

# Electric Vehicles

Developing a consumer-led approach to infrastructure planning



# Foreword



In 2020 London First published the findings of the [London Data Commission](#) and set out [Data for London](#), a new framework to solve civic challenges through better public and private data collaboration. A new [Data Charter](#) was successfully launched in September 2021 with an extensive list of corporate signatories along with the backing of the Mayor's office and London Councils through the London Office of Technology and Innovation (LOTI).

At London Tech Week 2022, the Mayor's office will announce the creation of a new Data for London Board, to oversee the modernised London Data Store, and provide governance for future data collaborations underpinned by the Data Charter.

While the data infrastructure is coming together, London First is working with members and stakeholders to encourage purposeful data collaborations between the public and private sectors.

Alongside its recommendations, the London Data Commission also explored practical data-led solutions across four 'first wave' pilots, one of which looked at optimising the location of new electric vehicle (EV) charging points in London. The pilot primarily focused on inner-city fast commercial charging infrastructure resulting in an analysis that combined a series of data sets into layered maps to identify potential charger locations. A demonstration of the pilot is available here. While the pilot identified 2000 publicly owned parcels

of land, data limitations were identified which are acting as barriers to putting the data to purposeful use.

In addition, the pilot considered mainly inner London charging. However, many Londoners live in areas away from the central business district in densely populated boroughs with limited or no off-street parking which could be used for private charging points. It is in these areas of London that future EV charging demand from private, taxi/lift sharing and courier/delivery drivers are expected to require significant investment in infrastructure. Such areas may not be attractive for private investors given possibly lower utilisation and hence a lower commercial return on investment. The first Data Commission EV pilot helped develop a better understanding of where EV infrastructure could be placed, but did not consider consumer needs or the 'demand signals' required for future infrastructure planning.

PwC was invited to work with London First to explore how public and private data collaboration might help build a richer picture of user demand and the different infrastructure needs of users - and hence where to prioritise investment. A series of workshops were run to consult with business leaders, data owners and experts and key stakeholders from London's government, Transport for London, (TfL), national government and the private sector.

This article sets out the findings from these workshops and outlines some next steps towards meaningful data collaboration between the public and private sectors



under the London Data Charter. The work concludes that while central London is already well catered for in terms of EV infrastructure, and in the more suburban areas home charging points are a viable option, there is a dense residential zone in-between where there is likely to be high demand from certain user types and those without off-street parking for public EV charging.

Our persona-led analysis also suggests that many car journeys originate or terminate in this zone and it's likely to be one of the areas where investment would help residents transition to EV vehicles. A public-private data collaboration drawing on a range of data indicators could help visualise how best to optimise EV charging infrastructure in these areas.

**John Kavanagh**  
*Programme Director, Infrastructure*

# Building a digital capital to help tackle London's biggest challenges

Our Data Commission laid the ground work for the Data for London ecosystem - our work on Electric Vehicles is the Place strand highlighted below:

London is not making the best use of data currently available



London has been a leader in publishing city data, and in making it widely available



The world is moving fast, and we are now creating more data in a single day than existed up to the year 2000



Much of the data about London is fragmented across the public institutions and inaccessible behind corporate walls



90%+  
Is never looked at again

Good data assesses the effectiveness of the existing policies and challenges assumptions, while showing how successes can be replicated. To unlock the potential of data in London we created the London Data Commission.



## London Data Commission

Brought together the public and private sector together to unlock the data currently available in London and support the creation of an internationally leading city data framework - Data for London.

The Data Commission found strong evidence of significant good will in the private sector towards sharing data, particularly where it achieved corporate social responsibility objectives

Skills, sustainable transport and place-making were identified as critical areas. COVID-19 stimulated further debate on the critical role of city-wide data.

These key challenges mapped closely to London First's business priorities for London: people, place, connectivity and competitiveness.



Data for London would be a new data ecosystem for London - a framework that will create a shared approach to data and bring together all parts of the capital's government and the private sector. The goal is to promote collaboration and data-sharing to generate insights that will lead to better policy decision-making, improving the lives of Londoners.



