Electric Vehicle Charging Infrastructure Strategy

Policy Databook

This document provides additional technical detail to support the Council's Electric Vehicle Charging Infrastructure Strategy, including policy context, data and evaluation details.

Contents

1. Policy context

1.1. European Union (EU) policy

Although the United Kingdom (UK) has left the EU, there are many vehicle manufacturers based in Europe that are governed by EU policy and regulations. Models made in the UK are sold across Europe and therefore the requirements of the EU in terms of vehicle specifications and decarbonisation indirectly affect the UK market.

The EU's Directive for Alternative Fuels Infrastructure requires governments to adopt national policy frameworks for electric vehicle infrastructure roll-out. The UK Government has also committed to achieving at least these goals following its departure from the EU. Grammes of Carbon Dioxide (CO_2) per kilometre (km) driven is the primary measure used by the EU to enforce improvements in new car and van fleet emissions, and vehicle manufacturers can be fined based on their average new car sales emissions. The current maximum threshold for new car sales is 95g CO_2/ km. The EU recently announced even tighter targets for new cars and vans to be achieved by 2030 through its Clean Mobility package. The UK Government has also committed to achieving these goals as a minimum following the departure from the EU.

1.2. National

During November 2020, the UK Government made announcements on new domestic (UK) policy with reference to the climate change challenge. These announcements also fed into the UK's hosting of the 26th United Nations Climate Change Conference of the Parties (COP26) in Glasgow in November 2021. For the first time, Ministers, and representatives from some of the world's largest and most progressive car markets have come together to form a new Zero Emission Vehicle Transition Council. A joint statement was released stating that road emissions currently account for over 10% of global greenhouse gas emissions, and emissions are continuing to rise. Therefore, the rapid transition to zero emission vehicles is vital to meeting the goals of the climate Paris Agreement. The globe is currently not on track and the pace of transition needs to dramatically increase. In addition to greenhouse gas emission reductions, this transition will generate job and growth opportunities, improve air quality, improve public health, boost energy security, and assist in balancing electricity grids during the transition to clean power.

The Climate Change Commission's (CCC's) Sixth Carbon Budget (2020) sets the limit on allowed UK territorial greenhouse gas emissions over the period 2033 to 2037. Under the Balanced Net Zero Pathway, options to reduce emissions, including take-up of zero-emission technologies and reduction in travel demand, combine to reduce surface transport emissions by around 70% by 2035 (Figure 1).

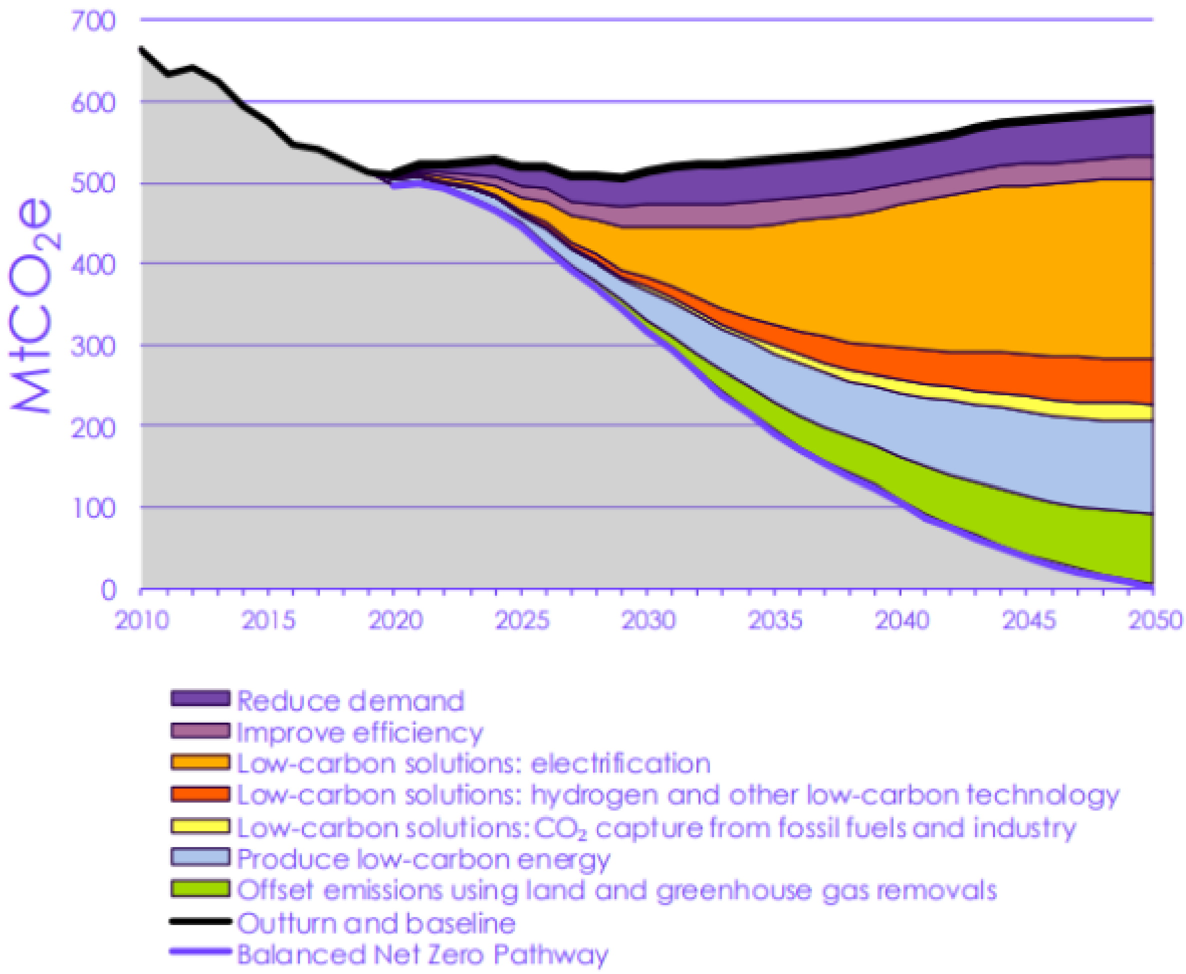

Figure 1: Sixth Carbon Budget – Types of Abatement in the Balanced Net Zero Pathway (Source: Committee on Climate Change, 2020)

The Department for Transport's Decarbonising Transport Plan (2021) recognises that transport is the largest contributor to UK domestic greenhouse gas emissions, and that most of these emissions come from passenger cars. It notes that domestic greenhouse gas emissions from transport have been broadly flat over the last 30 years, even as those of other sectors have declined. In fact, the UK's transport sector has made the least contribution to a reduction in emissions to date (~5%[1]), making it a prime target for future regulation. It confirms the Government's plan to end the sale of polluting road vehicles by 2030, with all new cars and van sold to be fully zero emission at the tailpipe from 2035 and sets an ambition to phase out all new non-zero emission road vehicles by 2040, from motorbikes to HGVs. However, it also notes that a transition to zero emission cars and lorries alone will not be sufficient to meet national climate goals, nor address other harms such as congestion or road danger, and that increasing car occupancy and the share of trips taken by public transport, cycling and walking is therefore also critical. The UK Net Zero Strategy (2021) echoes this message, and states that future Local Transport Plans produced by local authorities will need to demonstrate how local areas will deliver quantifiable carbon reductions in line with net zero targets. This confirms the approach set

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[1] Department for Transport (2021) https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/984685/transport-and-environment-statistics-2021.pdf

out in the Government’s Ten Point Plan for a Green Industrial Revolution (2020)

The National Electric Vehicle Charging Infrastructure Strategy “Taking Charge” (2022) sets out a plan to remove charging infrastructure as both a perceived and a real barrier to the adoption of electric vehicles. It recognises that predictions of the future mix and number of charge points is uncertain but aims to make electric vehicle charging cheaper and more convenient than refuelling at a petrol station. It states that there should be around 300,000 public charge points as a minimum in the UK by 2030 “but there could potentially be more than double that number”. It sets out plans for a £950m Rapid Charging Fund to support the rollout of at least 6,000 across England’s motorways and major A-roads by 2035, and a further £500m to support local authorities to plan and deliver public electric vehicle charging infrastructure.

Following a consultation in Summer 2019, the government has made changes to the English Building Regulations regarding electric vehicle charging provision in new developments, setting a new national minimum acceptable standard for new developments in Approved Document S. The Approved Document took effect on 15th June 2022 and applies to any applications submitted since that date, or before if work starts on site before 15th June 2023.

In 2021, the Office of Zero Emission Vehicles (OZEV) consulted on the prospect of providing government with the power to mandate Local Authorities, Charge Point Operators, or Landowners to have a statutory obligation to plan and provide infrastructure and improve the experience for electric vehicle charging infrastructure consumers. A response to the consultation is awaited.

National Grid’s Future Energy Pathway Scenarios (2021) sets out a framework for rapidly transforming the existing energy system to deliver reliability and value for consumers while achieving net zero emissions by 2050.

The Department for Environment, Food and Rural Affairs’ (DEFRA) Clean Air Strategy (2019) – sets out the Government’s plan to tackle all sources of air pollution, making our air healthier to breathe, protecting nature and boosting the economy, including supporting a move towards mass adoption of EVs.

1.3. Regional

Transport for the North (TfN) are the England’s first sub-national transport body, a partnership of local authorities, business leaders and transport operators, coordinating and lobbying for the transport infrastructure needed to drive transformational economic growth. Their *Strategic Transport Plan (2019)* outlines a robust case for transformational transport investment across the North, including a rapid increase in the number of public charging points across all areas of the North to ensure that electric vehicle drivers can easily locate and access electric vehicle charging infrastructure that is affordable, efficient, and reliable. Building on this, their *Transport Decarbonisation Strategy (2021)* sets out how TfN and partners across the North are committing to a regional near-zero carbon surface transport network by 2045. This supports TfN’s key aims for improving localised air quality, which are:

- A 55% reduction in emissions from 2018 to 2030, achieved mostly through mode-shift and demand reduction, and
- A 95% reduction in emissions from 2018 to 2040, reflecting longer-term decarbonisation measures, such as a high proportion of zero emission vehicles in the vehicle fleet.

The Cheshire and Warrington Local Enterprise Partnership is a regional partnership between private, public, and voluntary sectors which sets the strategic direction for the economic development of Cheshire and Warrington. Their Transport Strategy (2018) sets out the transport and connectivity improvements central to the region’s aspirations for growth and economic development. It notes the need to embrace and embed new technologies such as electric vehicles as part of holistic, efficient transport systems. The Cheshire & Warrington Energy and Clean Growth Strategy (2018) sets out the energy challenges facing the sub-region, and how to meet the challenge of delivering ‘affordable energy and clean growth’. The strategy notes that the Cheshire and Warrington Local Enterprise Partnership (LEP) has a role in promoting low carbon technologies and making new development sustainable, including promoting electric vehicle charging infrastructure. The Cheshire and Warrington Sustainable and Inclusive Growth Commission’s Sustainable and Inclusive Growth Strategy (2022) sets out plans for how to improve the inclusiveness of the regional economy, decarbonise local transport, use land sustainable and achieve net zero. It sets out a priority for creating an ecosystem which makes the adoption of electric or zero emission vehicles the most cost effective and accessible means of motorised transport where public transport is not appropriate or available by 2030, including the key role of the public sector in facilitating the roll-out of public charging devices.

1.4. Local

The Cheshire West and Chester Council Plan 2020-2024 sets out a vision for building greener, fairer, stronger communities across the borough. The Council has made two key emergency declarations: a climate emergency, with a requirement to achieve a net zero carbon borough by 2045, and a poverty emergency, which aims to drive a significant reduction in the number of people in the borough experiencing poverty and financial hardship. In delivering against these declarations, the Council’s Climate Emergency Response Plan (2020) sets out commitments to work with partners to increase the number of publicly available electric vehicle charging points, ensure that new builds include electric vehicle charging points, and review potential for provision of electric buses in future. The Fairer Future Strategy (2022) identifies transport as a significant barrier that keeps people trapped in poverty and supports urgent action to achieve affordable and sustainable transport to remove the barriers people face accessing jobs and key services.

The Cheshire West and Chester Council Low Emission Strategy (2018) highlights the significant problems caused by air pollution, and the particular contribution transport makes to these emissions. The strategy aims to incentivise the replacement of diesel vehicles with EVs, whilst emphasising the importance of establishing a network of charging infrastructure to facilitate the transition. The Chester Air Quality Action Plan (2022) proposes a series of actions to be taken to improve the quality of Chester’s air, including promoting sustainable modes of transport and modal shift away from private vehicle use, accelerating the uptake of electric vehicle taxis, exploring parking incentives which promote the uptake of EVs, and accelerating the widespread implementation of public electric vehicle charging infrastructure for private vehicles, taxis, and van-based fleets.

The Council’s Local Transport Plan (2017-2030) sets outs the Council’s overarching strategy and objectives for improving local transport in the borough. The plan identifies the importance of prioritising electric vehicle uptake to address air pollution problems and commits to pursuing external funding to support the building of additional electric vehicle charge points. Development of a new Local Transport Plan is currently underway, and will focus on the challenge of achieving fairer, greener transport.

The Cheshire West and Chester Local Plan Part Two (2019) sets out the requirement for new developments to seek to maximise the use of sustainable (low carbon) modes of transport by incorporating high quality facilities for pedestrians, cyclists, and public transport and, where appropriate, charging points for electric vehicles. The Council's Parking Standards Supplementary Planning Document (SPD) (2022) reiterates this requirement, including passive provision for future electric vehicle charging infrastructure installations and a recommended standard of the provision of electric vehicle charging infrastructure in developments with 10 or more new car parking spaces, including one dedicated electric vehicle charging point per 10 flats, 30 staff parking bays or 1,000m^2 commercial floorspace.

The Cheshire West and Chester Bus Service Improvement Plan (2021) recognises the need for a partnership approach to setting minimum emissions standards for the bus fleet in the borough, and the need to invest in charging/ fuelling infrastructure to enable deployment of zero-emission vehicles across the network.

2. Technological background

2.1. Electric vehicle trends and technologies

EVs are currently the only mature technology offering a workable alternative to Internal Combustion Engine (ICE) vehicles. However, uptake in the UK is still at the early adopter stage. Generally, uptake is led by relatively affluent, and environmentally conscious, buyers who are keen to:

- Adopt new technologies.
- Reduce their personal transport impacts; or
- Purchase an electric vehicle for tax reasons/ company policy.

Defining an electric vehicle

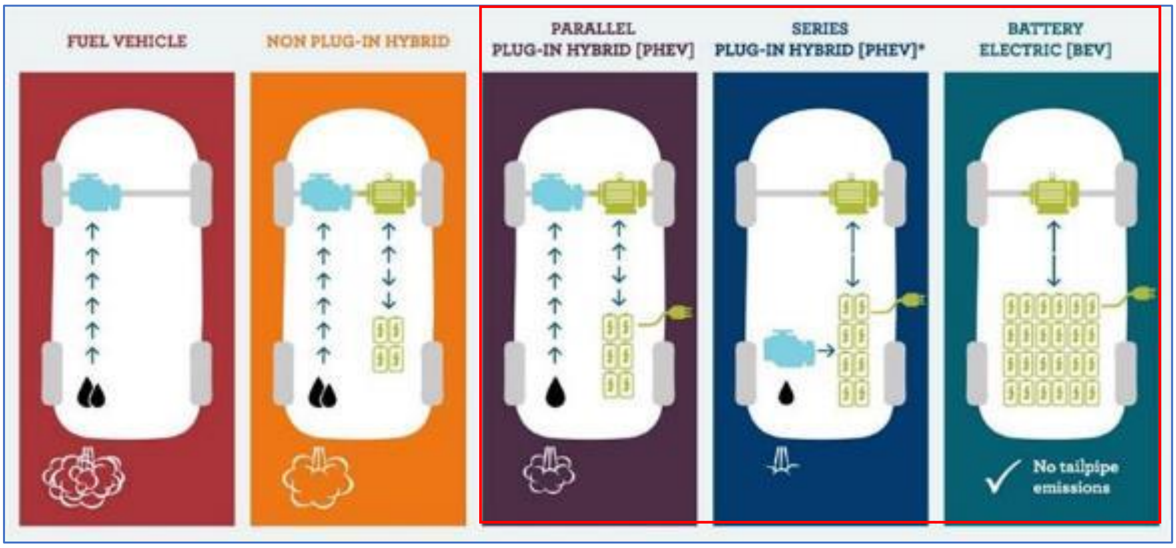


Figure 2: Vehicle Types (Source: Better NZ Trust)

This strategy uses the term 'electric vehicle' to refer to all 'plug-in' vehicles including pure Battery Electric Vehicles (BEVs) and Plug-in Hybrid Electric Vehicles (PHEV) as all require charging to travel using their zero emissions capabilities. The definition does not include hybrid vehicles without a plug.

Electric vehicle charging habits

Early research shows that electric vehicle consumers prefer to charge at home overnight or at work during the day, which suggests a low current demand for public recharging services. Most early electric vehicle adopters have off-street parking enabling them to charge at home overnight, although this capability is greatly curtailed in some residential areas.

As of early 2023, there are 151 BEV models available on the UK market. The second-hand electric vehicle market is still small, comprising just over 3% of the used car market in 2021[2].

Battery capacities and capabilities

The amount of charge a charge point can deliver is limited by the charging capability of the car itself. Prior to 2016, most EVs charged at 3 kW AC, called low speed charging,

[2] Record year for second-hand electric vehicle sales as used car market grows | RAC Drive

which was adequate to fully recharge most batteries overnight. While technology has moved on, only some models produced prior to 2016 are capable of rapid charging.

Analysis of the electric vehicle vehicles on the market shows that battery capacity is growing. However, there will be lower capacity batteries within the fleet from models sold in previous years that consequently have lower mileage ranges, particularly in the second-hand market. Whilst this will affect the average range of current BEVs, it will become less of a concern as the existing fleet grows because more recent models have longer ranges.

Battery Size	Number of Vehicles	Typical Range
Up to 40 kWh	10	Up to 160 miles
40 to 50 kWh	23	160 - 200 miles
50 to 70 kWh	30	200 - 280 miles
70 to 90 kWh	70	280 - 365 miles
90 to 100 kWh	7	365 - 400 miles
100 kWh+	11	400 - 500 miles

Figure 3: Distribution of vehicles along the battery range

Hydrogen vehicles

Hydrogen vehicles offer a potential future alternative to plug-in electric vehicles. Hydrogen fuel cell vehicles are powered by electricity they produce internally through chemical reactions between hydrogen and oxygen. The only exhaust emissions from hydrogen fuel cell vehicles is water. Similarly to plug-in EVs, the overall carbon impacts of these vehicles are predominantly linked to the decarbonisation of fuel production.

