating to the installation of new camera infrastructure
- Sharing of data from the camera network
- Transparency and meeting TfL's obligations around 'fair processing' including appropriate on-street signage (including during any camera testing prior to launch of any scheme), a readily available privacy notice, and publication of any DPIAs
- Processing of customer data in particular the administration of discounts and exemptions which has the potential to create, or require access to, significant datasets
- Public perceptions of invasion of privacy / intrusion
- Third party suppliers and service providers

Monitoring and keeping a scheme under review

The MTS sets out that road user charging schemes must be kept under review (Proposal 20) to ensure that they remain effective over time. From time to time it may be necessary to make changes to schemes in order that they continue to contribute to their specific objectives and to wider MTS objectives. It is assumed that the GLBC would also be subject to this type of review.

In order to understand the efficacy and impacts of the boundary charge TfL would use data from monitoring and evaluation as a key resource. As well as informing TfL's review of the scheme, such data would also be an important part of reporting publicly on the impacts of the scheme.

TfL has in place a rigorous monitoring and evaluation programme for transport in London and reports annually via the Travel in London (TiL) reports. Should the GLBC be implemented, it would be monitored and reported on in TiL and initially through other more frequent update reports. This would include traffic volume counts which would allow TfL to assess the impacts on vehicle flows in terms of total volumes, time of day and by vehicle type.

TfL would also seek to monitor and evaluate the wider impacts of any scheme against the aims of the MTS, such as its impact on air quality, on road danger and secondary impacts such as on local businesses and any equity impacts. A challenge that would need to be considered further is the need to monitor impacts on behaviour and wider effects of the policy taking place outside London.

Communications and Engagement

If a scheme were to be taken forward, it would require an extensive marketing campaign and stakeholder engagement programme to ensure that private and commercial drivers and vehicle owners are aware of the new scheme, understand how it impacts them and what their options are, including how to pay the charge.

5.5 Revenue and implications for investment in transport

If a scheme proposal is developed, TfL would need to publish a 10-year revenue plan setting out what the net charge income would be spent on. More generally, at this stage it is assumed that net GLBC revenue would support the buses and street outcomes to be delivered through TfL's Financial Sustainability Plan (FSP)³⁷. This includes measures to encourage the use of sustainable modes, such as the Healthy Streets programme and potentially a Sustainable Travel Fund for boundary boroughs to help fund local priorities like bus enhancements and new walking and cycling improvements.

³⁷ Published in January 2021 <https://tfl.gov.uk/corporate/publications-and-reports/business-plan>

6 Taking a scheme forward

6.1 Introduction

If, following this feasibility study, it is considered that it could be beneficial to take steps to propose the introduction of a GLBC in London, a significant programme of work would be required to progress from feasibility to delivery. The work that would need to be undertaken is likely to be on a timescale of around 18-24 months.

This work would fall into the following broad themes:

- Final proposed scheme design, including complementary measures and mitigations
- Drafting a scheme order which would set out the rules of the scheme including defining the charging area and zone, when liability to pay the charge arises, the level of charge and discounts/exemptions criteria
- Undertaking an Integrated Impact Assessment (IIA), including an Equalities Impact Assessment (EqIA)
- Engagement and consultation
- Operational and implementation preparation including customer considerations
- Use of revenue / Ten Year Plan

6.2 Final proposed scheme design, including complementary measures and mitigations

In Chapter 2 we set out the variables that would need to be determined to define a GLBC. For the reasons outlined previously (in section 3.3), in this study we have considered a central option for assessment, as well as testing other variables or sensitivities. Further assessment of the impact of these variables would be needed as well as an assessment of how they work as a package. This will mean that proposals can be refined to maximise benefits and minimise or reverse potential negative impacts.

As well as defining the rules and parameters of the scheme, final proposals should include an effective and targeted package of complementary measures, including for example investment in sustainable travel alternatives to driving. This will help to enhance the positive impacts of the scheme including public health benefits from behaviour change. Final scheme design should also include targeted mitigations which could include discounts for some people or vehicle types.

A package of complementary measures would provide alternatives to car use to support the scheme's primary objective of reducing cross-boundary traffic as well as other MTS objectives such as mode shift, reduced air pollutant emissions and more efficient use of road space. It would need to take account of the varied circumstances in different areas around the Greater London boundary, including complex regional commuting and travel patterns in London and the wider South East.

An area of focus could be increasing active travel connectivity between residential neighbourhoods and town centres in outer London and areas directly adjacent to the Greater London boundary. This could include enhancing cross-boundary bus routes, walking and cycling to town centres, trips attractors and rail stations.

Interventions would be based on analysis, engagement with stakeholders and local authorities and local circumstances to help identify the most appropriate and impactful measures by location. It will be important to consider these within the overall landscape of existing TfL and borough investment and transport plans.

6.3 Integrated Impact Assessment (IIA)

An IIA is a comprehensive assessment of a policy, plan, or project to ensure that impacts have been considered in detail in the following areas:

- equality impacts;
- business and economic impacts;
- environmental impacts;
- health impacts; and
- any other impacts.