### Data for London Board

Boosting the use of data currently available in London to deliver clearer insights into the city's



### London Data Charter

Safeguarding the anonymity and security of data from individuals with the highest standards of data management and transparency



### Data Innovation Challenges

Promoting the use cases and testing of new data technologies such as 5G, artificial intelligence, and helping ensure these innovations benefit all Londoners



### City Collaboration

Providing a strong and coherent voice for London in discussions with government and other cities

Four first wave practical data-led solutions, which closely map to London First's business priorities for London



### People

Transforming the way digital education is delivered



### Place

Developing insights to support the rapid uptake of electric vehicles



### Connectivity

Creating smarter neighbourhoods



### Competitiveness

Achieving a more accurate understanding of how the capital is responding to COVID-19



# Shifting to Electric Vehicles is a key enabler to reduce London's transport emissions

Addressing London's carbon emissions is well underway. As a C40 city<sup>1</sup>, the capital's emissions have fallen 40% between 2000 and 2017<sup>2</sup>. The Mayor's targets aim to accelerate this, with London becoming a net-zero carbon city by 2030. The Ultra-Low Emission Zone (ULEZ) introduced in April 2019 reduced CO2 emissions by 4% and NO2 emissions by 36% in the first six months alone<sup>3</sup>. However emissions from transportation remain stubbornly high having reduced by only 7%, the slowest rate of decline across any group of polluters.

Out of 379 local authority districts across the UK, parts of Greater London had the highest CO2 emissions by area in 2019<sup>4</sup> with road transportation a major contributor, although London has made progress over the past 20 years with overall CO2 emissions declining by around 37%.

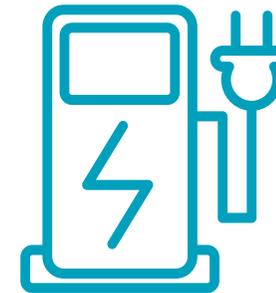
London, however, is using electrification to support the Mayor's ambition of becoming net-zero by 2030. Ambitious electric bus targets have resulted in Western Europe's largest fleet of zero-emission buses.

Taxi and private hire licensing regulations for vehicle emissions, supported by taxi delicensing payments and grants for those switching to zero-emission capable taxis, has meant now around a third of taxis in the capital are electric<sup>5</sup>.

EVs are also becoming a more attractive and accessible option for many consumers (10% of new cars in 2021 were Battery EVs<sup>6</sup>), and this number will only accelerate as we move closer to the national ban on the sale of new petrol and diesel vehicles from 2030.



**10%**  
of new cars  
in 2021 were  
Battery EVs



**London will need  
40-60k  
charging points  
by 2030**

The challenge now becomes our ability to match the exponential increase of EVs on our roads with the infrastructure that enables them. This is no small task, and modelling suggests that London will need 40,000 - 60,000 charging points by 2030 (4,000 of which will be rapid chargers)<sup>7</sup>. We currently have just 9,600 across the capital<sup>8</sup>. The proportion of EVs this infrastructure would support may result in a reduction in carbon dioxide emissions of between 1.5 and 2.6 million tonnes per year by 2030<sup>9</sup>.

1 <https://www.c40.org/>

2 Greater London Authority, London Energy and Greenhouse Gas Inventory (LEGGI) 2018, 2021, [www.data.london.gov](http://www.data.london.gov)

3 Transport for London, Central London Ultra Low Emission Zone – Six Month Report, October 2019, [www.london.gov.uk](http://www.london.gov.uk)

4 <https://www.gov.uk/government/collections/uk-local-authority-and-regional-carbon-dioxide-emissions-national-statistics>

5 <https://lruc.content.tfl.gov.uk/london-electric-vehicle-infrastructure-taskforce-delivery-plan.pdf>

6 <https://www.smmr.co.uk/vehicle-data/car-registrations/>

7 <https://lruc.content.tfl.gov.uk/london-2030-electric-vehicle-infrastructure-strategy-executive-summary-december-2021.pdf>

8 <https://www.zap-map.com/statistics/>

9 EV Infra Plan doc

Realising this opportunity will present a significant challenge. Assuming a best-case scenario, this means we need to deploy 10 chargers every single day between now and the end of the decade. An enabler to deliver such a capability will be the right level of private sector funding and a regulatory framework that incentivises investment. It will also require close public-private collaboration and information sharing across areas such as demand for EV charging, funding, land use, electrical grid capacity and EV user experience.

At the end of last year, TfL published the 2030 electric vehicles infrastructure strategy, and just recently, the Mayor published the [London Net Zero 2030: An Updated Pathway](#) which set out a range of policies to encourage Londoners and those who drive within London to shift from polluting cars to public transport and sustainable active travel and electric vehicles. While recognising the benefits of a greater uptake of public transport and active travel, travel by car will remain a part of the transport mix.

The task is to facilitate the switch and provide the infrastructure required to meet increasing user demand to help the UK achieve net-zero. The challenge is greater than simply increasing the number of EV charging points, it's ensuring that these chargers meet the needs of consumers, or we risk investment being wasted in infrastructure that is not used to its full potential creating stranded assets for investors and disincentivising future investment.



