TAKING CHARGE

A comparative analysis of current and required public EV charging infrastructure in four European cities

CleanCities

This briefing was written by Clean Cities, hosted by T&E. Clean Cities is Europe's largest network of organisations on a mission to build public support for cities to shift from polluting vehicles to active, shared and electric mobility.

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Executive Summary

Electrifying road transport is an essential part of cities' shift to zero-emission mobility. Europe's cities are already moving in this direction, but the transition can only succeed at scale if charging is reliable, affordable and easy to access, including for people who cannot charge at home. **Sufficient public charging infrastructure is therefore central to a successful transition.**

This briefing is aimed at city governments, local policy makers and stakeholders. It **sets out what it will take for Greater London, Madrid, Paris and Warsaw to build the charging networks needed to support electrification at pace**. It compares the current state of public electric vehicle (EV) charging in these four cities, and models the public charging infrastructure requirements by 2030 and 2035. Because the cities have different administrative boundaries, urban forms and starting points, the comparison should not be read as a ranking.

The findings show that **all four cities need to expand public charging substantially, but not in the same way** or at the same starting point.

- **Public charging provision varies widely**, from 5.3 charge points per 1,000 inhabitants in Paris to just 0.5 in Warsaw, with London (3.2) and Madrid (1.0) in between. Paris and London have more developed networks, built largely around slow alternating current (AC) charging, while Madrid and Warsaw are at an earlier stage and have deployed a higher share of fast direct current (DC) infrastructure. These different starting points create different challenges and opportunities as EV markets grow.

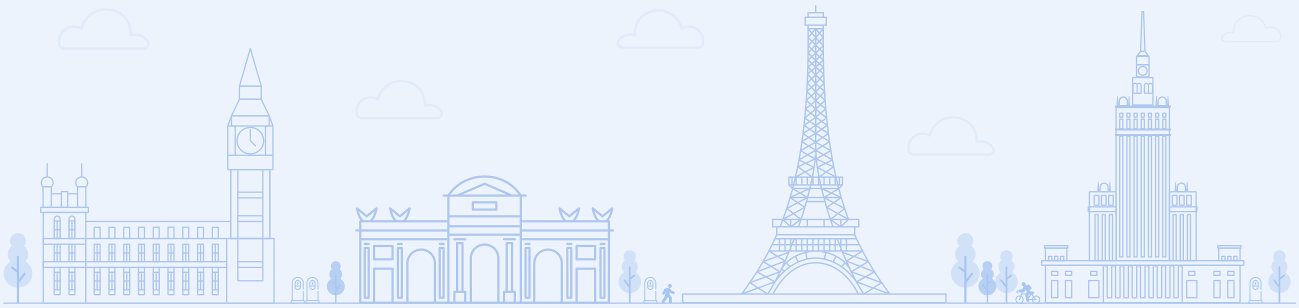
- Across all cities, the challenge is not only the number of charge points, but where they are located, how affordable they are, how reliably they serve people who cannot charge at home, and how well they fit with wider urban mobility goals. **Chargers remain concentrated in central and commercially attractive districts, with outer and some lower-income neighbourhoods often less well served.** The key equity issue is charging dependency: whether those without access to home charging have convenient, affordable and reliable public alternatives.

- **Utilisation rates also vary considerably**: London and Paris show the highest rates, both exceeding 15%, suggesting their networks are better matched to current demand, while Madrid's network is the least utilised, at around 7%, with Warsaw slightly higher at around 14%.

- Ad-hoc public charging is most expensive in London on a purchasing-power-adjusted basis, and **DC charging carries a substantial price premium in all four cities**, ranging from 20% to 51%.

- **All four cities need to expand their networks significantly before 2030**, and further still by 2035. **Smarter policy can reduce the scale of expansion needed**: shifting demand towards workplaces, destinations, and higher-power charging cuts projected requirements by around one fifth, and combining this with a ten percent reduction in car ownership cuts them by more than a quarter. But these efficiencies do not remove the need for grid planning, investment and careful site selection, nor do they remove the need to ensure that expansion serves all residents equitably.