There are also combustion hydrogen systems using a conventional engine. However, these still produce nitrogen oxide (NOx) and CO^2 exhaust emissions, and are therefore not zero emission vehicles

The 2021 UK Hydrogen Strategy[3] sets out the government's view of what needs to happen to enable the production, distribution, storage and use of hydrogen across a number of different sectors. It notes that hydrogen is likely to be fundamental in achieving decarbonised transport by complementing electrification. However, its use is likely to be focused initially on heavier forms of transport that might be unsuitable for standard electric vehicle systems, particularly for buses, heavy goods vehicles, shipping and aviation. These vehicles are outside the scope of this strategy and in no way reduce the urgent demand for new electric vehicle charging infrastructure. Battery electric technology is anticipated to remain the majority route for cars and vans over the coming decades at least, and this is reflected in investment plans from car manufacturers as well as rising uptake of EVs amongst motorists.

2.2. Electric vehicle charging technologies

Types of chargepoint

[3] UK hydrogen strategy - GOV.UK (www.gov.uk)

There are many specifications of charge point in the market, differentiated by power output, communication protocol, type, and number of charging outlets (see Figure 4). Each have factors which make them suitable for different charging settings and use cases. Low speed, standard and fast chargers suit home/ destination charging patterns, where the driver looks to recharge at a location that they will be leaving the car for a considerable amount of time. Rapid and high-power chargers suit on-route charging, quick recharging at destinations, and support the taxi trade due to their high-speed capabilities.

Charge Point Types	Power Output (kW)	Current/ Supply Type	Socket/ Plugs	Charging Duration (40kW battery)	Use Cases
Slow	<3.7	AC	Type 2 Socket	>12 hours	Home
Standard	3.7 - 8	AC	Type 2 Socket	6-12 hours	Home/ Destination
Fast	7 – 49	AC / DC	Type 2 Socket	2 to 5 hours	Destination
Rapid	50-149	AC	AC – Type 2	30 minutes to 80%	Destination/ On-route
		DC	DC – CHAdeMO		
		DC	DC – CCS Captive cables with plugs attached		
Ultra-rapid	150 +	DC	CCS 150kW+	Varies depending upon vehicle	On-route

Figure 4: Charging Point Types

Charging connectors

PIV cars and light vans are supplied with a charging cable used to connect the vehicle to low speed, standard or fast charge points. This cable has a plug specific to the vehicle on one end, and a suitable plug on the other end to connect to charge points in the UK. Some vehicles have separate charging sockets for low speed/ standard/ fast and rapid charging solutions, whilst some manufacturers have standardised around one vehicle-side socket for all charging solutions.

Charging cables are typically supplied with a Type 2 plug to connect to low speed and fast charge points in the UK. Charging cables are also available fitted with standard UK three-pin plugs, which are intended for infrequent use where Type 2 charging solutions are not available.

Rapid and high-power chargers do not use the cable supplied with the vehicle. Instead, these chargers are fitted with tethered cables and connectors that plug directly into the vehicle due to the high power being delivered. There are four socket/ plug formats used for rapid and high-power charging in the UK. Most vehicle manufacturers use the CHAdeMO or CCS DC socket/plug for rapid and high-power charging.

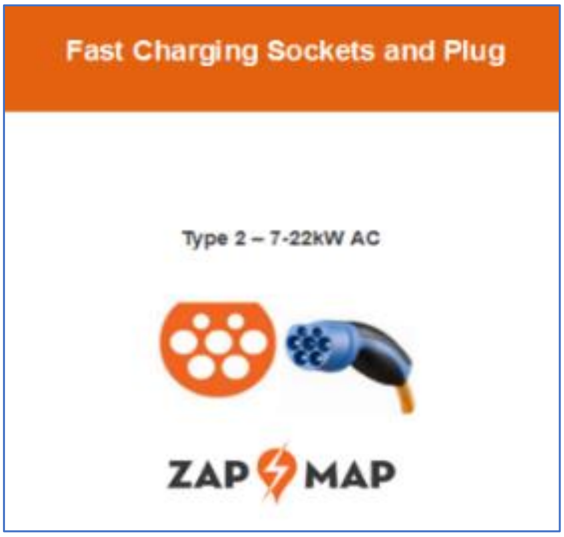


Figure 5: Charging sockets and plug types (Source: Zap-Map)

Smart charging

Regular charging commences as soon as the electric vehicle is plugged in, drawing the maximum amount of power available from the supply until the battery is fully charged. For large fleets, this could overload the available power supply causing practical power outages on-site, as well as financial penalties from the energy supplier. Alternatively, smart charging allows the monitoring and management of the charging session. The session can be managed remotely and control when, for how long, and how rapidly, the electric vehicle recharges.

There are currently three levels of smart charging available:

- Basic load balancing distributes the available power capacity equally between all charge points to prevent overloading and high energy costs at peak times.
- Scheduled/ static load balancing can also optimise charging schedules to take financial benefit from time of use energy tariffs.
- Dynamic load balancing can combine both static and dynamic data such as bus routes, next day plans and dynamic energy pricing. This ensures that the entire fleet is charged in time for individual departure at the lowest cost.

Wireless charging

Various national companies and national Governments across the world are trialling methods of wireless charging, attempting to iron out the questions raised on the topic such as retrofitting costs, whether infrastructure should be built if supply is not sufficient and vice versa, and the international standards needed for wireless charging to go global. Existing vehicle models do not include this technology and therefore there is not an immediate requirement for this infrastructure.

2.3. Opportunities and challenges for electric vehicle charging

EVs and the infrastructure needed to support them present a series of challenges and opportunities. Figure 6 summarises the factors considered in developing this Strategy.

Opportunities	Challenges
• Encouraging drivers to switch from petrol/diesel to electric vehicle will benefit local air quality and decarbonise transport as energy generation progresses from fossil fuels to renewable sources. • Chargers may attract electric vehicle users to an area and stimulate nearby shops and the local economy • Charge Point Operators (CPOs) offer concession contracts for chargers at little or no cost to local authorities and which may provide a revenue opportunity in the future. • The Council owns car parks located in urban centres close to both businesses and residential properties which have limited off-road parking. • The Council has control of highways land assets on major roads which could provide opportunities for rapid charging stops. • On-street charging infrastructure may offer locations for users to charge where there is no off-road alternative. • In the longer-term, as electric vehicle adoption accelerates, chargers could offer a new revenue stream for Councils	• Available power capacity on the electricity network varies across the borough and is limited in some areas, including key urban settlements. Upgrade costs are often high. • Access to working public electric vehicle charging is a key concern for electric vehicle drivers. • Instant access to electric vehicle charging networks often requires use of apps, roaming across charger networks is limited. • Owning and operating chargers and management of contracts generate costs for Councils while funding is constrained. • The business case for CPOs remains challenging whilst demand for EVs is still growing and some operators may not want to operate in low-use settings. • Nationally, approximately 25% of households have no access to home electric vehicle charging as they park on the street. • On-street chargers require space on the public highway. Some locations may present an obstruction to pedestrians. • On-street parking bays are limited in certain areas. Reserving bays for electric vehicle users may increase pressure on parking and require resources for the traffic order. • Risk of engraining car-dependency and undermining modal shift

Figure 6: Opportunities and challenges for developing a public electric vehicle charging network

3. Electric vehicle charging infrastructure supply and demand

3.1. Electric vehicle uptake in Cheshire West and Chester borough

To support the drive to reach net zero carbon emissions by 2050, the UK government has set out its ambitions to end the sale of new petrol and diesel cars by 2030, bringing the end date forward by 10 years from that proposed in the Road to Zero.

electric vehicle ownership in Cheshire West and Chester is growing steadily, in line with global trends. Figure 7 shows the growth between 2009 Q4 and 2022 Q2 in the proportion of EVs in the wider Cheshire West and Chester vehicle fleet compared to:

- Cheshire East
- Warrington
- Merseyside
- York
- Oxford

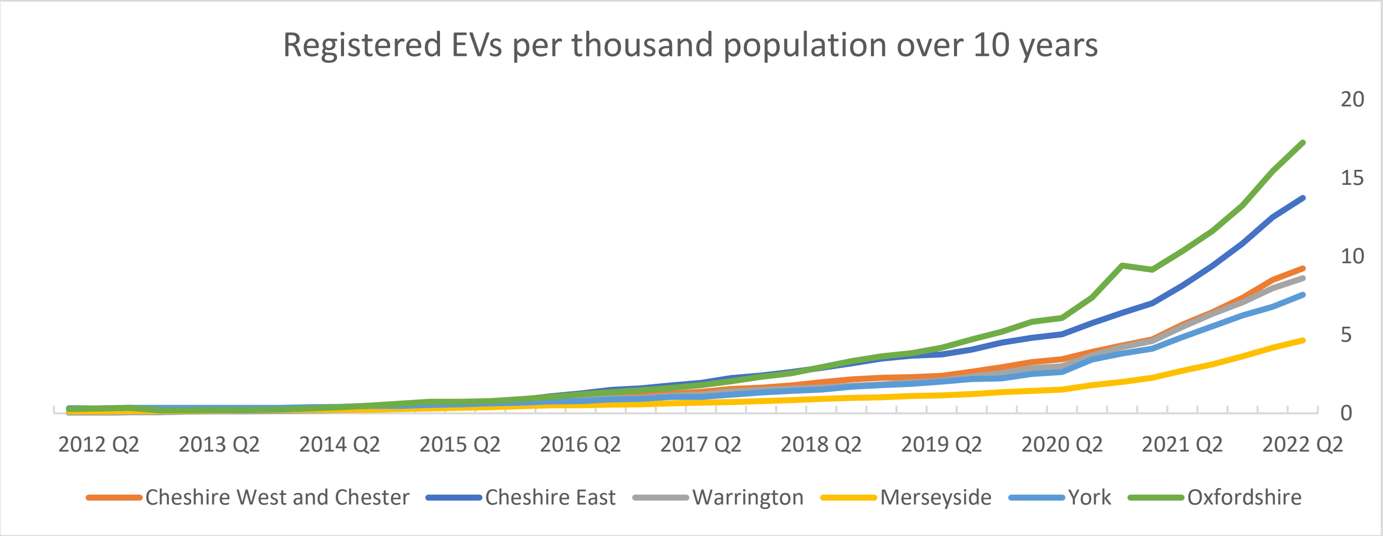


Figure 7: Registered EVs per 1000 population (2012 – 2022) (Source: ONS)

3.2. Current electric vehicle charging provision

Figure 8 illustrates the current distribution of electric vehicle charging infrastructure charge points across the UK.

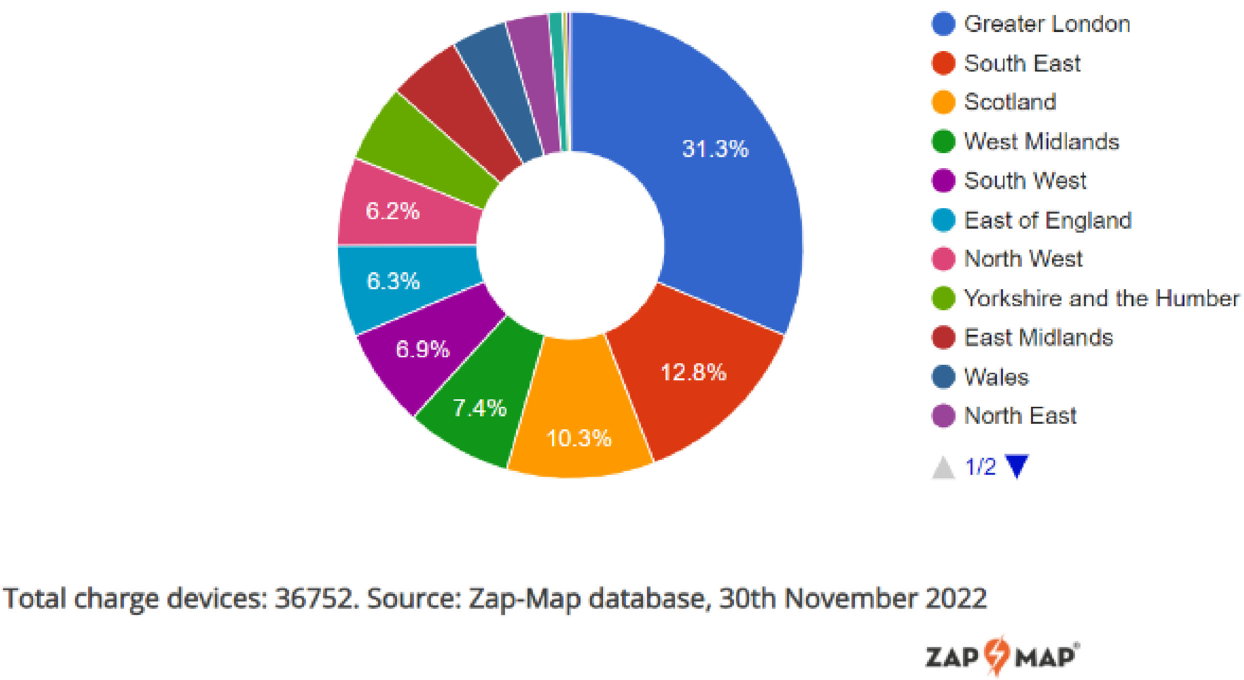


Figure 8: Total Connectors by Region (Source: Zap-Map 2022)

Public electric vehicle charging infrastructure in Cheshire West and Chester is currently limited and patchy, with most centred in urban areas and little provision in smaller market towns or more rural areas. The latest national data suggests there are currently 176 public chargers within Cheshire West and Chester borough, divided by speed as set out in Figure 9. Figure 10 and Figure 11 demonstrate how this compares with regional and national averages across the UK.

Charger speed	Number of sites	Number of charge points
Ultra-Rapid	2	4
Rapid	12	35
Standard/ Fast	32	110
Low Speed	1	1
Total	**48**	**150**

Figure 9: Public electric vehicle chargers in Cheshire West and Chester by speed

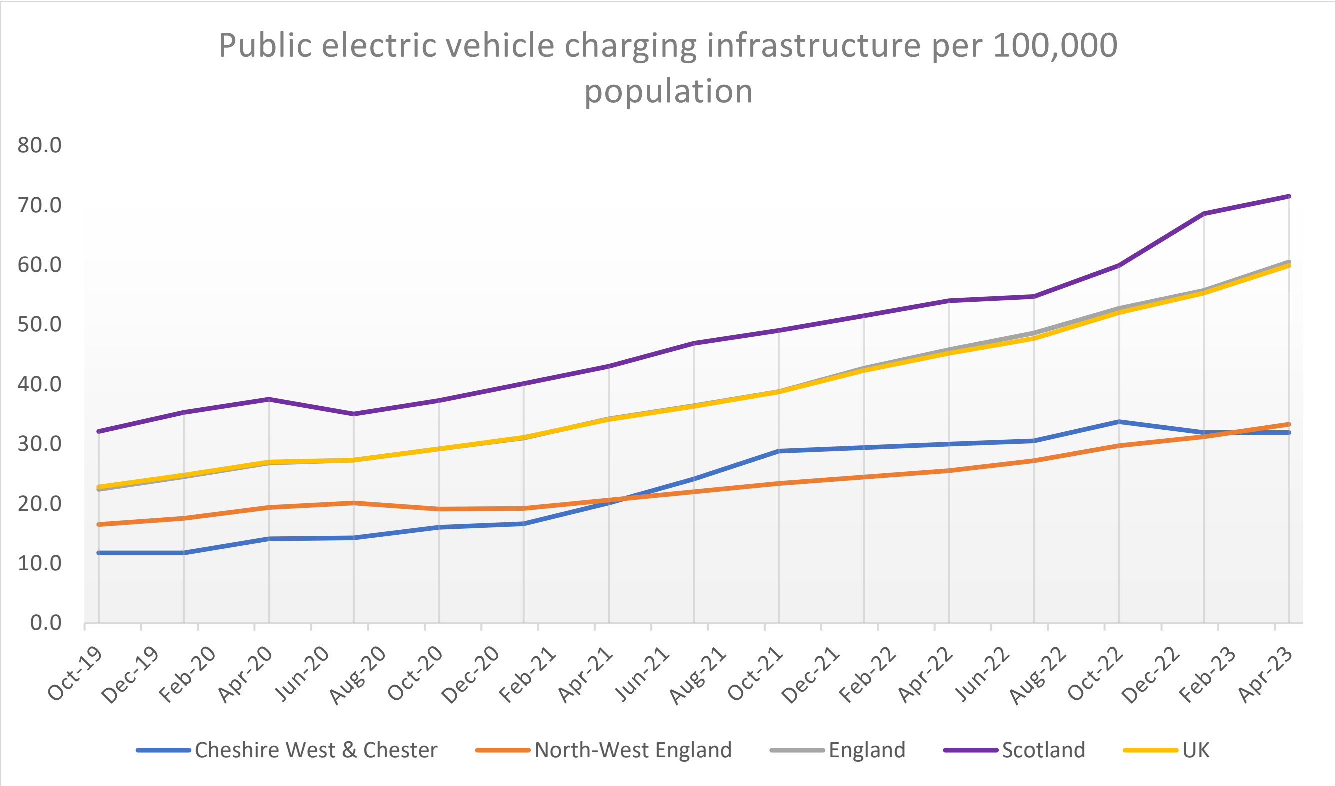


Figure 10: Regional comparison of public charge points per 100,000 population

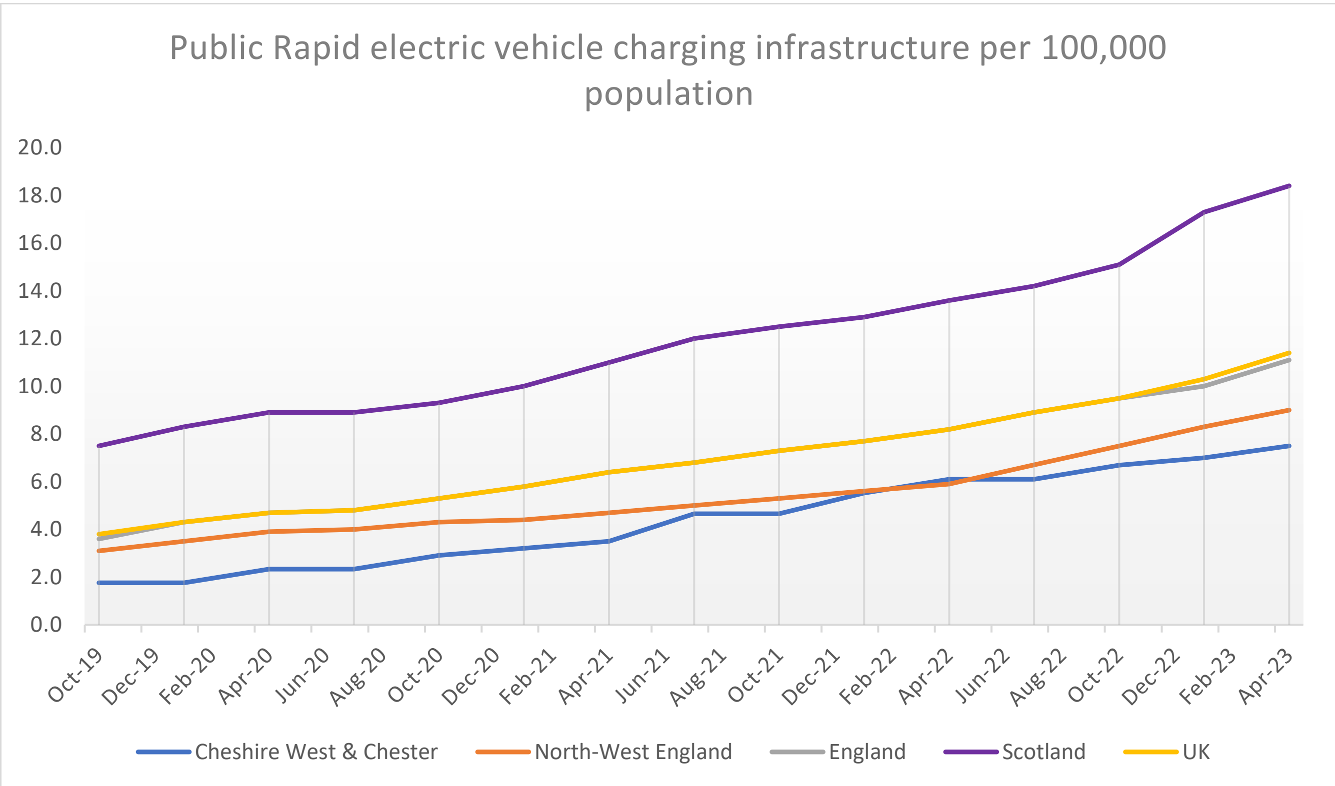


Figure 11: Regional comparison of public rapid/ ultra-rapid charge points per 100,000 population