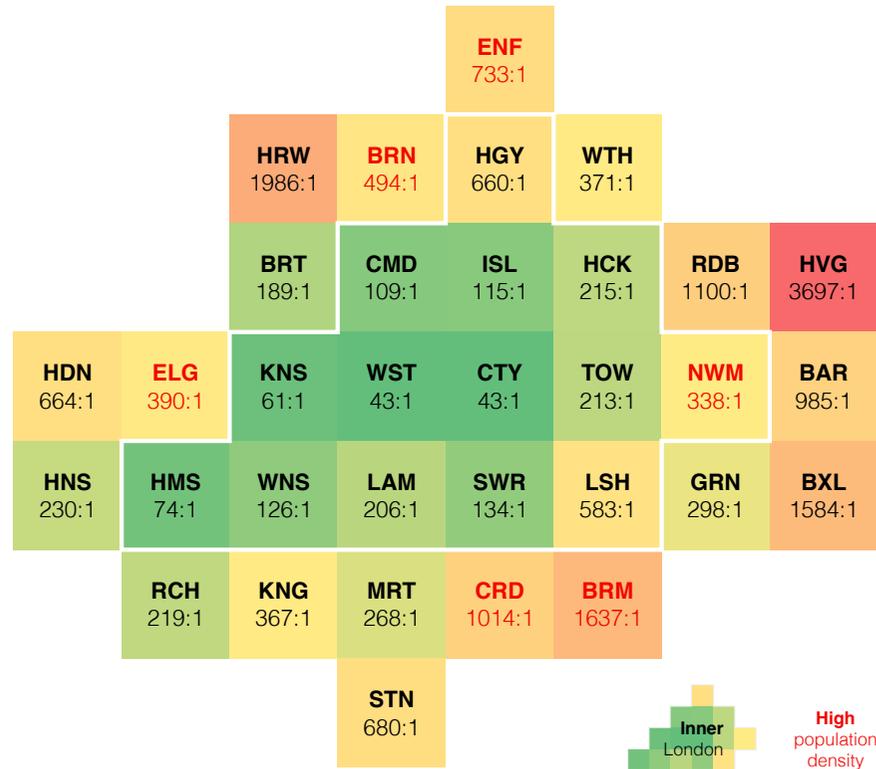
# Prioritising investment based on consumer needs

Perhaps understandably, much of the data analysis in EV infrastructure has been focused on 'hard' factors such as geography, topography and locality.

The 'first wave' EV pilots of the London Data Commission looked at optimising the location of new EV charging points in London. It identified c. 2000 potential locations across London for EV charging stations, based upon power availability, proximity to traffic routes, and remoteness from existing charge point data. A demonstration of the pilot is available [here](#).

However, it was recognised that additional work was required to combine this analysis with human factors such as user demand and utilisation. This subsequent phase builds on that work by adopting a 'user led' approach - understanding the drivers and barriers for consumers and using these to prioritise where investment should be made.

In starting our analysis, we compared car registration data against the number of EV charging devices that are publicly available across each London borough<sup>10</sup>. This heatmap analysis suggests that whilst many areas of central London are well catered for in terms of charging facilities, they are more limited toward outer London and particularly in Havering, Bexley and Harrow.



However, whilst public charging facilities are fewer in these areas, there is more land available for private charging (such as driveways and parking bays). If we look at those areas where population density is highest, we see that Bromley, Croydon and Enfield are areas where public charging facilities are limited, space for private charging is less common, and barriers to EV adoption are likely to be greater.

To help understand consumer demand further, we subsequently developed five personas to represent a cross-section of 'typical' users of EV charging facilities informed through a series of workshops with business leaders, stakeholders and data experts. The personas set out charging behaviours (such as what time of day to charge) and concerns such as accessibility and time to charge.

<sup>10</sup> <https://data.london.gov.uk/dataset/licensed-vehicles-type-0>  
<https://www.gov.uk/government/statistics/electric-vehicle-charging-device-statistics-january-2022>



## Sarah Fleet Manager

As a fleet manager, Sarah manages 45 drivers and the vehicles themselves who operate primarily across West and Central London. She wants a more modern fleet and is open to investing in an EV fleet, but is concerned about the practical limitations.