The cities that act early, plan well and build for everyone will be best placed to turn the electric transition from a promise into a reality.



GREATER LONDON

Existing charging points (2026)

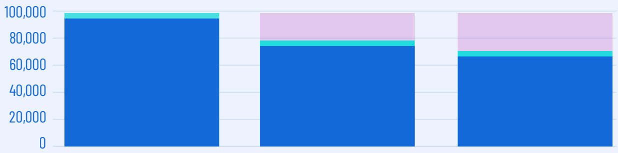
DC: 2,127
AC: 27,264

Electric Vehicle share of passenger car fleet

2024: 6%
2035: 59%

Number of charge points required (2035) under the three scenarios

Base scenario | High efficiency | High efficiency + modal shift



Base scenario	High efficiency	High efficiency + modal shift
DC: 3,935	DC: 4,116	DC: 3,704
AC: 94,439	AC: 74,080	AC: 66,672
	Reduction: 21%	Reduction: 28%

MADRID

Existing charging points (2026)

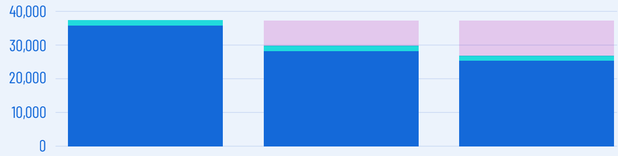
DC: 780
AC: 2,640

Electric Vehicle share of passenger car fleet

2024: 1.8%
2035: 43.9%

Number of charge points required (2035) under the three scenarios

Base scenario | High efficiency | High efficiency + modal shift



Base scenario	High efficiency	High efficiency + modal shift
DC: 1,493	DC: 1,566	DC: 1,409
AC: 35,838	AC: 28,184	AC: 25,365
	Reduction: 20%	Reduction: 28%

PARIS

Existing charging points (2026)

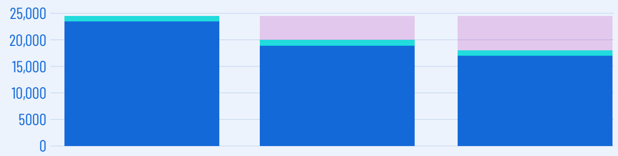
DC: 451
AC: 10,706

Electric Vehicle share of passenger car fleet

2024: 4.9%
2035: 54.5%

Number of charge points required (2035) under the three scenarios

Base scenario | High efficiency | High efficiency + modal shift



Base scenario	High efficiency	High efficiency + modal shift
DC: 978	DC: 1,052	DC: 947
AC: 23,473	AC: 18,936	AC: 17,042
	Reduction: 18%	Reduction: 26%

WARSAW

Existing charging points (2026)

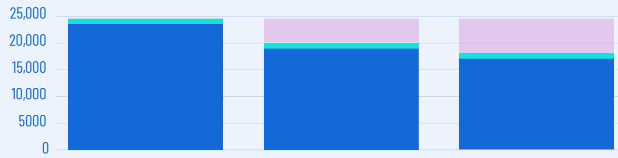
DC: 332
AC: 592

Electric Vehicle share of passenger car fleet

2024: 1.1%
2035: 24.9%

Number of charge points required (2035) under the three scenarios

Base scenario | High efficiency | High efficiency + modal shift



Base scenario	High efficiency	High efficiency + modal shift
DC: 972	DC: 1,045	DC: 940
AC: 23,317	AC: 18,809	AC: 16,928
	Reduction: 18%	Reduction: 26%

Policy recommendations:

- **Plan strategically, not reactively**. Develop a Charging Masterplan that maps projected demand by district, identifies grid constraints early, and sequences rollout over time. Districts with high public charging dependency, and particularly residential areas without off street parking should be prioritised.
- **Align charging with broader urban mobility goals**. Pairing a more efficient rollout of EV infrastructure with investment in public transport, cycling and shared mobility can cut infrastructure requirements by almost 30%. Fewer cars means less infrastructure, lower costs and more public space for other uses. Rolling out charging infrastructure should not entrench car dependency in cities.
- **Shift demand away from the street**. Reduce public charging needs by steering residential demand towards workplaces, semi-public spaces, car parks and private garages using spatial planning and procurement. On-street charging should primarily serve households with no viable alternative. Data and utilisation thresholds should be used to guide expansion.
- **Make charging affordable for all**. Use procurement and concession contracts to require transparent kWh-based pricing and set maximum ad-hoc prices where appropriate.
- **National governments and grid operators** should remove the bottlenecks cities cannot solve alone, and national governments should introduce effective and enforceable right to plug rules for tenants and owners.
- **At EU level**, ambitious and predictable targets, such as the CO_2 standards and the proposed Clean Corporate Vehicles regulation, are the single most important driver of EV adoption at EU level and must be maintained. Price transparency rules in the AFIR should be strengthened.

Glossary

AC: Alternating Current charging (slow charging, P < 50 kW).

AFIR: Alternative Fuels Infrastructure Regulation, is an EU regulation that mandates EU member states to deploy a minimum level of alternative fuels infrastructure such as electric vehicle charging points.

BEV: Battery Electric Vehicle, a fully battery electric vehicle with no combustion engine.

CPO: Charge point operator

CV: Coefficient of Variation, a statistical measure of inequality. Higher values indicate greater variation.

DC: Direct Current charging (fast charging, P ≥ 50 kW).

EU: European Union

EPBD: Energy Performance of Buildings Directive, an EU directive requiring member states to ensure new and substantially renovated buildings are equipped with EV charging infrastructure or pre-cabling, and setting minimum charging standards for existing non-residential buildings.

EVSE: Electric Vehicle Supply Equipment or charge point: A single charging outlet. A charging station may contain multiple charge points.

HPC: High-power charging, ultra-fast DC charging delivering 150kW or more.

IEA: International Energy Agency

kW/MW: kilowatt (1,000 watt) and megawatt (1 million watt).

LCV: Light commercial vehicles with a gross vehicle weight of 3.5t or less, often referred to as vans.

PHEV: Plug-In Hybrid Electric Vehicle, a hybrid electric vehicle whose battery can be charged.

Public charging: Charging infrastructure accessible to the general public 24/7 without any restrictions.

Semi-public charging: Charging infrastructure accessible to the general public but located on privately owned land (e.g. car parks, supermarkets) that can be subject to specific, non-discriminatory access restrictions (e.g. closure over night).

TCO: Total cost of ownership

Utilisation rate: The proportion of time a charge point is actively in use, expressed as a percentage.

Why public charging infrastructure matters

The shift from petrol and diesel cars to active, shared and electric mobility is already taking shape in many cities across Europe. With three in four Europeans living in urban areas, cities are at the forefront of the transition to zero-emission mobility. Clean Cities' own modelling in the (E)Mission: Zero report showed that electrifying the vehicle fleet is an essential part of this transition. Electrification can only happen at scale if charging is reliable, affordable and easy to access. Scaling up public charging infrastructure is both a critical enabler and a potential bottleneck.

The EU's Alternative Fuels Infrastructure Regulation (AFIR) sets minimum deployment requirements benchmarked against the size of the registered EV fleet. These requirements are a floor, not a ceiling. Meeting regulatory minimums will not be sufficient to support the scale of EV adoption that cities need. For the majority of urban residents, especially those without a private garage or driveway, public charging is not a convenience but a necessity. Cities need to plan ahead, and plan well. Clean Cities' From Plan to Plug guidebook provides a practical, step-by-step framework for doing exactly that.

This briefing presents the findings of a comparative study of public and semi-public EV charging infrastructure, referred to here as public charging, in four major European cities: London, Madrid, Paris and Warsaw. These four cities, where Clean Cities is active, represent a cross-section of European geographies and stages of EV adoption. The study combines a stocktake of charging networks in each city with a modelling exercise projecting what public charging infrastructure will be needed by 2030 and 2035 under different scenarios. Its purpose is to provide a clear, evidence-based picture of where each city stands and what action is needed to support ambitious electrification.