Figure 12 shows the locations of the existing electric vehicle chargers within Cheshire West and Chester borough, categorised by charging speed. This shows that there is less charging infrastructure in central and southern regions of Cheshire West and Chester, with no rapid / ultra-rapid chargers and few fast chargers in operation at the time of writing. This is likely to be due to the rural nature of these areas, which generally have a lower population and more dwellings with off-street parking than urban areas. These factors therefore result in lower demand for charging infrastructure. Furthermore, limited charging infrastructure along key corridors such as the A41, A49 and A51 reduces the viability of on-route charging.

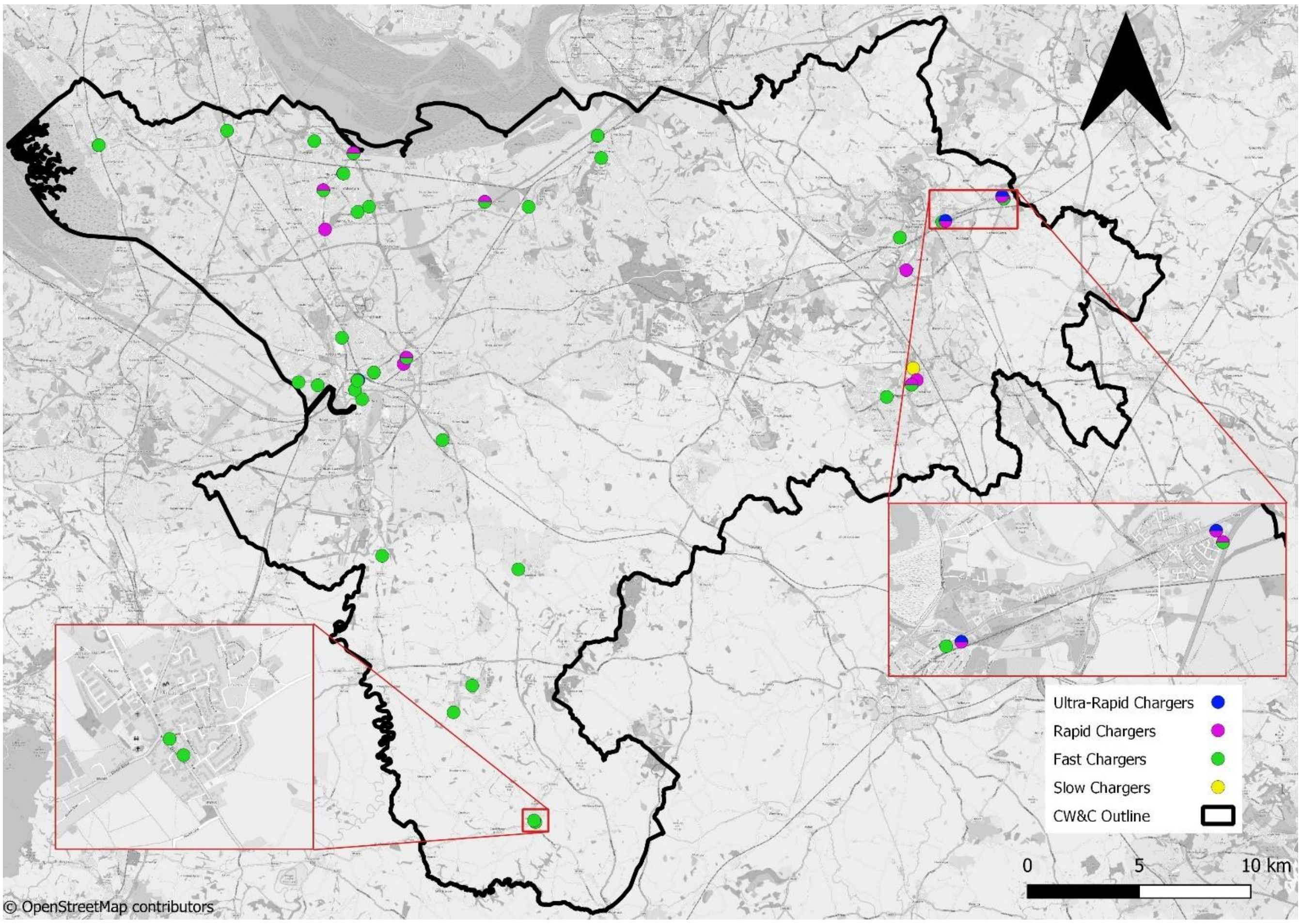


Figure 12: Electric vehicle charging infrastructure in Cheshire West and Chester (Source: Zap-Map)

Council-led electric vehicle charging infrastructure installations to date

The Council currently own and operate 34 standard/ fast chargers located in eight Council car parks across the borough, as well as 2 rapid chargers located adjacent to the National Waterways Museum in Ellesmere Port. The majority of chargers are twin charge points, allowing two vehicles to charge simultaneously and consequently there is presently capacity on the Council network for 69 vehicles to charge at the same time.

The chargers have been installed through a range of funding sources to supplement private and commercial chargers with the aim of supporting residents and businesses in the transition to electric vehicles.

Comparison with other local authorities

Figure 13 shows a comparison of charge points in Cheshire West and Chester against a number of similar sized authorities, in terms of population. The existing EVs per outlet ratio in the borough is above the UK average of 36.

District/ Area	Population (mid-2021)	Total electric vehicle registered (Q3 2022)	Total Number of outlets (Q4 2022)	Total EVs per outlet
Cheshire West and Chester	357,200	3,376	59	57
Cheshire East	398,800	5,633	69	82
East Riding of Yorkshire	342,200	2,748	29	95
Wakefield	353,300	2,298	60	38
Leicester	368,600	2,192	69	32
Coventry	345,300	2,916	678	4
Bournemouth, Christchurch, and Poole	400,300	3,169	62	51
Dorset	379,600	3,715	81	46
United Kingdom	67,281039	938,182	25,750	36

Figure 13: Cheshire West and Chester Area Charging Outlets Against Comparative Areas (Source: NCR, December 2020[4])

Current utilisation within Cheshire West and Chester

Cheshire West and Chester hold electric vehicle charging utilisation data for locations that we are responsible for operating and maintaining. Using this data, Figure 14 sets out analysis of nine public sites with a minimum of two electric vehicle charge points, detailing the monthly average number of charges at each location and the average monthly power usage. Figure 15 shows the location of each of these chargers. Utilisation varies significantly by site and by area. Data relating to the new multi-storey carpark (MSC) at Northgate in Chester is not available as the site has not been open for long enough to allow proper comparison.

While each site will be used for a variety of charging purposes (residential, destination and on-route), to provide an indication of the predominant use case for each location, the following assumptions were made:

- Vehicles that are on-route would charge for up to 30 minutes.
- Vehicles using the location as their destination would charge for between 30 minutes and four hours; and
- Vehicles using the location for residential charging would charge for over four hours.

[4] The NCR is not updated as frequently as Zap-map, therefore higher figures may be quoted here than in other figures elsewhere in this report

Car Park	Area	electric vehicle Charge Point Type	Total Uses	Total kWh	Average Sessions per day	Average Power per session KW	Predominant Use (Estimated)
Bishop Street Car Park	Chester	4 x 22 kW fast charge points	1,456	29,145	4.0	19	Destination
Brook Street Car Park	Chester	4 x 22 kW fast charge points	1,177	13,921	3.2	12	Destination
Northgate MSC	Chester	21 x 7kW fast	-	-	-	-	TBC
Boat Museum	Ellesmere Port	2 x 22 kW fast	214	2563	0.6	12	Destination
Boat Museum	Ellesmere Port	2 x 50 kW rapid	2171	46087	5.9	21	Destination
Shrewsbury Road Car Park	Ellesmere Port	4 x 7 kW charge points	437	8,799	1.2	15	Destination
Moor Lane Car Park	Frodsham	4 x 7 kW charge points	502	6,044	1.4	13	Destination
Chester Road Car Park	Neston	4 x 7 kW charge points	1,074	19,981	2.9	19	Residential
Park Street Car Park	Northwich	4 x 22 kW fast charge points	325	9,289	0.9	26	Residential

Figure 14: electric vehicle Charge point utilisation (April – December 2021)

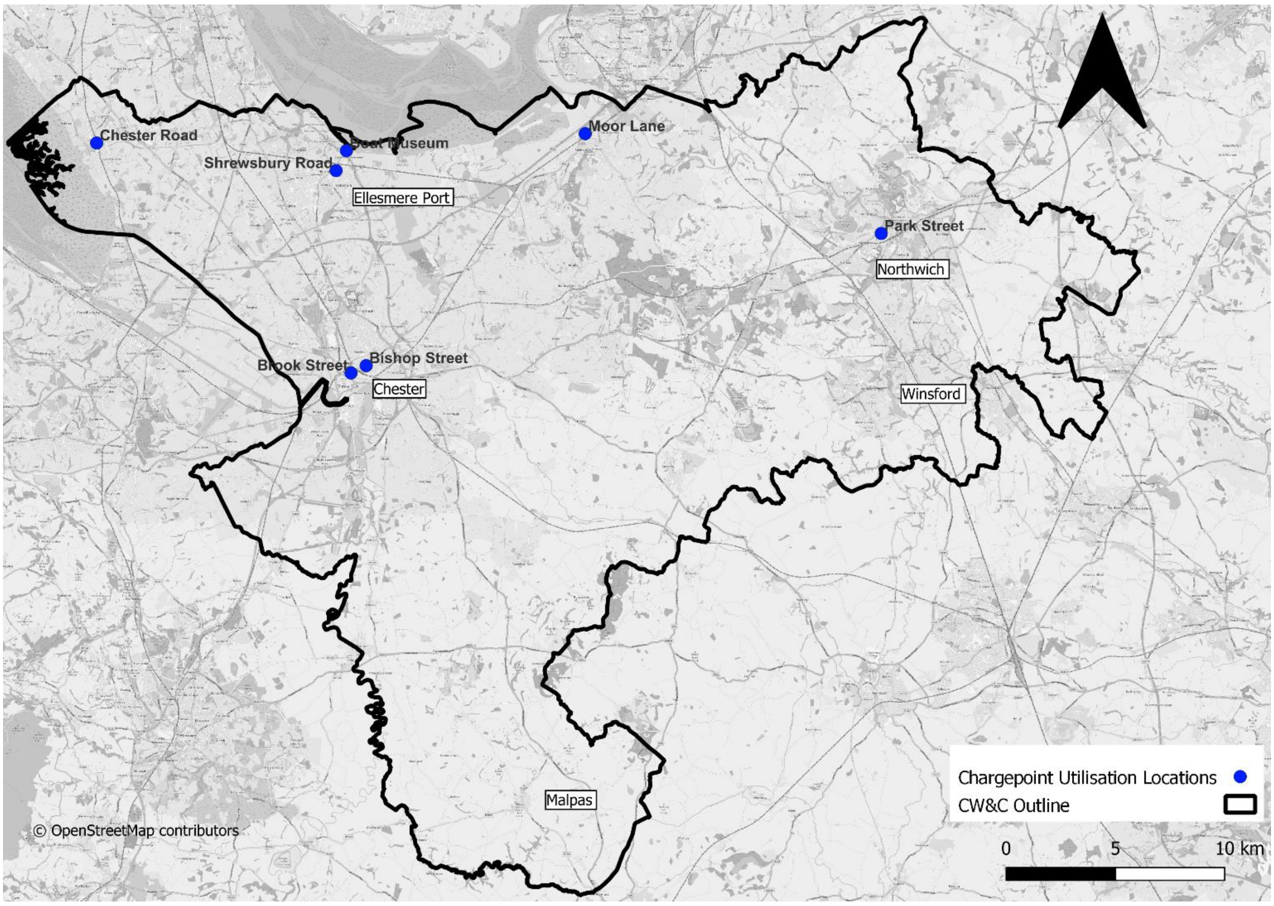


Figure 15: Charge point utilisation locations

The data suggests that the most popular charge point location is the Boat Museum Car Park, Ellesmere Port (6.5 uses per day/ overall 48,650 kWh). This is primarily because:

- It is situated near leisure, commercial and work facilities near Ellesmere Port.
- It is located close to the M53 motorway, which facilitates on route charging.
- There are few car parks in Ellesmere Port that currently have rapid electric vehicle charging infrastructure.

Bishop Street car park in Chester is also a highly performing charging site, likely due to its proximity to the retail area of Faulkner Street and the terrace housing of Westminster Road which offers limited off-street parking. In contrast, Moor Lane Car Park in Frodsham has the lowest usage (1.4 uses per day/ overall 6,044 kWh), despite being in the vicinity of the railway station and the high street.

The data suggests that, generally, the predominant use case for all sites is destination charging due to their proximity to retail and leisure facilities. However, Chester Road Car Park and Park Street Car Park predominantly support residential charging.

More detailed analysis of the data also demonstrates that, across all sites, usage rates are increasing year-on-year, likely linked to increased electric vehicle ownership in the local area. Installation of charging infrastructure gives local residents the confidence to purchase EVs, knowing they will be able to charge their new vehicles.

4. Anticipating future demand

A range of key factors can influence charging demand in different areas, including access to off-street parking spaces, demographics, geographic area, and commuter journey patterns. Chargers must be located in areas which are convenient to drivers, and have the space, energy, and network connections to make installations feasible.

4.1. On-street parking

Residents without access to off-street parking are unlikely to be able to accommodate private charging points, making it less attractive to transition to an electric vehicle both in terms of cost and convenience. Not everyone without off-road parking has a vehicle, and user habit trends are still emerging in relation to electric vehicles, but there are indications that around 25% of all cars nationally are currently parked on streets overnight[5]. This is confirmed within the National electric vehicle Charging Strategy[6]. However, a network of public chargers is essential for drivers who do high mileage, travel long distances and/or have no access to chargers at home or work. The National electric vehicle charging infrastructure Strategy notes that 90% of all current electric vehicle drivers rely on the public charging network from time to time.

Figure 16 below provides an indication of households that are less likely to have access to private driveways and garages. The following dwelling types were considered to have limited off-street parking availability:

- Whole house or bungalow: Terraced (including end-terrace).
- Flat, maisonette or apartment: Purpose-built block of flats or tenement.
- Flat, maisonette or apartment: Part of a converted or shared house (including bed-sits).
- Flat, maisonette or apartment: In a commercial building; and
- Caravan or other mobile or temporary structure

Most on-street parking in Cheshire West and Chester is focused on the urban centres of Chester, Ellesmere Port, Neston, Northwich and Winsford, where terraced properties and high-density housing are key features of the urban landscape, and where air quality concerns are most acute.