### Concerns

- Access for her drivers to on-demand charging.
- Speed of recharging meaning less deliveries can be made
- RoI when compared to buying new diesel vehicles

### Enablers

- Dedicated rapid charging hubs for fleet vehicles
- More widespread accessibility of rapid/ ultra-rapid charging points
- More readily available information on EV's and benefits (e.g. ULEZ & Congestion Charge exemption)



## Lucy Student & Ride Share driver

Lucy lives in a flat in Greenwich and works for a ride sharing company around her commitments as a masters student. She works primarily across East and Central London, and is concerned about the cost of working in the new ULEZ.

### Concerns

- Access to charging near her home
- Cost of current electric vehicles
- Speed of recharging could impact the amount of hours she can work.

### Enablers

- Lamp-post charge points and supermarket charging hubs More readily available information on EV's and benefits (e.g. ULEZ & Congestion Charge exemptions)
- Rapid charging points available across Central London.



## Mandeep & Jasmine Private Users

Mandeep and Jasmine are parents from Waltham Forest who live in a semi-detached house with no driveway. Mandeep works reduced hours to allow him to do the daily school run, whilst Jasmine works nights. They share one vehicle.

### Concerns

- Compatibility of charging points
- Widespread accessibility to charging points as their routine is erratic
- Lack of access to a private charging point

### Enablers

- More readily available information on charging points and compatibility
- Easy, fast charging stations available around London
- Charging hubs and supermarket charging stations close to home



## John Hackney Carriage Driver

John is a Hackney carriage driver who operates in central London but lives in Enfield. He drives a 2010 LTI TX4 which has covered over 300,000 miles and is now considering replacing it with a newer model.

### Concerns

- Access to on-demand charging
- Mileage range and cost of current electric vehicles
- Installation and cost of private charging point

### Enablers

- Easy, fast charging as and when required and close to his route
- More readily available information on EV's and benefits (e.g. ULEZ)
- Supermarket charging points and grants for home charging



## Josh Delivery Company Owner

Josh owns his own delivery company providing 24 hour delivery services for a number of businesses across London. He lives in Croydon and works variable shifts to suit his clients.

### Concerns

- Availability of charging points open at night time
- Restrictions on travelling long distances on a single charge
- The cost of installing a private charge point

### Enablers

- Charging hubs and supermarket stations which remain open at night
- Rapid street-side charging plugs available around London
- More readily available information on charging grants available

# What did we find by taking a consumer-led approach?

## What are the investment priorities for our personas?

We found that large corporate courier and goods vehicle user needs were being met without the need for intervention. Many of the significant players in the market are already investing in depot-based charging. To go a step further and optimise EV charging along delivery routes of multiple market players would require significant collaboration and cooperation of commercially sensitive material for which we found very little appetite.

We conclude that the most urgent investment and a key priority for London is to meet the infrastructure needs of private cars, independent/home-charge couriers, taxis, and rideshare vehicle users which cumulatively account for approximately 75% of the 18.5bn motorised road miles travelled each year across London<sup>11</sup>.

Our work suggested that there is a natural economy of scale in infrastructure that meets the needs (fully or partially) of more than one user group. For example, off-street charging where facilities are available to private users and ride-sharing vehicles alike. However, as identified in London's 2030 EV infrastructure strategy, the existing EV charging infrastructure in London is focused on the centre.



11 <https://roadtraffic.dft.gov.uk/regions/6>

Areas like East London have only around a fifth of the charging infrastructure available in central London - albeit with a larger land area and a more dispersed population to serve. In contrast, Central London is well catered for in terms of private-sector investment such as that from Charge Point Operators given its attractiveness in terms of utilisation, e.g. day-charging from the likes of lift sharing/taxi drivers.

As a result of this analysis, the following five EV infrastructure investment priorities were developed:

- 1 Rapid charging hubs for taxis and ride-sharing vehicles** – Because of the low predictability of usage, these groups require a high degree of flexibility which could be offered by rapid charging hubs at key gateway locations (such as those routes which would normally be used for a long-distance fare e.g. the A1 / M25 interchange)
- 2 EV charging at office locations in outer London** – Offices provide natural hubs for private vehicle commuters. Charging facilities could also be lower voltage because workers' vehicles are likely to be idle for significant periods during office hours
- 3 EV charging at shopping / retail hubs in outer London** – These locations attract large amounts of visitors as well as having large spaces dedicated to parking, alongside typically good access to the utilities required



- 4 On-street charging in dense outer London residential areas where EV ownership is expanding rapidly** – Drivers (private and home-charging taxis/ ride-sharing/ couriers) in London are most likely to park their vehicles overnight where they live, but research suggests that housing in the outer London boroughs which are not at the very edge of Greater London (e.g. Newham) are less likely to have private driveways that could be fitted with dedicated charging points creating a higher demand for EV infrastructure in these areas

(as well as an opportunity to deploy slower charging solutions which may offer good value for money options for overnight charging, e.g. in local car parks)

- 5 Off-street EV charging hubs in dense outer London residential areas where EV ownership is expanding rapidly** – With a similar theme to #4, these rapid charging hubs are already gaining traction in pilot locations, and could provide access to EV owners who would live locally.