The assessment typically includes key stages including a baseline, objectives, evidence of likely impacts of the proposals, assessment of these against the objectives, and finally a summary of potential positive and negative impacts. IIAs also identify potential mitigations for negative impacts or ways to enhance positive impacts.

Equality impact assessment (EqIA)

Under the Equality Act 2010, TfL has a Public Sector Equality Duty to have due regard to the need to ensure that our functions are carried out in such a way so as to achieve certain objectives designed to minimise negative impacts on people from protected characteristic groups as well as, advance equality of opportunities and foster good relations between these groups and others. In line with best practice, the impact on groups who have the potential to be socially excluded such as those on low incomes or from deprived communities would also be assessed.

Business/ economic impact assessment

The economic and business impacts that would be considered are:

- the impact on different types and spatial locations of business, including the impact on SMEs;
- the business sectors which are most affected and what could be done to minimise this; and
- the impact on employment and the wider economic impacts on London and the UK.

Environmental impact assessment

For a potential scheme proposal, the environmental impacts that would be assessed include those relating to air quality, carbon emissions and biodiversity as a minimum. Further scoping would need to be carried out to determine whether or environmental topics should be in scope.

If an MTS revision is required, then the IIA would also need to include an environmental report which complies with the statutory requirements of a Strategic Environment Assessment (SEA). The environmental report would need to identify, describe and evaluate likely significant effects on the environment of implementing the amendment(s) and reasonable alternatives taking into account the objectives and geographical scope of the MTS.

Health impact assessment

The health impacts to be assessed include, but are not limited to: the impact on physical activity; illness; air quality; noise; road danger; community severance and climate change; as well as access to key community services including health and social care and access for the emergency services.

6.4 Engagement and consultation

As this scheme focuses on the Greater London boundary, it will be important to undertake early and frequent engagement with the outer London boroughs, as well as with the unitary authorities, counties (and constituent districts) surrounding London, and with National Highways. As noted earlier in the study, the outer boundary of a GLBC would coincide with the LEZ boundary, and there is therefore some experience of authorities working together to achieve the establishment of a RUC scheme at this location.

Table 3 lists the affected authorities.

Table 3: Local authorities relevant for the Greater London Boundary Charge

Outer London boroughs (15)	Barking and Dagenham, Barnet, Bexley, Brent, Bromley, Croydon, Ealing, Enfield, Greenwich, Harrow, Havering, Hillingdon, Hounslow, Kingston upon Thames, Merton, Redbridge, Richmond upon Thames, Sutton, and Waltham Forest
Contiguous boroughs outside London (counties with constituent districts and Unitary Authorities)	Berkshire, Essex, Hertfordshire, Kent, Surrey, and Sussex Buckinghamshire, Slough, Windsor & Maidenhead
Other authorities	National Highways, Heathrow Airport Limited
Sub-national transport bodies	Transport for South East Transport East England's Economic Heartland There are also several Local Economic Partnerships – alliances/partnerships of businesses including some transport bodies/organisations.

Some early engagement has already taken place with authorities inside and outside London as part of the preliminary identification of impacts. Among the issues identified from these early discussions are the potential impacts on local businesses and employment; access to education across the Greater London boundary and potential adverse local impacts caused by re-routing. These and other issues will be explored further as part of the IIA and broader development work if a GLBC was taken forward.

As noted in section 4.10, engagement with other stakeholders has also taken place as part of the exercise to identify preliminary impacts for the purposes of this study. If work is taken forward, further pre-consultation engagement with stakeholders would be required to highlight issues to consider and gain insights based on their experience and expertise.

Stakeholders in this case would include political stakeholders, business and freight representatives, Health Trusts and emergency services, transport groups and operators, representative groups including those for protected groups under the Equality Act such as disabled people and people from diverse backgrounds, environmental groups and charities and local residents.

Any proposals to introduce a GLBC in London would be subject to consultation. As part of a consultation, a suite of documents would be made available to the public to provide sufficient reasons and information to allow respondents to give an informed response. This could include:

- a description of the proposal, including maps showing the proposed charging area;
- an assessment of the impacts on equalities, environment, business and the economy and health (the IIA as explained above) as well as on privacy and data protection;
- a Scheme Order which sets out the precise rules of the schemes and a 10 Year Revenue Plan which describes in general terms how the proceeds of the scheme would be applied; and
- a consultation form for respondents to use, containing questions about the proposals.

Because a proposed GLBC is likely to require a change to the MTS, environmental statutory bodies (Historic England; Natural England; and Environment Agency) would need to be engaged at the scoping stage of the environmental assessment to help determine whether the amendments are likely to have significant environmental impacts. The proposed amendments to the MTS, as well as the IIA which will include the environmental report, would also be subject to wider public consultation. The final draft version of the amended MTS text would need to be laid before the London Assembly prior to publication who may move a motion to reject it within 21 days.

A consultation report, which would include responses to issues raised as part of the consultation, would be provided to the Mayor to assist him to decide whether or not to amend the MTS and confirm the establishment of the GLBC scheme with or without modification. This report would be published together with all the documents relevant to the decision making process.