[5] NTS0908 Vehicle mileage and occupancy - GOV.UK (www.gov.uk)

[6] UK electric vehicle infrastructure strategy - GOV.UK (www.gov.uk)

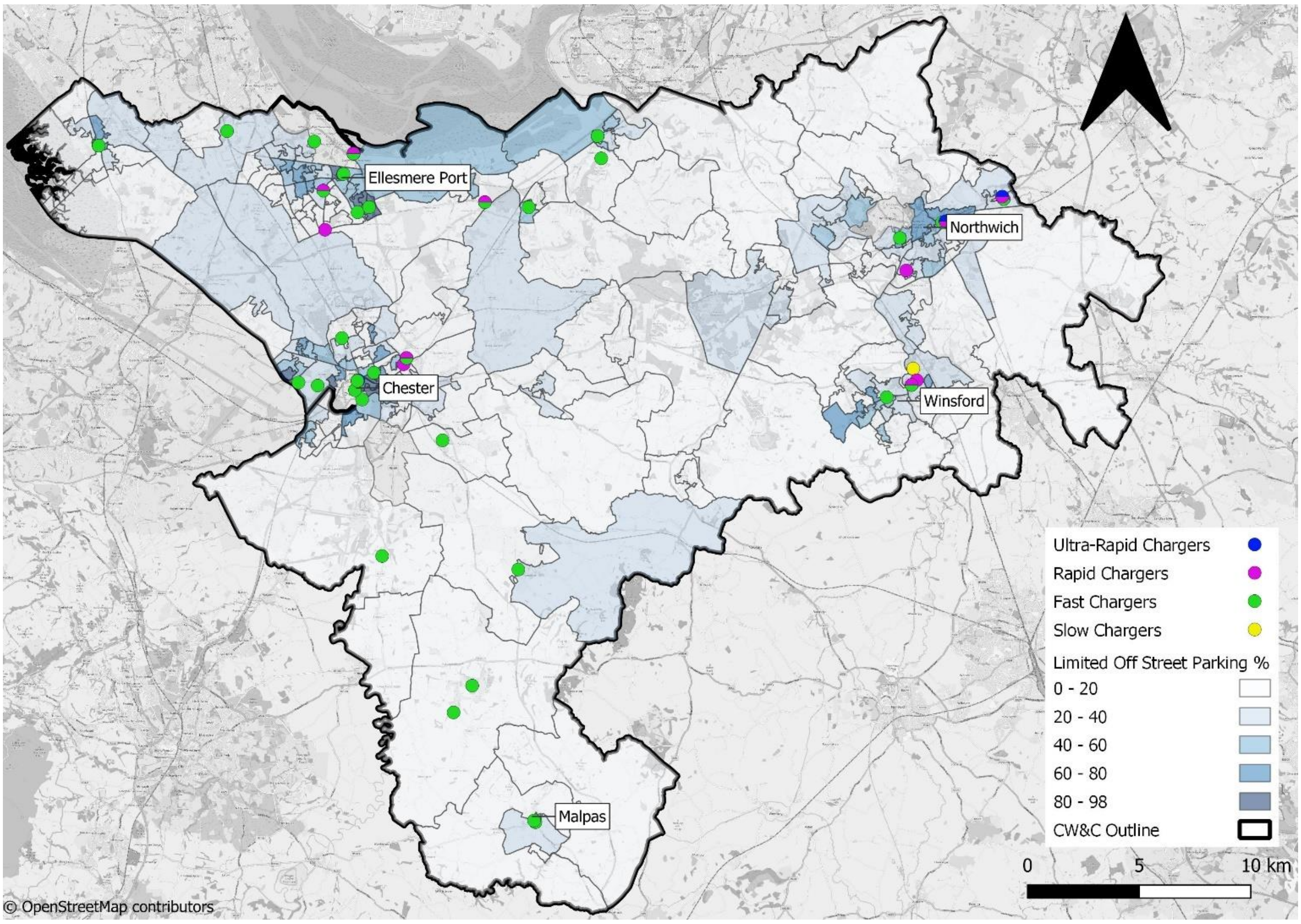


Figure 16: Existing Charging Points and Limited Off-Street Parking Availability (Source: Census 2021)

4.2. Demographic analysis

As set out in Section 4.1, there is currently an established link between income levels and the uptake of EVs. As this trend is expected to continue into the medium-term, income data has been analysed to help understand where stronger uptake of EVs may come forward. However, this strategy also considers how a balanced network can be provided across the borough, and the benefits of electrification do not solely benefit drivers (if delivered as part of a comprehensive multimodal strategy).

Figure 17 shows the English Indices of Deprivation (EID) across the borough. This analysis suggests that the most deprived areas include the areas North and East of Ellesmere Port, Winsford, Northwich and some areas of Chester. The least deprived areas are outside of the main urban areas and focused on the centre and north of the borough.

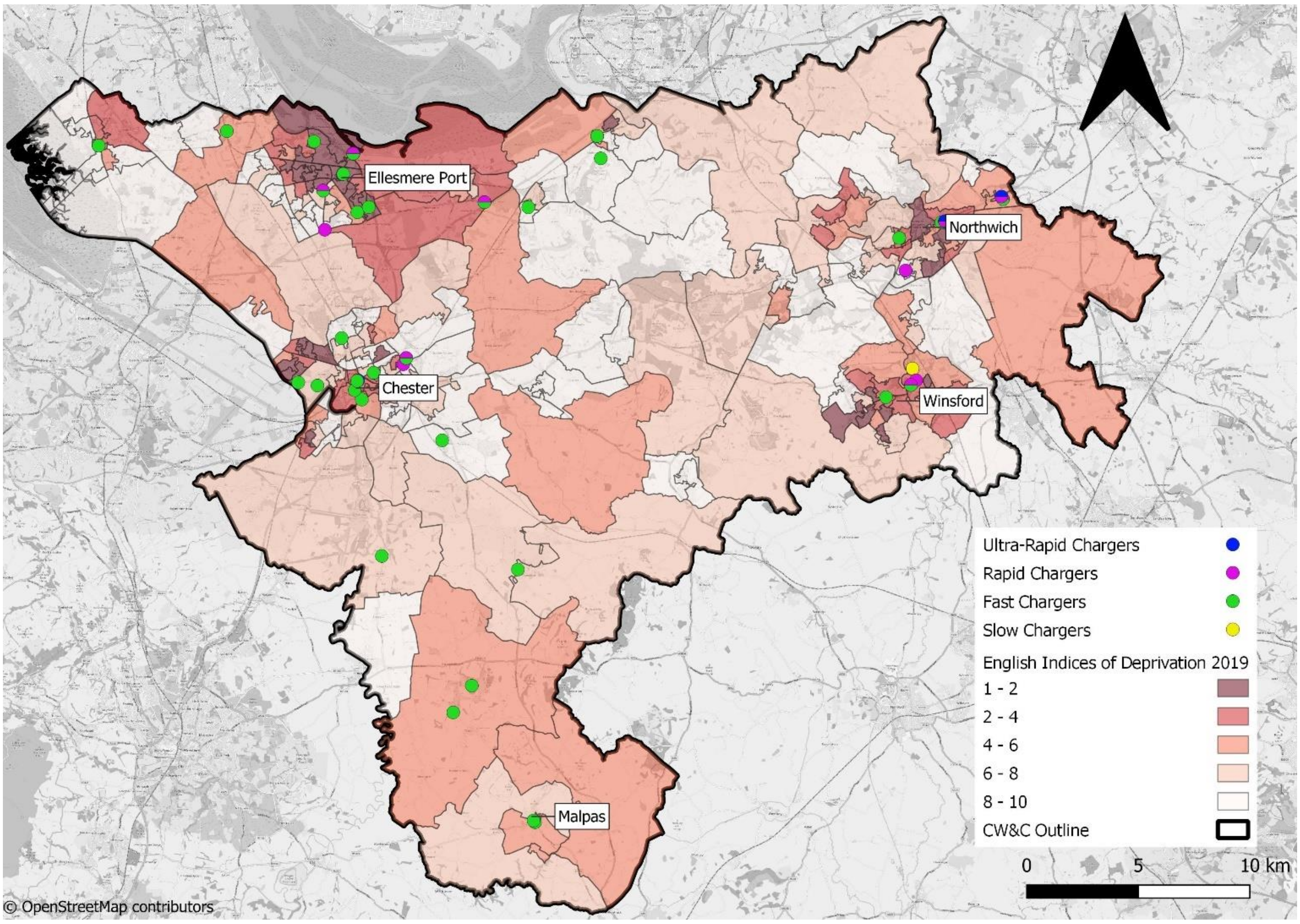


Figure 17: English Indices of Deprivation across Cheshire West and Chester Borough (Sources: Zap-Map and GOV.UK)

4.3. BEV and PHEV ownership

Figure 18 presents Battery electric vehicle (BEV) ownership across the region, whilst Figure 19 presents PHEV ownership. While overall ownership remains low, ownership is higher in the east and central areas, this follows the general pattern of the EID as discussed above. Areas located on key commuter corridors tend to experience higher levels of ownership.

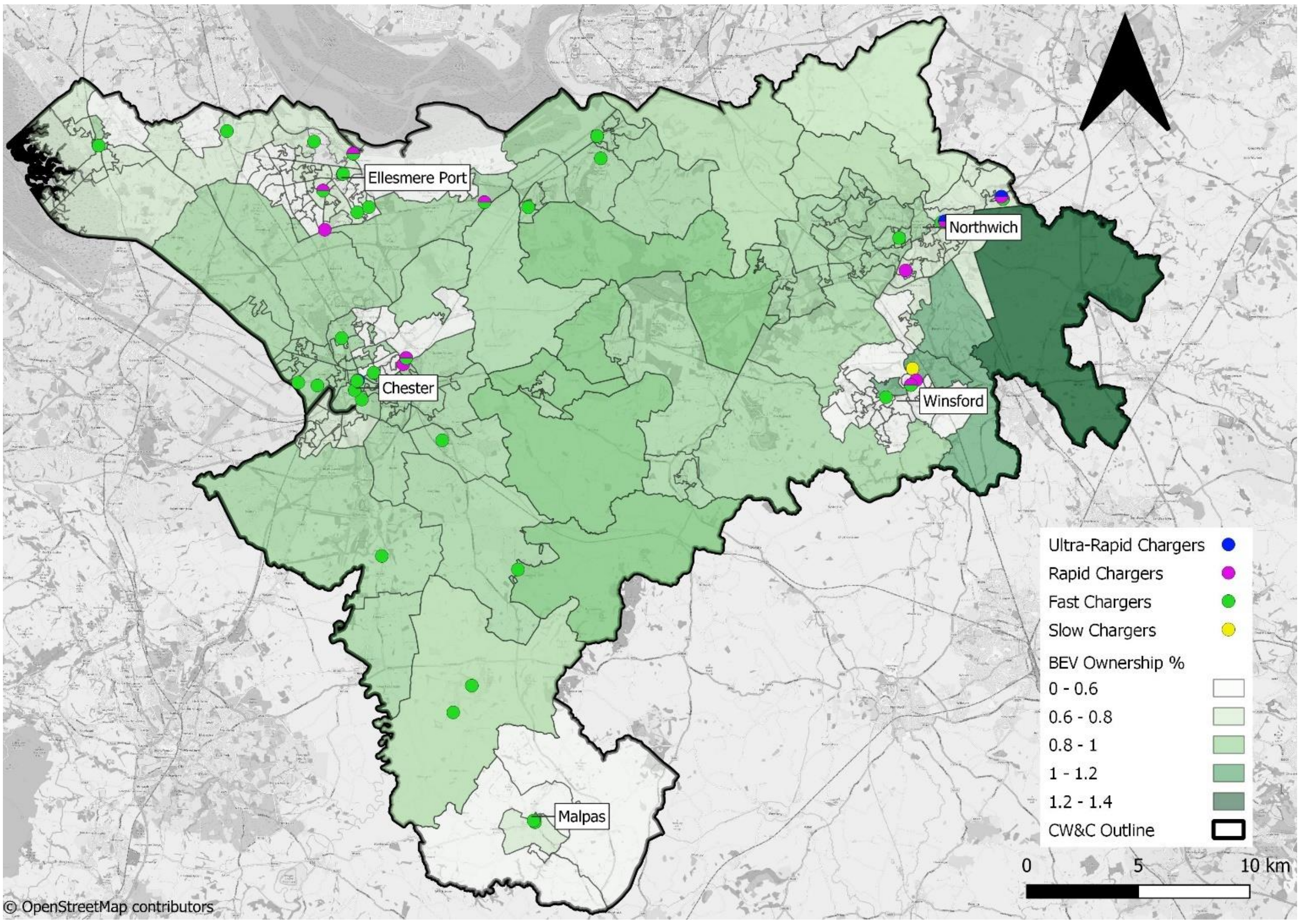


Figure 18: Battery electric vehicle Ownership (Source: Zap-Map and GOV.UK)

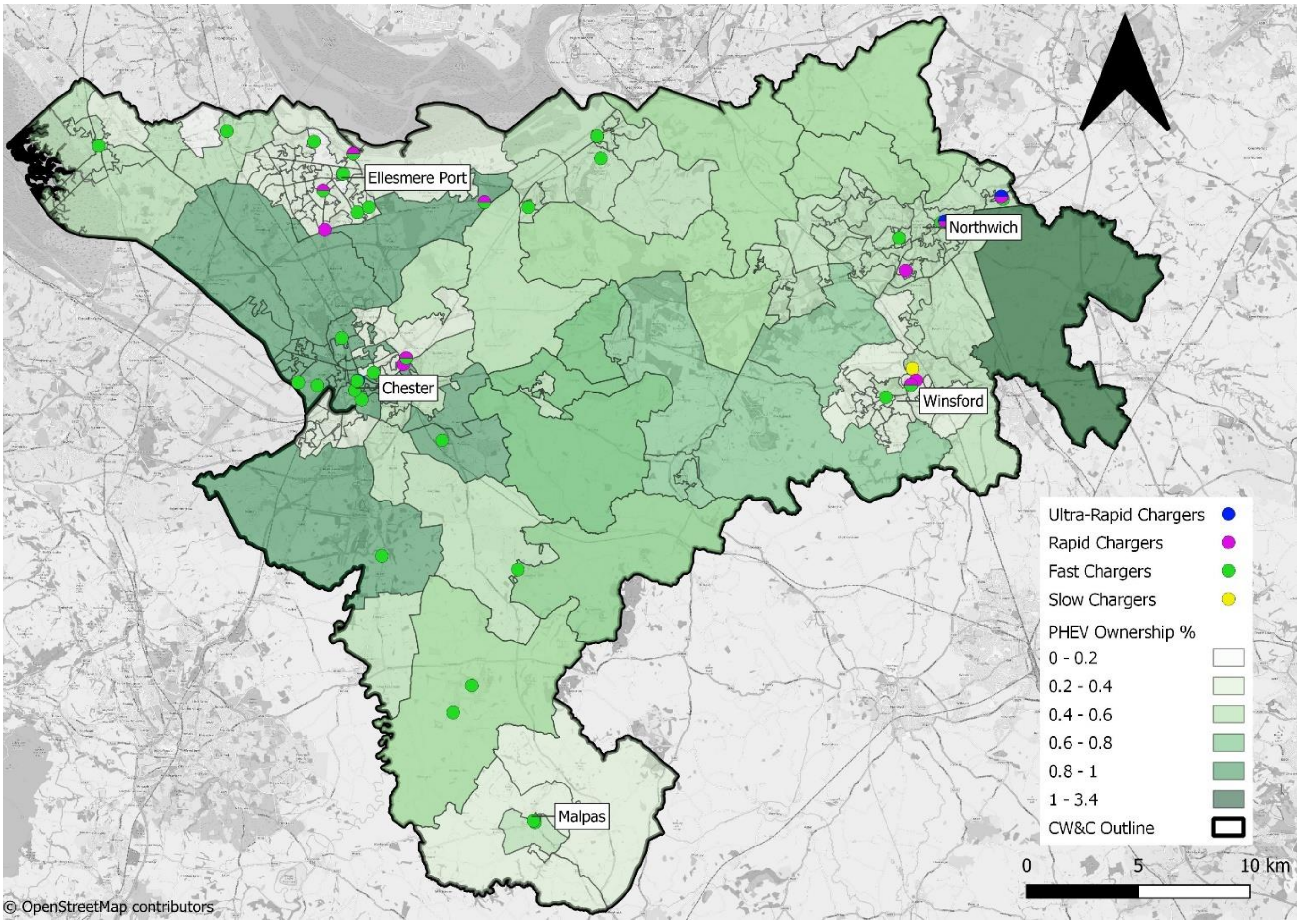


Figure 19: Plug-In Hybrid electric vehicle Ownership (Source Zap-Map and GOV.UK)

National Electric Vehicle Insights and Strategy electric vehicle uptake forecasts

The National electric vehicle Insights and Strategy (NEVIS) service, delivered by CENEX, is a national tool developed to support English local authorities in the development of their electric vehicle charging infrastructure strategies. It provides reliable, independent, up-to-date information on Electric Vehicles and electric vehicle charging infrastructure

Figure 20 below provides a forecast of electric vehicle uptake by fuel type to 2050, based on a scenario including the proposed 2030 ban on the sale of new petrol and diesel cars and vans. It is important to note that the average lifespan of vehicles means petrol and diesel vehicles will continue to make up a substantial portion of the overall fleet of vehicles until the late 2030s.

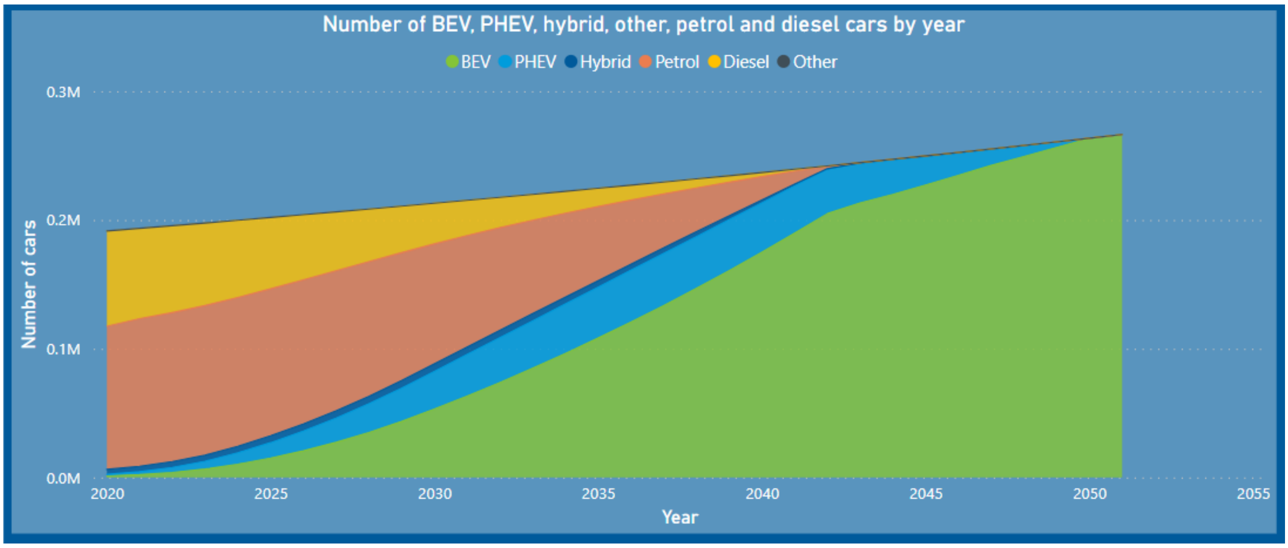


Figure 20: Projected uptake of EVs in Cheshire West and Chester borough by fuel type 2020-2051 (Source: NEVIS Insights Toolkit, 2022, Cenex)

4.4. Spatial modelling – future uptake of electric vehicles

Outputs

The Council has utilised a geospatial model to forecast increase in uptake of electric vehicles across the borough until 2050. Details of the model are set out in Appendix 1.