## How do we prioritise where investment should take place?

Clearly, it's not possible to invest in every EV infrastructure project that fulfils the needs of our user groups. Having developed the set of five interventions (above) that could address our personas' needs, we developed criteria / benefit areas to help narrow down the potential investment opportunities.

Our second workshop focused on developing a framework highlighting these criteria. This framework was then used to map appropriate data inputs. The aim was to prioritise investment by using data to model the potential impact of an intervention.



Eight criteria were developed from mayoral and national priorities and presented at the workshops. Some criteria were found to be too difficult to make a causal link with EV infrastructure and others lacked creditable data sources, resulting in three key criteria:

**Congestion** – Understanding the impact that an intervention would have on existing traffic (creating an increase or decrease), if this impact would be near to sensitive locations (such as schools) or high volume locations (such as stadiums). This would need to be considered alongside the push for more active travel (e.g. walking, cycling) as per the UK's transport decarbonisation plan.

**Cost** – Measuring the upfront investment as well as the ongoing cost of maintenance, as well as the cost of connection to utilities

**Tackling climate change** – Understanding existing pollution levels in proposed areas, and how much of an intervention would reduce these levels - linked to more active travel as per the point above on congestion. This data might also look at the current utilisation of local existing EV infrastructure to understand potential utilisation.

Each of these themes were explored further to understand what data sets would be required to both develop a baseline for measurement, as well the metrics for measuring impact.



# Next steps

This project builds on the data pilot work of the London Data Commission and the London Data Charter by bringing together business leaders, data owners and experts and key stakeholders from London's government, Transport for London (TfL), national government and private sector to consider how data collaboration could be used to provide a richer picture of user demand and ultimately help decision-makers to optimise investment in EV infrastructure.

We recognise that a lot of work is going into the role of EVs in the UK's journey to net-zero alongside removing barriers to deploying infrastructure. We've found that user demand requires more consideration to map out local needs, and that layering the needs of the consumer is crucial to de-risking future investment in EV infrastructure. Our analysis and findings, that build on the outputs of the phase one pilot, give us a unique insight into the barriers and opportunities that exist.

Whilst this work has set out a framework and approach, this is only the first step. We have uncovered significant private and public sector willingness to engage on this issue and a willingness of some data owners to contribute meaningful data through a data exchange.

## Key next steps will be:

- To create a data geo-visualisation that maps possible EV infrastructure solutions based on consumer demand in areas of London with limited off-street parking and densely populated boroughs,
- Use this analysis to prioritise areas for further investigation using the criteria / benefit areas set out here, e.g. a minimum viable product to demonstrate feasibility for infrastructure roll out,
- If successful, to expand the geo-visualisation supported by criteria/benefits analysis to cover the whole of Greater London. This will give decision-makers across London a means of de-risking planning of future EV infrastructure and provide an evidence base to incentivise increased private sector investment.

### If you are interested in understanding more about our work please contact:



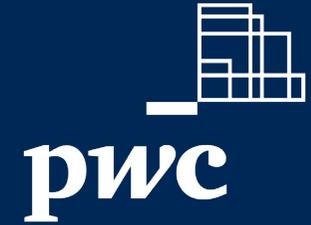
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## Our mission is to make London the best city in the world in which to do business.

London First was set up by business leaders with the belief that by harnessing business assets we can drive positive change. We operate as a business campaigning force, with over 175 members, and are uniquely placed to champion the city:

- We've done it before: back in the 1990s, London's prospects looked bleak. Business leaders came together to lead when others wouldn't;
- We've achieved a lot: over the past three decades, we've campaigned for the creation of the office of London Mayor and Transport for London, for Crossrail, for congestion charging and for expansion at Heathrow; we incubated Teach First and created the UK's largest annual jobs and careers fair for school leavers, Skills London;
- We give London's employers a powerful voice, prioritising the critical interventions needed to keep our capital competitive and connecting with allies to create solutions that help our country succeed as one.

Now, we're stepping up once again. With our members – and the millions of people they employ in the UK – we are pursuing an agenda that will keep London at the forefront of global business, working with and for the whole UK.

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