Given the scope and impact of the proposals, it would be relevant and prudent to seek views from residents, businesses and other stakeholders from outside London. This would need to be considered when drawing up plans to promote awareness of the consultation.

6.5 Customer considerations

In addition to the operational and implementation considerations outlined previously in this study, which would need to be updated in response to any final proposed package, more work would be needed to consider the customer proposition and experience. In particular, to consider how the various TfL schemes could be presented to the customer in an integrated way.

Several channels already exist for customers to interact with road user charging schemes in London, described online as 'Pay to Drive'. Since the Congestion Charge was introduced in 2003, a range of payment channels has been maintained and updated. Auto Pay is the most popular and accounts for around 75 per cent of payments made. Auto Pay enables users to register for a payment account which has the advantages of meaning that payments cannot be inadvertently missed and lead to Penalty Charge Notices (PCNs) for non-payment. Payment can also be made online, via our Contact Centre (including by phone) and via the Pay to Drive app which users can download to manage accounts and payments.

6.6 Use of proceeds / 10-Year Plan

Net proceeds from a GLBC must be applied for relevant transport purposes, that is, to deliver the MTS directly or indirectly. Although it is not appropriate at the feasibility stage to provide detailed information about how proceeds would be used, we can make some broad assumptions.

Firstly, revenue would be used to help pay for schemes which improve opportunities for the use of sustainable transport in London including initiatives to encourage walking and cycling. Secondly, the Mayor has made reference in the context of the GLBC to the creation of a Sustainable Travel Fund for boundary boroughs to help fund local priorities like bus enhancements and new walking and cycling improvements. The potential to create such a fund would depend on the level of net operating surplus and TfL's financial ability to deliver its existing activity in line with the requirements of the MTS.

In order for the GLBC scheme to be implemented TfL would be required to set out a 10-Year Plan for the use of the net proceeds arising from the scheme which would form part of the consultation materials.

An example of such a 10-Year Plan be found at Annex 4 of the consolidated Congestion Charge Scheme Order³⁸.

Beyond the 10-Year Plan TfL would report on the gross and net revenue from the GLBC, as it does for all road user charging schemes, in its annual report and accounts.

³⁸ <https://content.tfl.gov.uk/consolidated-scheme-order-july-2020.pdf>

7 Appendix 1: Glossary of Terms

ANPR	Automatic Number Plate Recognition
CC/CCZ	Congestion Charge
DPIA	Data Protection Impact Assessments
DVLA	Driver and Vehicle Licensing Agency
DVS	Direct Vision Standard
EqIA	Equalities Impact Assessment
FAC	Forecourt Access Charge
FSP	Financial Sustainability Plan
GDPR	General Data Protection Regulation
GLA	Greater London Authority
GLBC	Greater London Boundary Charge
HAL	Heathrow Airport Limited
HGV/HGVs	Heavy Goods Vehicle(s)
ICE	Internal-Combustion Engine
IIA	Integrated Impact Assessment
LES	London Environment Strategy
LEZ	Low Emission Zone
LIP	Local Implementation Plan
LTDS	London Travel Demand Survey
MoTiON	Model of Travel in London (demand model)
MTS	Mayor's Transport Strategy
NPPF	National Planning Policy Framework
PCN	Penalty Charge Notice
PHV/PHVs	Private Hire Vehicle(s)
PM	Particulate Matter
RUC	Road User Charging
SEA	Strategic Environment Assessment
SMEs	Small and Medium-sized Enterprises
TDP	Transport Decarbonisation Plan
TfL	Transport for London
TiL	Travel in London
TLRN	Transport for London Road Network
UAs	Unitary Authorities
ULEZ	Ultra Low Emission Zone
VED	Vehicle Excise Duty
VRMs	Vehicle Registration Marks
WHO	World Health Organization

8 Appendix 2: Stakeholders involved in the Preliminary Identification of Wider Impacts work undertaken by Arup

Local Authorities and LA representative organisation

- Epping Forest District Council
- Royal Borough of Kingston
- London Borough of Sutton
- London Borough of Hillingdon
- Watford Borough Council
- Elmbridge Borough Council
- Reading Borough Council
- Spelthorne Borough Council
- Surrey County Council
- Thurrock Council
- London Councils

Transport-focused stakeholder

- Addison Lee
- British Vehicle Rental and Leasing Association
- UK Coach Operators Association
- Bus and Coach Operators UK
- Confederation of Passenger Transport UK
- GMB Union
- Licensed Private Hire Car Association
- Licensed Taxi Drivers' Association
- Logistics UK
- Motorcycle Action Group
- National Motorcyclists Council
- Private Hire Board
- Road Haulage Association
- London Travel Watch
- United Cabbies Group

Environment-focused stakeholders

- Friends of the Earth
- Mums for Lungs
- Greater London Authority (Air Quality)

Businesses and business-focused stakeholder

- Federation of Small Businesses London

- London Chamber of Commerce and Industry
- Heathrow Airport