The spatial results for electric vehicle uptake across Cheshire West and Chester are shown in Figure 21. This shows that the greatest variation in electric vehicle uptake density occurs between 2025 and 2035, particularly within the main urban areas. However, except for Helsby and Frodsham, the model forecasts that settlements central and in the south of the borough will not experience significant increases in electric vehicle density until at least 2035. The distribution of EVs within the borough generally follows population density.

Given government commitments to introduce a 2030 ban on sale of diesel and petrol vehicles, and in line with Figure 20 above, it is assumed that almost all non-electric vehicles will be removed from the network by 2045. Growth in EVs from this date will be predominantly driven by demographic changes, new residential/ commercial developments, and changes in society's relationship with transport. Accurately predicting the scale of change beyond this point, which could be induced by any of these variations, is out of scope for this strategy.

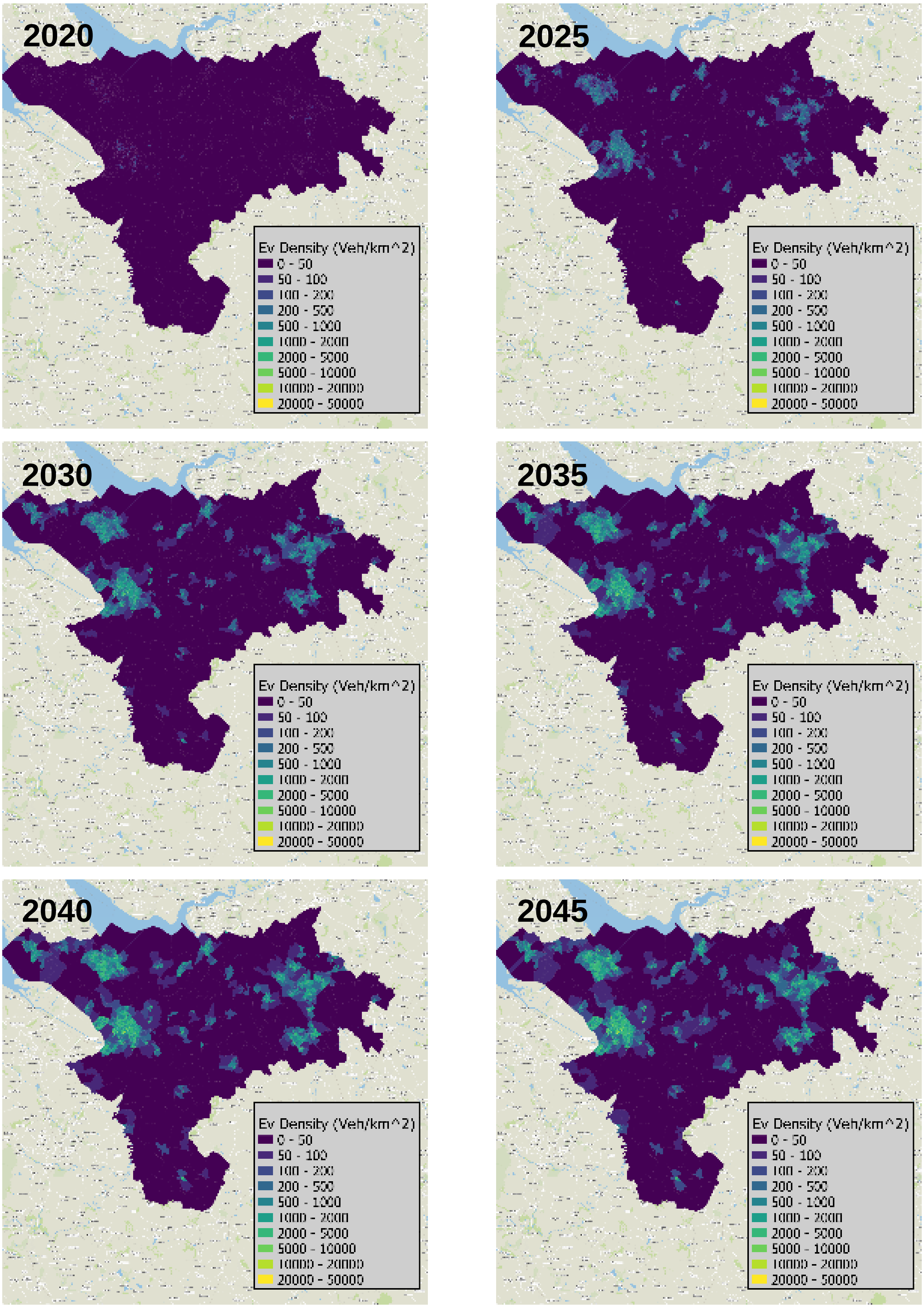


Figure 21: Spatial uptake of EVs by forecast year

Overview of Model

The usage potential for any charging site depends on many different factors, but the most important is the total number of EVs. This is not a static number, either spatially or temporally. Therefore, it was important to develop a model that can handle both the variation in location and the year of interest.

To understand how the public fleet will transition to EVs, the model includes a function to assess how new technology will diffuse into an existing fleet. The diffusion of the new vehicle models was governed by two important characteristics outlined below

Characteristic	Description
Rate that new vehicles are purchased	This determines the "churn" of vehicles within the overall fleet. If few new vehicles are being purchased (e.g., due to a recession), there will be a substantial reduction in the transition to EVs as the population of vehicles is not being replaced.
Probability of new vehicle purchases being an electric vehicle	If the fleet is to transition to EVs, the probability of each new vehicle being an electric vehicle should increase to 100%. This aligns with the 2030 target that has been set by the UK Government.

Income data for each Middle Super Output Area (MSOA) and the ratio of new vehicle to existing vehicle registrations was used to generate a probability of new vehicle purchases. This variable alters with income due to the strong relationship between average income and new vehicle purchase rates.

To calculate the probability of new vehicle purchases being an electric vehicle, a choice model was used. This model is a technique for providing a systematic method of choosing between multiple options, each of which may have benefits associated with it. The choice model used was a Binary Logit Choice Model, with changing variables over two alternatives. This allowed the probability of choosing between two distinct options available to the purchaser to be calculated. The general form of this model is shown below.

$$P(C_1) = \frac{\exp(\lambda U_1)}{\exp(\lambda U_1) + \exp(\lambda U_2)}$$

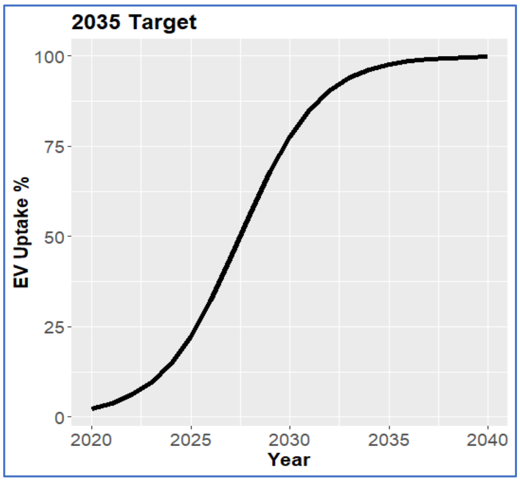
Here, C_1 represents Option 1 and U_1 represents the Utility of that choice (defined below). λ is a parameter used to determine the sensitivity to change for the utility values within the model. The utility in this case is defined through a combination of income and electric vehicle price.

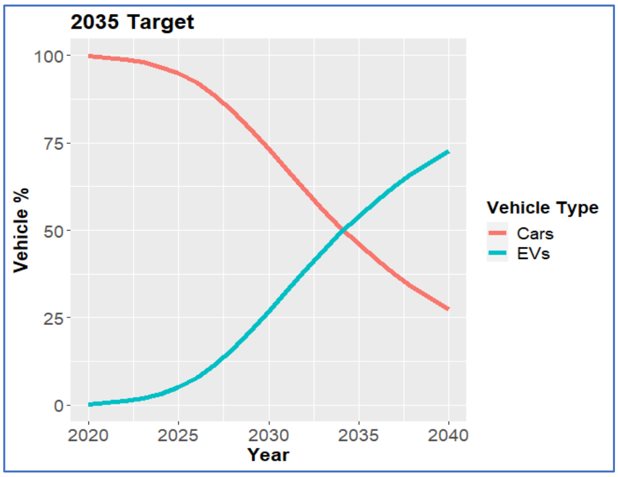
From this model, a stock flow equation was created to govern the movement of vehicles into and out of the public fleet.

$$Fleet_{2021} = Fleet_{2020} + New\ Vehicles_{2021} - Scrapped\ Vehicles_{2020}$$

The fleet in 2021 is governed by the fleet in 2020 plus all new vehicles from 2021, minus those vehicles scrapped in 2020. The new vehicles will comprise a mix of ICE and electric vehicle.

The two charts below show that the number of EVs in the fleet lags behind the 2035 target. Even though 100% of all new vehicles by 2035 will be EVs, the fleet will only contain approximately 50% EVs.





Data Review of Information Feeding into the Model

The model has been constructed, where possible, through the combination of publicly available data sets shown in the table below.

Data	**Description**	**Use**
Current electric vehicle Sales	The current electric vehicle sales by Local Authority	To determine both the current state of the electric vehicle market and also used to verify the uptake model.
Current Car Totals	The current car totals by Output Area	To disaggregate electric vehicle uptake into smaller zones.
Housing Distribution	Total numbers of houses, including housing type by Output Area	To determine the percentage of homes with off-street parking.
Income Distribution	Median income by MSOA	To determine both electric vehicle uptake percentage and the probability of purchasing a new vehicle.
Employment Distribution	Employment type by LSOA	To determine the destination charging potential using different employment types to categorise the zones.
Journey to Work OD Matrices	Survey data from MSOA to MSOA	To determine journey charging potential.
OpenStreetMap Road Network	Open-source road network	To construct a graph network of the UK which, with the journey to work matrices, is used to model long

		distance movements.

4.5. Commuting and travel pattern analysis

In addition to uptake of EVs and demographic factors, the demand for electric vehicle charging infrastructure will depend on the movement of vehicles. Journey to work data from the 2011 census has been used to estimate commuting journeys within the borough. This has been combined with data from the National Trip End Model to provide an estimated ratio for weekday to weekend trips.

Figure 22 shows the ratio of long to short journeys within the borough, collated by where journeys begin and end. Within the map, the areas with a higher ratio (those in yellow/ orange) have a greater proportion of long-range trips. Where longer journeys are forecast (primarily rural areas), this suggests that these areas would require more frequent charging.

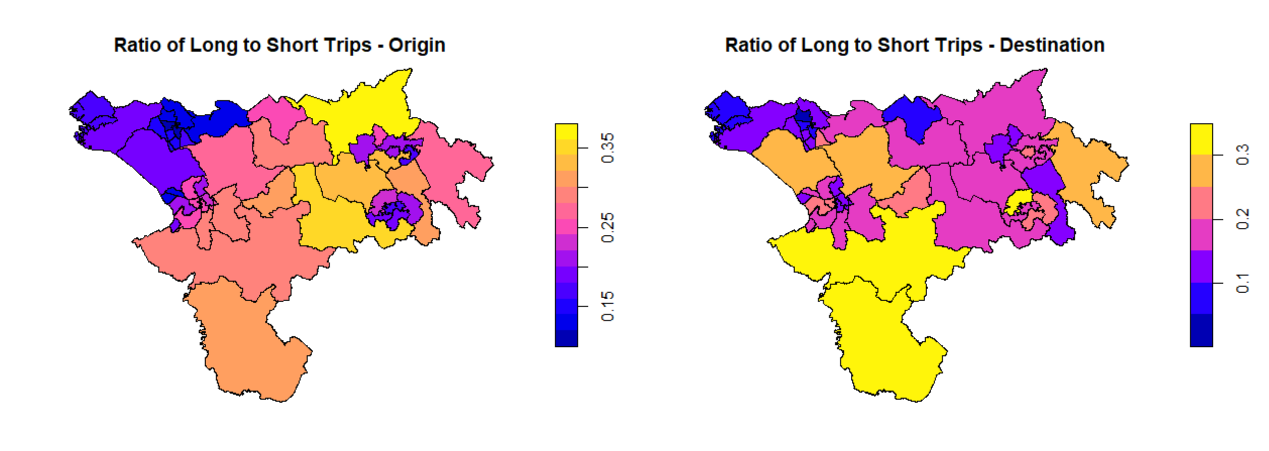


Figure 22: Ratio of long to short journeys for destinations and origins

Figure 23 shows the ratio of weekend trips to weekday trips. The areas with a higher ratio are those where the trips during the weekend are greater than those during the week. Weekend trips are likely to be generated by leisure and other non-work-related activities, which could serve as an indicator for charging during non-weekday time periods. Areas around Winsford and Northwich show substantially lower ratios than average, likely caused by the different usage patterns and a concentration of different usage types.

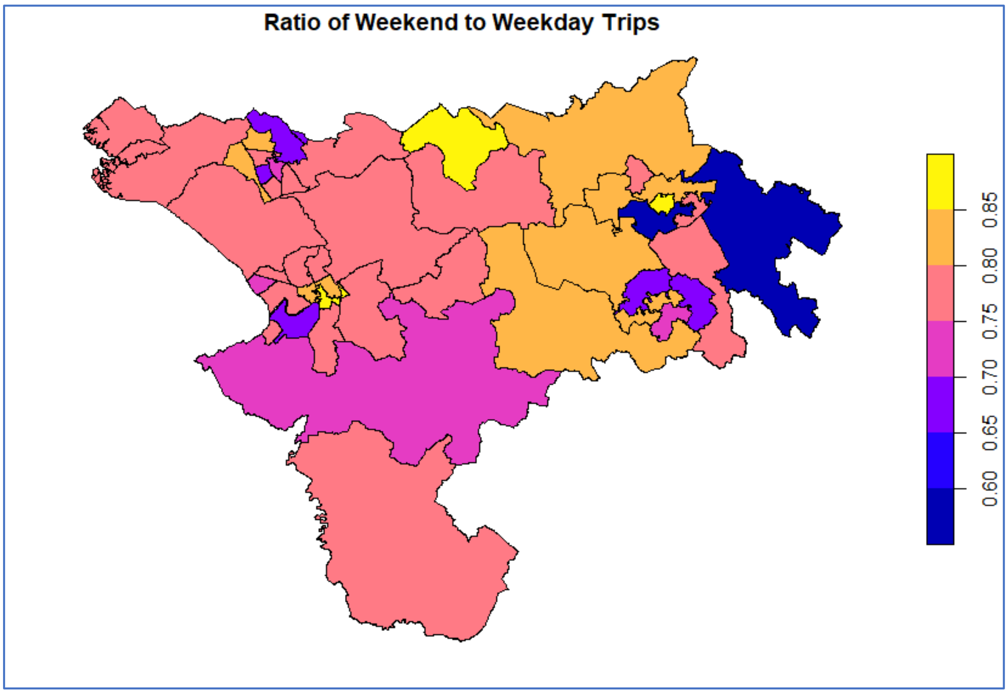


Figure 23: Ratio of weekend to weekday journeys

Finally, Figure 24 shows the ratio of work to non-work trips across the borough. The few areas showing a higher proportion of weekend to weekday trips also have a comparative reduction in work trips compared to non-work trips. This suggests that:

- Chargers with lower power could be provided in areas of high weekday workplace trips (by destination) because they serve people who are parked for a longer period of time
- The provision of rapid charging on route may be less necessary, because that the vehicle will likely be stationary for an extended period of time at their destination. If their destination was a typical non-workplace destination (sporting event, shopping etc.), the dwell time of the vehicle would be less, meaning a reduced capacity to charge.

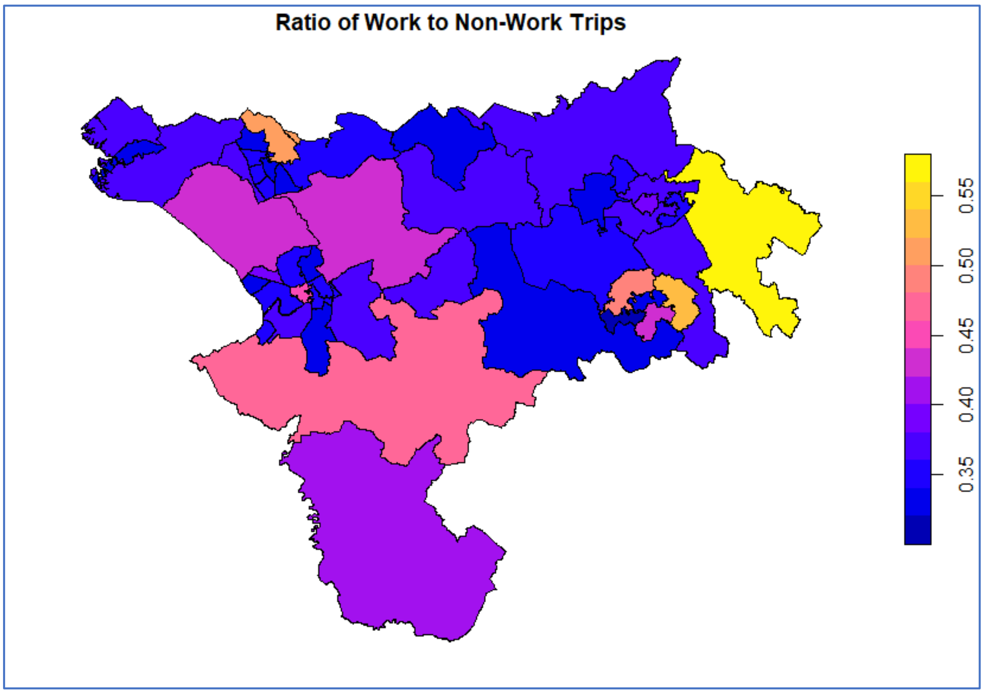


Figure 24: Ratio of work to non-work trips

4.6.Second-hand vehicle uptake

The majority of analysis of electric vehicle uptake focuses on the purchase of new EVs, as it is the influx of EVs into the overall vehicle marketplace that will determine the overall success of the transition to electromobility. However, the final distribution of those vehicles (such as where they are parked at night, where they are parked during the day, who owns them etc.) will also be determined by the second-hand market.

Data on second hand purchases of EVs is difficult to obtain. As current levels of electric vehicle ownership are relatively low, the probability of those EVs being sold on second-hand is even lower. However, in the future this could be a key market in Cheshire West and Chester due to affordability and strong sales of nearly new vehicles.

The RAC report "Car Ownership in Great Britain"[7] shows the average length of time that a new vehicle is owned for, at circa 14 years. Based on the assumption that a new vehicle, once sold on, is then distributed across the local area purely weighted by the overall level of vehicle ownership, it is possible to produce an approximate estimate of electric vehicle population distribution.

Figure 25 shows that the total number of second-hand EVs is expected to steadily increase from 2025 and form a majority of total electric vehicle sales by approximately 2035. Therefore, analysis and procurement of electric vehicle charging infrastructure beyond 2030 must take this into account to ensure that the charging network remains accessible to all owners.

[7] Car ownership in Great Britain (racfoundation.org)

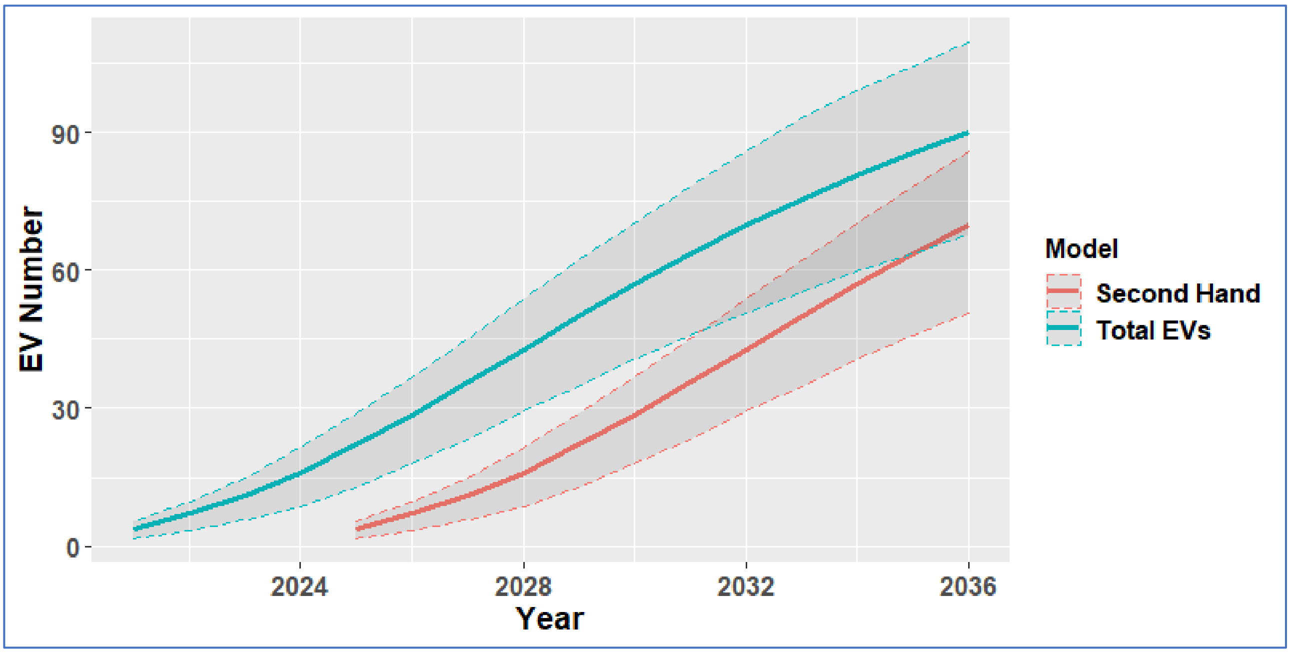


Figure 25: Estimated second-hand electric vehicle uptake rates

As shown in Figure 26, the inclusion of second-hand vehicles leads to a redistribution of EVs from the original high uptake areas (urban centres) to those which were not previously expected to see as much demand (rural areas) within the borough. However, it should be noted that growth in the second-hand electric vehicle market is later than new EVs, and any associated electric vehicle charging infrastructure demand will therefore also follow later.

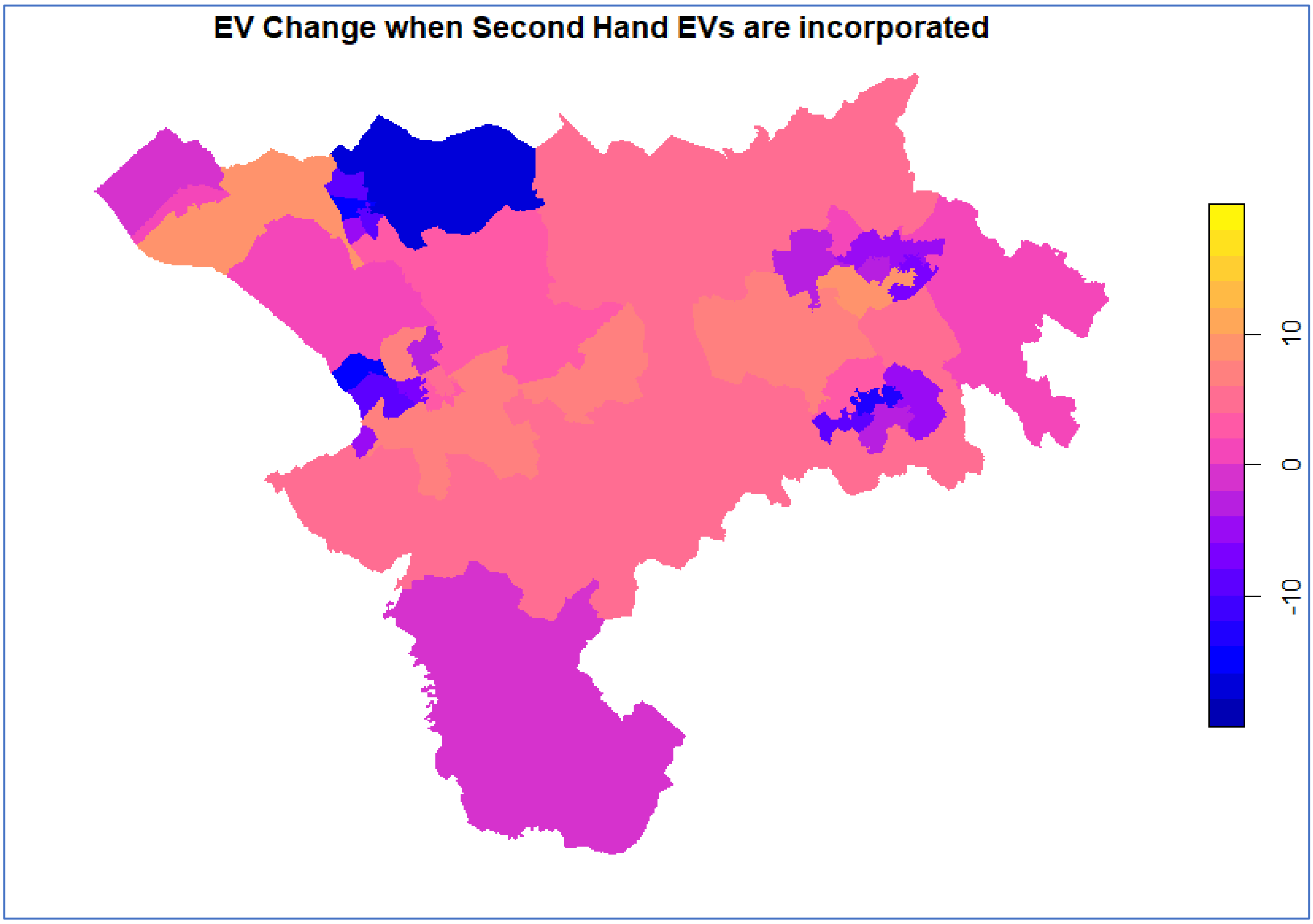


Figure 26: The impact of second-hand electric vehicle market on electric vehicle uptake distribution

4.7. On-street charging demand

The Strategy sets out a tiered approach to providing charging facilities for residents without access to off-road parking. This approach prioritises the use of local charging hubs in council car parks within a 5-minute walking distance. Analysis has been carried out to identify the areas outside this distance to help inform where on-street facilities may be required. This will be subject to further assessment and appraisal when planning roll-out of the borough's public charging network.

Green diamonds indicate council-controlled or Brio Leisure car parks. Streets coloured darker red indicate higher unmet forecast charging demand.

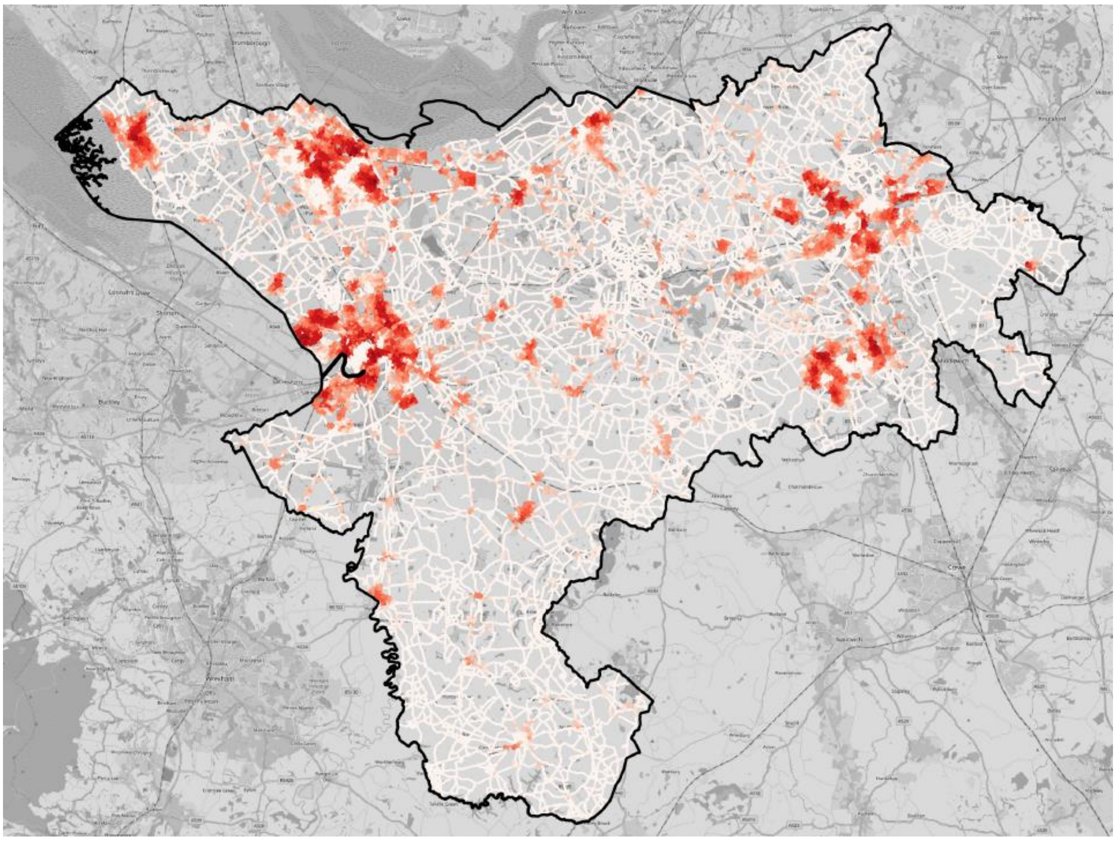


Figure 27: Residual on-street charging demand - boroughwide

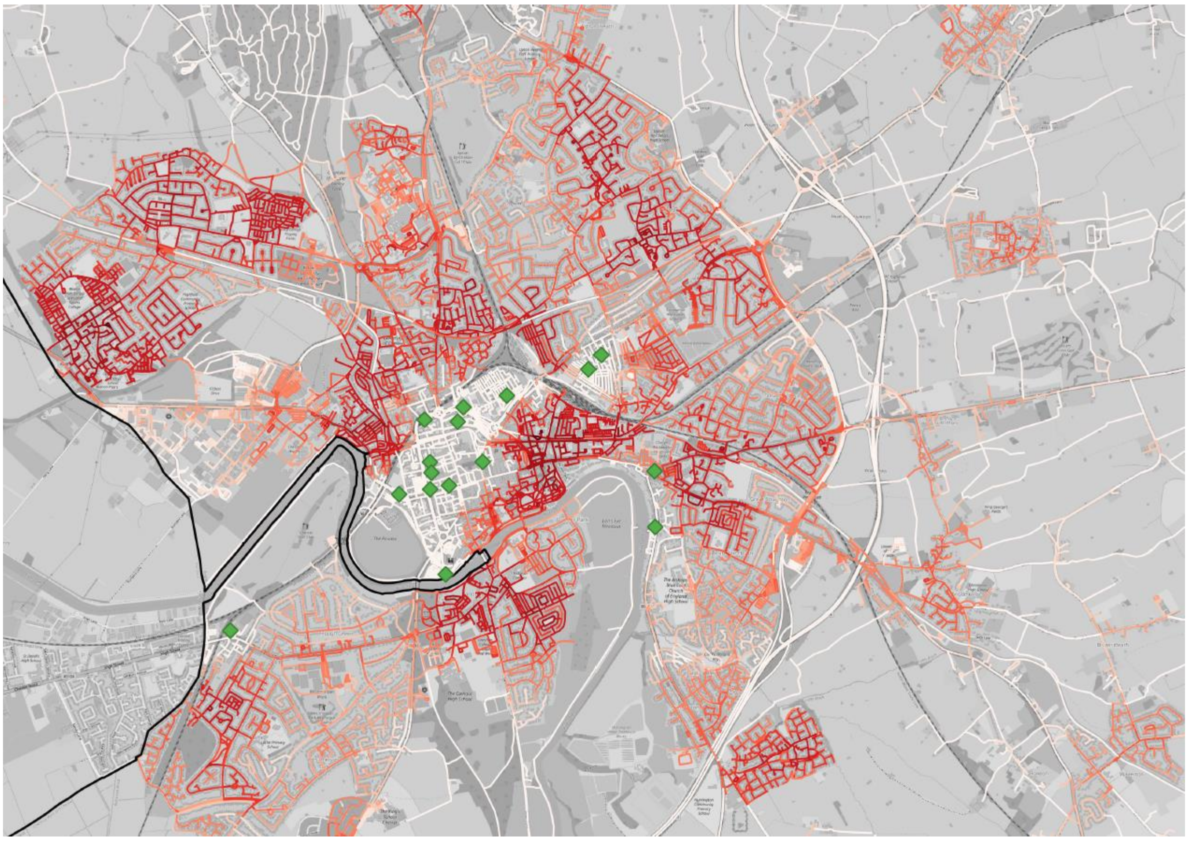


Figure 28: Residual on-street charging demand - Chester

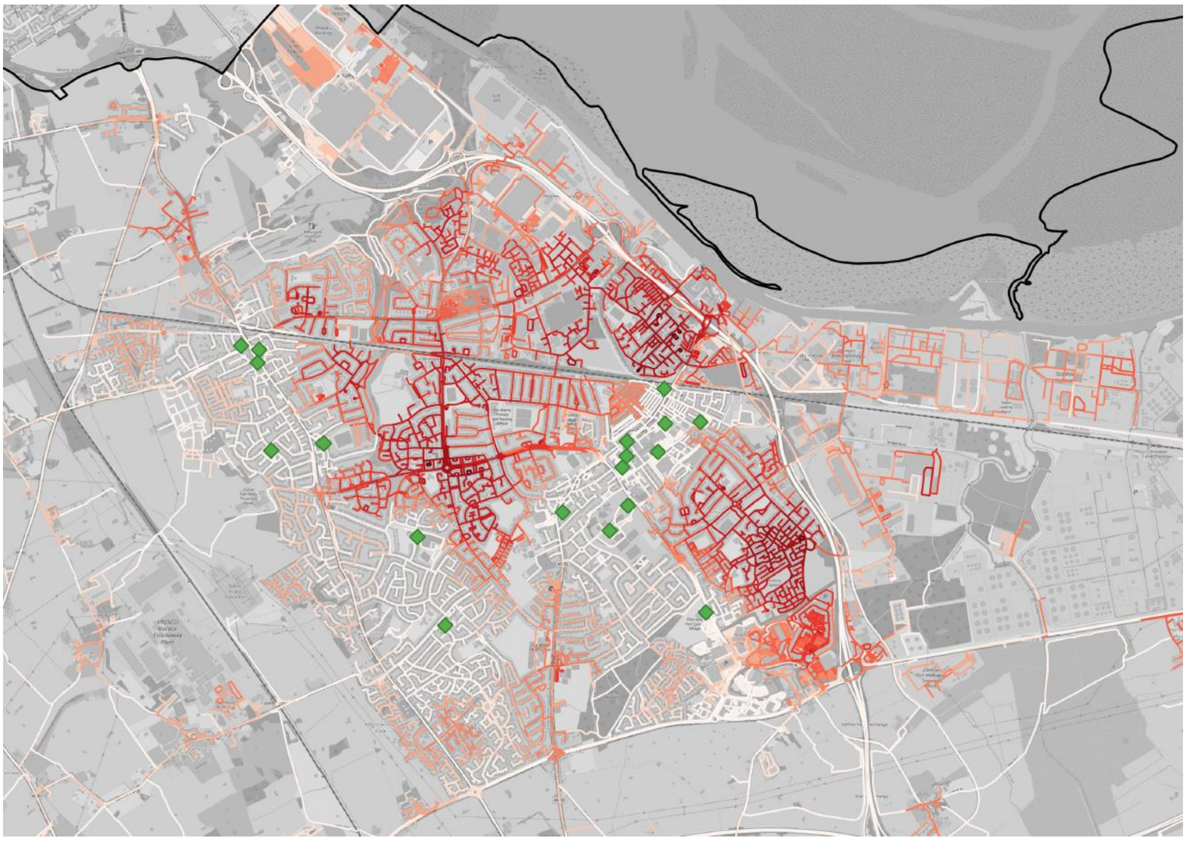


Figure 29: Residual on-street charging demand - Ellesmere Port

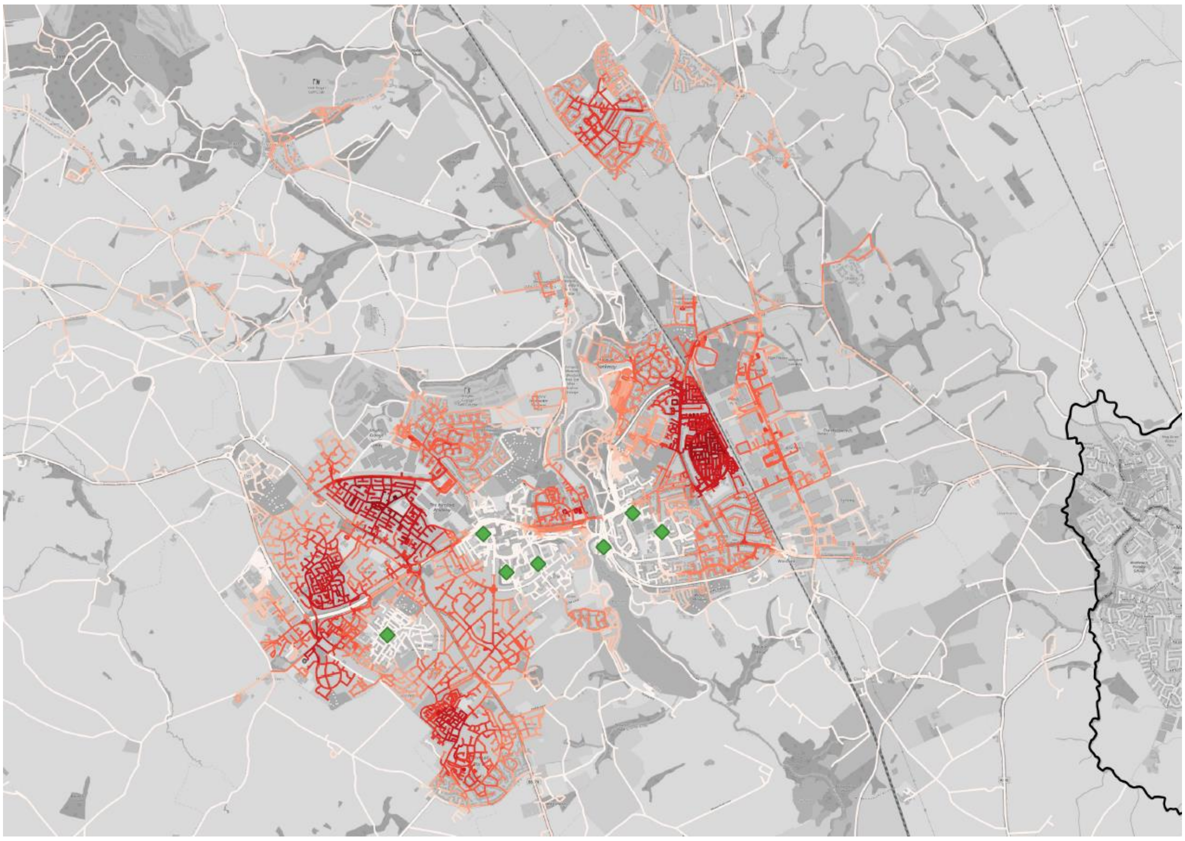


Figure 30: Residual on-street charging demand - Winsford

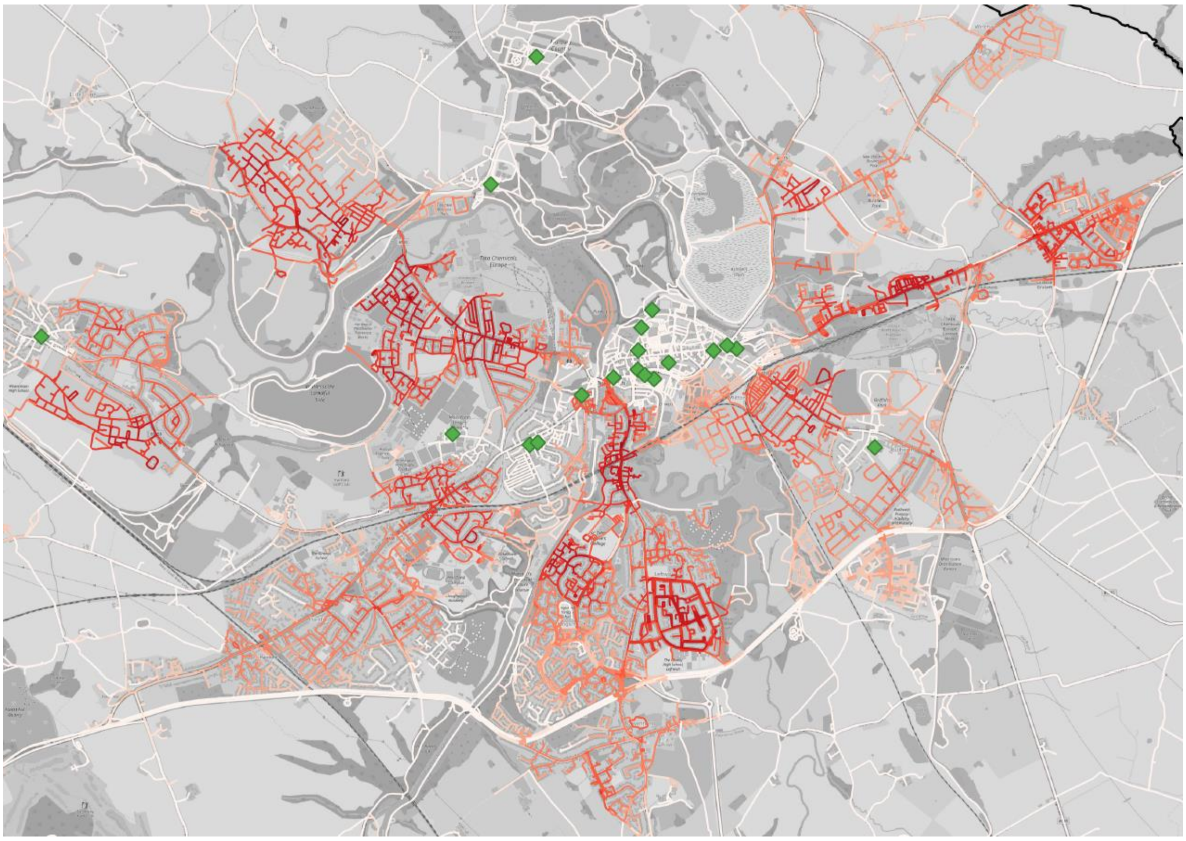


Figure 31: Residual on-street charging demand - Northwich

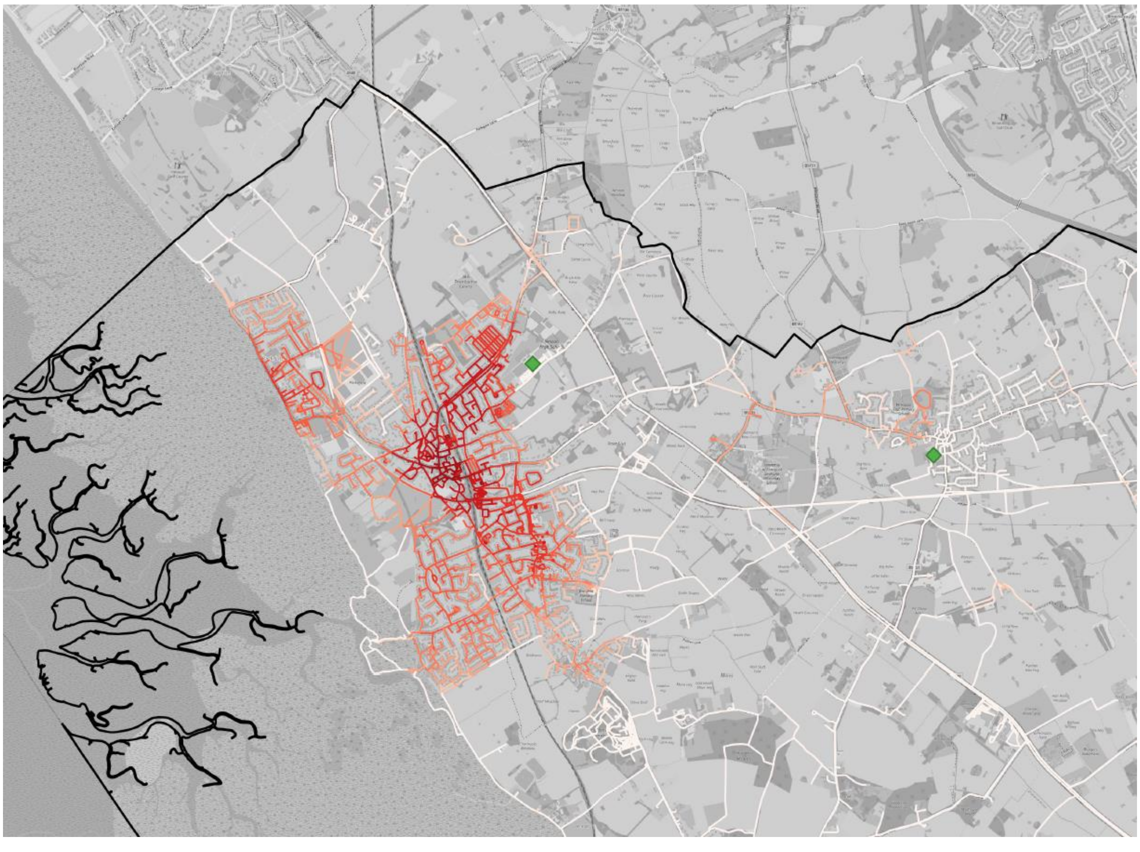


Figure 32: Residual on-street charging demand - Neston

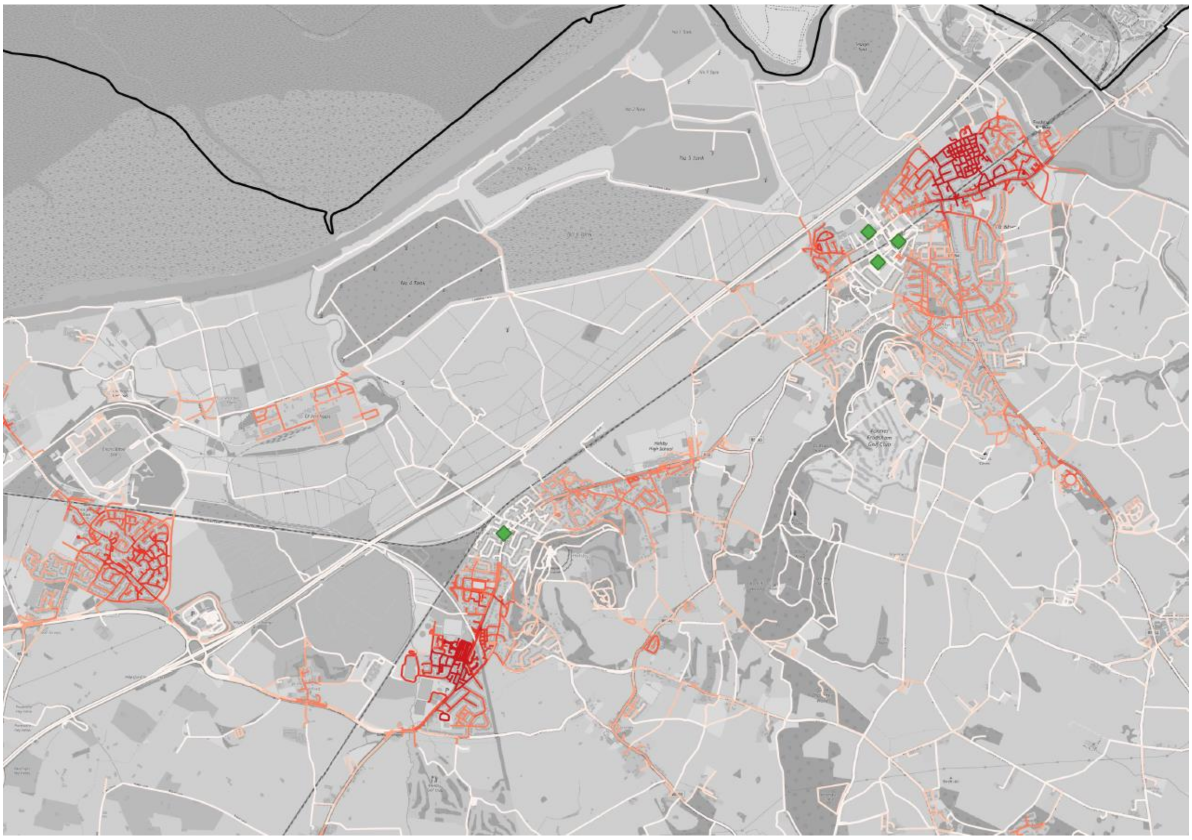


Figure 33: Residual on-street charging demand - Frodsham

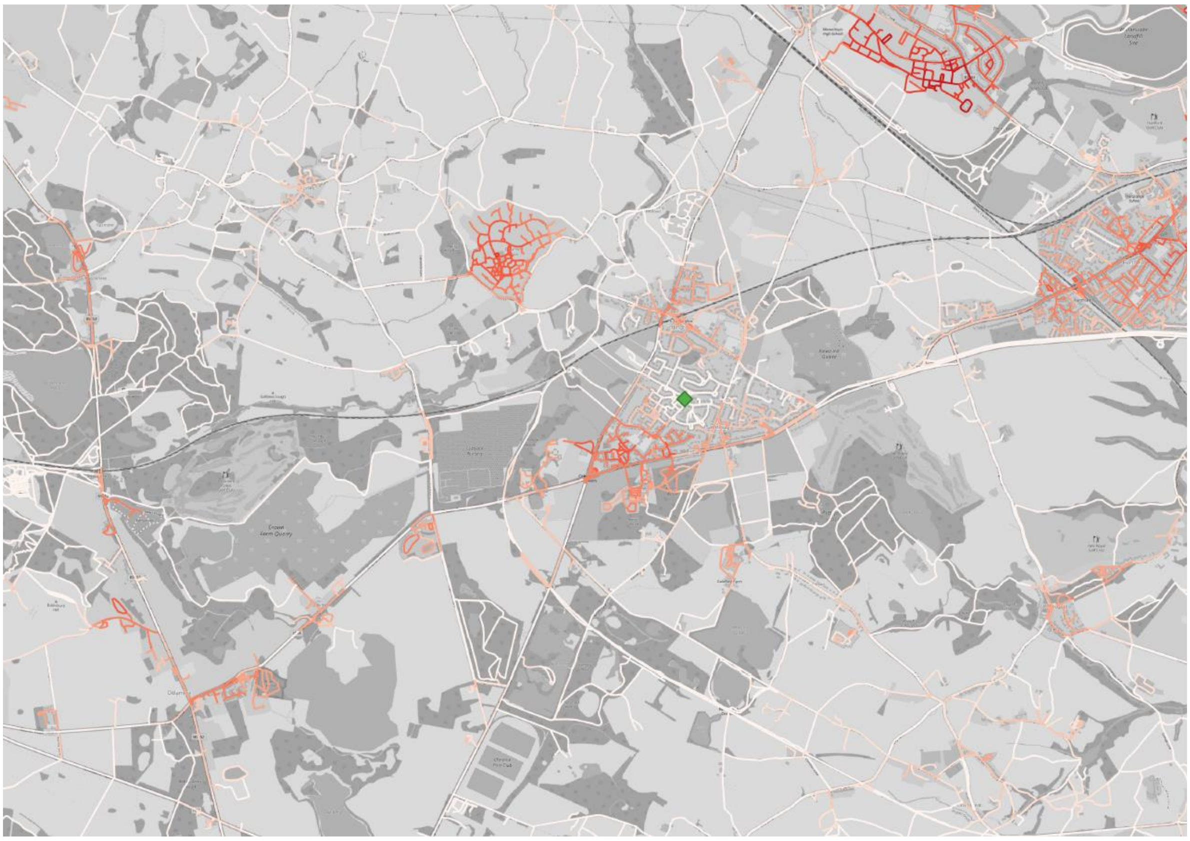


Figure 34: Residual on-street charging demand - Sandiway

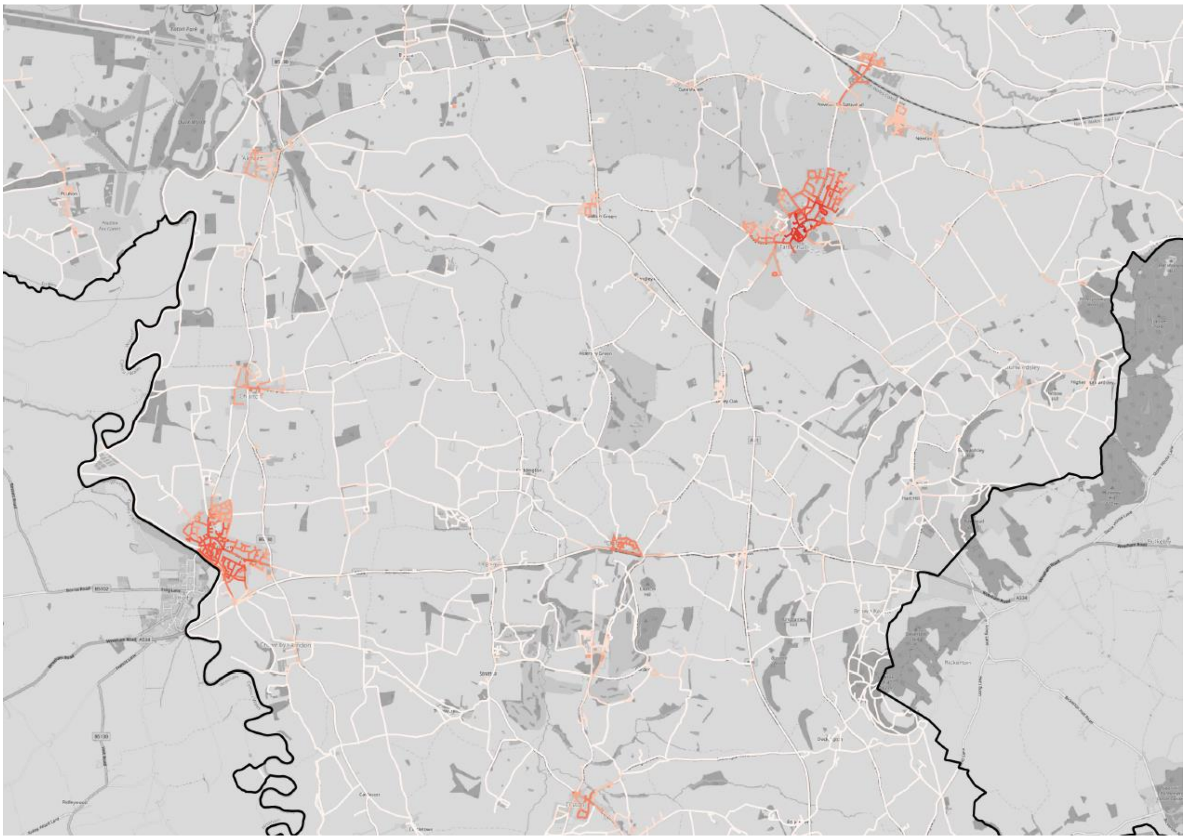


Figure 35: Residual on-street charging demand - South

Figure 36: Residual on-street demand: - Mid Cheshire

4.8. Future chargepoint demand

Transport for the North Electric Vehicle Charging Infrastructure Framework

Published in 2022, the Transport for the North (TfN) electric vehicle charging infrastructure Framework[8] uses regional analytics to develop a place-based understanding of future electric vehicle uptake and charging need. Across the North of England, it identifies a total public charging requirement of 39,000 to 54,000 by 2025, and 123,500 to 161,200 by 2030. Forecast requirements in Cheshire West and Chester are set out in detail in Appendix 6 and are summarised in Figure 27 below.

Charge point use case		Destination Charging	Public Residential	Workplace Charging
Status		**Public / Private**	**Public**	**Private**
Total electric vehicle Charge points Required	**2025**	210 – 870	360 – 800	190 – 310
	2030	660 – 1800	1200 – 1700	580 – 640
	2035	930 – 2700	1900 – 2600	840 - 980
	2040	940 – 3100	2000 – 2900	890 – 1100
	2045	930 – 2900	2000 – 2700	820 – 950
	2050	910 - 2700	2000 – 2600	790 – 870

Figure 37: Forecasted electric vehicle Charge Point Demand (Source: TfN, 2023)

The TfN Framework also provides an indication of key locations for locating rapid and ultra-rapid chargers for on-route charging (See Appendix 6). Areas identified on a regional scale are Chester, Ellesmere Port, Frodsham, Northwich, Winslow and Tarvin, with Chester and Ellesmere Port being identified as key points of focus at a local authority scale.

Electric vehicle charging infrastructure rapid charger model

Rapid chargers (capacity of approx. 50 kWh) serve a wide range of use cases, including destination and on-route charging as well as charging for service vehicles such as taxis. The analysis above demonstrates there is a particular shortage of rapid and ultra-rapid charge points across Cheshire West and Chester. To guide the development of a base network in the short to medium term, an indicative model has been developed to estimate the number of rapid chargers required. Details of the methodology for this model is contained in Appendix 5.

The assessment using this model suggests a need for between 17 and 50 rapid chargers to satisfy current demand, and between 113 and 325 rapid chargers by 2025. With 23 rapid public chargers currently in place across the borough, this suggests a remaining need for up to 300 additional rapid or ultra-rapid charge points by 2025 to increase the potential for on-route, destination, residential and taxi charging. Key locations include expanding rapid provision in Chester and Northwich.

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[8] Electric Vehicle Charging Infrastructure | Transport for the North - Transport for the North

National Electric Vehicle Insights and Strategy chargepoint demand forecasts

The National Electric Vehicle Insights and Strategy (NEVIS) service, delivered by Cenex, is a national tool developed to support English local authorities in the development of their electric vehicle charging infrastructure strategies. It provides reliable, independent, up-to-date information on electric vehicles and electric vehicle charging infrastructure

Figure 28 below sets out the NEVIS forecasts for Cheshire West and Chester borough based on a medium scenario including the target of a 2030 ban on the sale of new petrol and diesel vehicles.

Year	**7kW charge points required** (Standard)	**22kW charge points required** (Fast)	**Subtotal** (Standard/ Fast)	**50kW sockets required** (Rapid)	**150kW sockets required** (Ultra-Rapid)	**Subtotal** (Rapid / Ultra Rapid)	**Total** (all)
2025	842	98	**940**	81	57	**138**	**1078**
2030	2,407	187	**2594**	112	120	**232**	**2826**
2035	4,665	275	**4940**	144	242	**386**	**5326**
2040	6,498	399	**6897**	217	110	**327**	**7224**
2045	7,010	414	**7424**	268	122	**390**	**7814**
2050	7,372	416	**7788**	318	131	**449**	**8237**

Figure 38: Forecasted electric vehicle Charge Point Demand, medium blend scenario, LGVs + Cars (Source: NEVIS Insights Toolkit 2023)

5. Site Assessment – electric vehicle charging infrastructure charging hubs

Site assessments were completed using data from a demand-led evidence base and model. The assessments primarily focus on the short to medium term, where trends in electric vehicle uptake and technological developments are more certain.

Site assessments and location recommendations are indicative only and require further assessment and appraisal, including by charge point operators, prior to installation.

5.1. Criteria for assessment

The methodology for conducting the multi-criteria appraisal of sites is presented Figure 29 and Figure 30.

Infrastructure feasibility assessments were carried out in liaison with Scottish Power Energy Networks, the local Distribution Network Operator, and utilised their ConnectMore Tool. This indicatively shows whether each site would have a sufficient energy supply to facilitate the proposed charge points. For off-street sites, a requirement of 100 kWh power was assessed to:

- Reflect the need for rapid chargers as identified in the evidence base.
- Best practice of installing a cluster of chargers for resilience; and/ or the need for significant banks of standard/ fast chargers.

For on-street sites, assessments of 50 kWh were made to reflect:

- The constraints on installing multiple rapid chargers; and
- The fact some on-street locations would serve predominately the residential use case through a collection of 7 kWh chargers.

Further technical feasibility work would be required prior to deploying sites, including seeking budget estimate quotes from Scottish Power Energy Networks.

Classification	Sifting Criteria	Description
Off-Street Public	Capacity	Sites with a capacity under 20 spaces are removed from contention
	Electric Vehicle Uptake of Wider Area	Projected electric vehicle uptake of the LSOA and daily travel catchment
	Destination Charging Potential	Based on an assessment of future usage based on proximity to key facilities such as retail and employment locations
	On-Route Charging Potential	Whether the site is in close proximity to routes used by high volumes of traffic requiring top up charging
	Residential Charging Potential	The expected charging demand that would be driven from residential parking
On-Street	Electric Vehicle	Projected electric vehicle uptake of the LSOA

Public	Uptake of Wider Area	and daily travel catchment
	Residential Charging Potential	The expected charging demand that would be driven from residential parking rather than on-route or destination parking

Figure 39: Sifting Criteria to identify shortlist

Classification	Sifting Criteria	Description
On or Off-Street Public	Electric Vehicle Uptake of Wider Area	Projected electric vehicle uptake of the LSOA and travel catchment.
	Destination Charging Potential	Based on an assessment of future usage based on proximity to key facilities such as retail and employment locations.
	On-Route Charging Potential	Whether the site is in close proximity to routes used by Fleet vehicles and/ or high volumes of traffic.
	Residential Charging Potential	The expected charging demand that would be driven from residential parking rather than on-route or destination parking.
	DNO Supply	Is there sufficient capacity to accommodate electric vehicle infrastructure and cost estimates.
	Commercial Electric Vehicle Charging Conflict	Proximity to existing charge points or anticipated future sites (e.g., nearby Shell / BP Garages, Supermarkets etc.).
	Security of Location	Review whether the location is well lit, fenced off, has barriers etc. that provides a secure location to park vehicles. Considering future improvements. Crime issues identified from data.
	Place-making conflicts	Assessment of whether delivery of infrastructure would impact on usability of footway or wider public realm.

Figure 40: Assessment criteria for 40 sites on the short list

5.2. Assessment of potential charging sites

Sites that already have rapid charging infrastructure were discounted to focus this assessment on other sites that could potentially provide rapid charging to expand the existing base network. The criteria in Figure 31 were used to assign each site a score.

Criteria	Description
Place-making conflicts	Sites were scored 1-3 based on whether the delivery of electric vehicle charging infrastructure would impact on the usability of the footway or

	wider public realm.
Site Security	Sites were scored 1-3 for security based on factors such as lighting, fencing, security barriers, CCTV, and proximity to surrounding developments. Sites scoring 3 were most secure, whilst sites scoring 1 were least secure and lacked the listed security measures.
Commercial Electric Vehicle Charging Conflict	Sites were scored 1-3 on their potential for conflict with current and future commercial charge point investment. Sites located near current charge points, supermarkets, or close to companies with future plans for charge point investment such as Shell and BP scored lower.
DNO Supply	Following an assessment on the implementation costs for each site, sites were scored 1-3, 1 being the most costly (over £30k), and 3 being the least costly (£0-£10k).
Without Off-Street Parking	Model output scoring the site 1-3 based on the number of EVs predicted to not have access to private off-street parking i.e., those that would require some form of public charging infrastructure. Score is based on a rank between each area.
Destination Demand (Employment & Retail/ Leisure)	Model output scoring the site 1-3 based on an assessment of future destination-based usage through a review of proximity to key facilities such as employment, retail, and leisure locations.
On-Route Demand	Model output scoring the site out of 3 on whether it is in close proximity to routes used by fleet vehicles and/ or high volumes of traffic. In LSOAs that are home to key roads, the score was determined on the order of total flow on that particular road; 3 being the highest flow and 1 being the lowest. In LSOAs without a key road, a score of 1 was given.
Local Electric Vehicle Uptake (within 1km)	The model output for the projected electric vehicle uptake within 100m grids. Daily travel catchment calculations scored each site out of 3, 3 being high projected output and 1 being low.

Figure 41: Scoring criteria for assessing potential charge sites

Additionally, a RAG assessment for deliverability at each site was also included:

- Sites assessed as red require further work with Scottish Power Energy Networks to improve the existing connection.
- Sites assessed as amber are likely to require some reconfiguration of car parks and/ or other civils works (e.g., footway widening) to facilitate electric vehicle charging infrastructure; and
- Sites assessed as green can accommodate electric vehicle charging infrastructure, subject to further on-site assessment.

This deliverability assessment has been completed through a desktop review. This assessment should be validated through site visits and liaison with partners prior to installing electric vehicle infrastructure at any sites.

6. Evaluation of charging options for residents without private off-road parking

Option	Streetscape & Mobility Impact	Complexity & cost of deployment	Commercial Sustainability	Scalability
Off-road fast charging hubs	Nil • Avoids street clutter	Medium • High density installations enable efficiencies • Reduced interaction with utilities and parking regulations: deployment less complex	High • Multiple charger installations enable cost savings • ORCS funding can be accessed for certain property-types. • Use by residents and car park visitors generates higher usage and income • Opportunities for private investment and concession agreements	High • Opportunities to deploy in publicly or privately owned car parks
Cable gullies / channel	Medium • Integrates well into existing streetscape • Requires footway excavation • Reliant on users feeding cable into channel – potentially dirty and with implications for disabled users • Potential for heels to get	Low • Low tech and simple: reduces costs of installation significantly • Regular cleaning of channel needed to remove leaves / detritus. May require agreement with resident • May require residents to hold public	High • Potential for self-funding by residents, similar to dropped kerbs • Low maintenance requirements mean very low ongoing costs • Potential for damage by statutory undertakers	Medium • Very few limitations on where cable gullies can be deployed • Clusters of gullies in close proximity may impact cost of footway maintenance

	caught, causing trips.	liability insurances		
Off-road rapid and ultra-rapid charging hubs	Nil • Avoids street clutter entirely	Medium • Multiple charger installations can enable efficiencies in deployment • Reduced interaction with utilities and parking regulations makes deployment process less complex • High power needs of rapid and super-rapid charging can create complexities and significant costs in securing power supply	Medium • Higher usage across groups generates greater income for operator • This is balanced by significant upfront costs for installation • Opportunities for private investment and concession or hosting agreements with landowners	Medium • Suitable sites with appropriate power supplies are challenging to secure • High numbers of rapid and super-rapid chargers generate significant challenges for local and national electrical grid
Street-light integrated charging	Low • Integrates well into existing streetscape • Limited to locations with streetlighting at kerbside	Medium • Relatively simple installation • ORCS funding can be accessed for certain property-types.	Medium • Low cost of technology and installation • CPOs moving away from concession models including maintenance	Medium • Deployment limited to areas where street-light position is at leading edge of footway • Deployment limited by lighting network capacity
Free-standing on-street charger bollards	High • Generates street clutter from charger pillar and	High • Dedicated electrical supply is required • Low density installations:	Low • Higher costs of installation and low utilisation mean that residential on-street locations	Low • Deployment limited by grid capacity and pavement width

	electrical supply cabinet • Removes space for walking and cycling modes	cost savings cannot be realised • Potential high level of maintenance/ replacement needed due to vandalism/ vehicle strikes	are less commercially viable in the near term (5-10 years) • CPOs moving away from concession models including maintenance	• Lack of commercial sustainability means operators by be reluctant to install in areas likely to see low usage without subsidy
Rising bollards	Medium • Stored below pavement surface when not in use. • Some clutter impact when in use	High • Deep excavation required, generating complexity with existing utilities and archaeological sites • Dedicated electrical supply is required • Costs are higher for installation.	Low • Higher costs of installation and low utilisation- less commercially viable in the short term • Charger operators moving away from concession models including maintenance • Additional maintenance liability to ensure raise/ lower function operates	Low • Deployment limited by grid capacity, pavement width and underground utilities • Lack of commercial sustainability means operators by be reluctant to install in areas likely to see low usage without subsidy
Removable Lance	• Low clutter when not in use. Some impact when in use • Lance may be too heavy/ inaccessible for some users	• Relatively simple installation • Dedicated electrical supply is required	• Relies on users having correct lance from correct manufacturer. • 'Locked in' to particular supplier	• Deployment limited by grid capacity and pavement width

Figure 42: Assessment table

7. Procurement of electric vehicle charging infrastructure

electric vehicle charging is a developing market, and business models for successful operation of charging networks are evolving rapidly. Installing and operating electric vehicle charging infrastructure requires both upfront capital and ongoing revenue funding. The bulk of capital funding is spent in the connection of the electric vehicle charger to the energy network, and remains reasonably static, while chargers themselves have significantly reduced in cost as technology has developed and demand increased. Ongoing and essential inspection and maintenance of chargers represent the bulk of revenue costs, with back-office and data connection fees taking a smaller part.

Much of the UK's charging infrastructure has been supported historically by capital grants from Government, currently administered via the Office for Zero Emission Vehicles (OZEV). However, public funding is becoming less readily available and private investors require an acceptable return on their investment, which is sometimes difficult to define in an evolving market.

There is a continuous spectrum of differing models that could be followed in delivering or expanding an electric vehicle charging network. **Error! Reference source not found.** outlines t he key features of three models, setting out how they work and the risk implications for a Local Authority. It is important to note that although a particular commercial model might be preferred, it cannot be known if a specific model is possible in a specific area until market research and/ or an actual procurement process has been carried out. In reality, multiple commercial models could co-exist in a single Local Authority area.

Model		Description	Features/ Risk
1	In-House Management	A Local Authority selects locations, purchases charging points and keeps any revenue.	• Purchase could include installation and ongoing maintenance. • OZEV grant funding could be used for residential on-street charging points. • Potential to ensure equity through providing in areas of market failure. • Particularly appropriate for workplace and fleet installations where demand is assured. • Income for the Local Authority. • *If under-utilised, financial risk for the operation and maintenance falls on the Local Authority. Inter-operability with other provision needs to be factored in.*
2	Partnership/ Concession	A Local Authority leases public highway or off-street parking bays to private suppliers/ operators.	• Annual permit price plus possible up-front charge. • Operator selects own locations and Local Authority consults/ approves/ makes traffic order. • Local Authority may receive a small share of revenue from each charge point annually. • Likely to be more suitable for rapid/ fast chargers near key destinations. • Publicly owned car parks/ land could be considered

			under this model. • *Financial risk divested to suppliers/ operators but interested operators may be limited in some areas.*
3	Commercially Led	Private-sector suppliers use private land with limited or no Local Authority involvement.	• Rapid/ ultra-rapid charging points purchased and installed on private property (such as petrol station forecourts, private car parks, supermarkets, highway services, etc). • Requires sufficient capacity in the electricity network • Larger scale installations often require ancillary commercial uses which may not be appropriate for a particular site in planning policy terms • *No financial risk to Local Authority. However, this approach will likely lead to gaps in provision where locations are less commercially attractive.*

Table 43: Summary of electric vehicle Charging Commercial Models

Local authorities have taken various approaches to the funding and ownership of electric vehicle charging infrastructure. Initial electric vehicle charging infrastructure installations were delivered using an ‘in-house’ model. This approach saw local authorities acting as Charge Point Operators and required significant resourcing to manage the network. However, this model left Councils with an ongoing operating cost burden without the funds to support it, causing poor reliability and availability with the associated customer dissatisfaction. Recognising this, private charging suppliers began offering to cover the operation and maintenance costs if the Council or private organisation paid the capital costs. This allowed the Council to maintain asset ownership while passing on responsibility for operation and maintenance for a fixed period, usually with the option of extension, in the supplier’s contract.

A financial model developed for the Council, based on each of the options above is included in Appendix 3. This demonstrates revenue potential in the long-term, but limited returns prior to 2030, largely due to the gradual uptake of EVs. The model also assumes 100% usage, which is unlikely in the short-term. 6 charging events per day. However, if utilisation drops below this point to levels more usually indicated by market engagement, the ongoing revenue losses will be considerable, leaving the Council with significant ongoing funding commitments for several years.

The high cost of installing and managing electric vehicle charging equipment in house means that it is unlikely that Councils will be able to fund this without ongoing government funding and private investment.

Instead, the Council will pursue a partnership/ concession model, whereby local authorities can ‘host’ chargers operated and managed by the CPO at little or no cost to the local authority, while revenue from charging is retained by the operator or shared with the host. The larger scale of the networks operated by commercial businesses allow them to benefit from savings in operating costs which are not readily accessible to Councils running smaller networks in-house. This model has been successfully used around the country

In instances where usage and turnover of electric vehicle charge points are low, particularly on-street electric vehicle charging in residential areas, the business case for operators is more challenging. Some capital government subsidies exist, but the business case for operators may still be less attractive where return on investment is uncertain, making it more challenging for the Council to secure externally funded electric vehicle charging infrastructure.

The economics for on-street residential charging will continue to be challenging until the tipping point for electric vehicle adoption is closer, and analysis of and improvements in deployment costs, commercial models and actual asset utilisation can be assessed and addressed more fully. This may continue to require government grant funding to help de-risk electric vehicle charger deployment.

As uptake of EVs grows over time, we will continue to monitor the usage of Council-owned charge points to help us to identify sites of particularly high demand where additional charging infrastructure may be required. This will help to mitigate risks associated with drivers queuing to charge their vehicles, such as inconsiderate parking within car parks or in nearby areas.