The study focuses solely on battery-electric vehicles (BEVs), namely passenger cars and light commercial vehicles (LCV) not part of a fleet. Large commercial truck, van and bus fleets, taxis and private hire vehicles are out of scope. Plug-in hybrid electric vehicles (PHEVs) have also been excluded as they are charged far less than BEVs and, as a transitional technology, new registrations are expected to decline within the study period. This research draws on authoritative EV charging infrastructure data compiled by Eco-Movement, the primary data provider to the European Commission's European Alternative Fuels Observatory.

The data provide insights into how much infrastructure is available, what type it is, where it is located, how it is distributed, how much it is used and what it costs. The results and insights are drawn from the analysis and modelling undertaken by EVConsult for Clean Cities. EVConsult has helped several leading cities develop their charging infrastructure strategies, including Amsterdam, Rotterdam, Paris and Prague. The full technical report, including detailed methodology, assumptions and results, is available on the Clean Cities website.

The current state of public EV charging in the four cities

This chapter examines the current state of public EV charging across Greater London, the city of Paris, the city of Madrid and the city of Warsaw. While all four are major European capitals, they differ widely in size, density, urban structure, socioeconomic context, administrative geographies and challenges they face. Table 1 provides an overview of the many differences.

The purpose of the comparison is therefore not to rank or rate these cities, which would be of limited value, but instead to identify different strategies, stages of charging infrastructure rollout and lessons that other cities can draw on. The comparison draws on data compiled by Eco-Movement and analysed by EVConsult, reflecting the situation as of February 2026, and is structured around the six indicators set out in Table 1.

Table 1: Overview of differences between the four cities

	Greater London	Madrid	Paris	Warsaw
Population	9,089,736	3,422,416	2,084,894	1,863,845
Surface area (km²)	1,572	606	105	517
Population density (residents per km²)	5,782	5,648	19,856	3,605
Car ownership per 1,000 residents	287	421	278	717
EV share of the passenger car fleet	6.0%	1.8%	4.9%	1.1%

Compiled by Clean Cities. All figures for 2024, data sources can be found in the appendix

Table 2: Overview of indicators and metrics used

Indicator	Metric
Number of existing charge points	Number of charge points (Electric Vehicle Supply Equipment (EVSE)), total and per 1,000 inhabitants
Installed charging power	Cumulative installed capacity in kW, total and per 1,000 inhabitants
Charging type (AC vs DC)	Percentage share of charge points by type
Charge point distribution within cities	Coefficient of variation at district level, i.e. the ratio of the standard deviation to the mean, measuring how unequal the distribution is
Utilisation rate	Share of time charge points are used over an average day throughout a year, weighted by EVSE
Pricing	Average ad hoc charging price, adjusted for purchasing power parity in euros, for the largest AC and DC charge point operators in each city

A large gap separates early movers from the rest

The number of publicly accessible charge points per resident is the most basic measure of whether a city's charging network is keeping pace with the growth of its electric fleet and whether people who cannot charge at home have any viable alternative.

Paris, has the densest public charging network of any of the four cities relative to its population with 5.3 charge points per 1,000 inhabitants. Greater London follows with the largest charging network in absolute terms, but spread over a larger population, giving it 3.2 charge points per 1,000 inhabitants. Madrid and Warsaw are at an earlier stage and have substantially fewer chargers, both in absolute and per inhabitant terms, with 1.0 and 0.5 charge points per 1,000 inhabitants respectively.

When total installed power is considered, a measure of how much charging capacity the network can deliver at any one time, the gap narrows. A single high-power DC charger can deliver far more electricity per day than an AC charge point, so a city with fewer but faster chargers may meet a greater share of charging demand than raw charge point counts suggest.

Madrid and Warsaw both have fewer charge points in total but a higher proportion of DC fast chargers, so their total capacity is proportionally higher than their charger counts suggest. Yet Paris and Greater London residents have more charging capacity available. Per 1,000 inhabitants, the two lead with 58.7 and 52.3 kW respectively, while Madrid and Warsaw are at 39.8 and 28.3 kW.

Cities have taken different approaches to charging technology

In the four cities, public charging infrastructure falls broadly into three different power tiers. Low-power charging, with typically 11 kW or less, is common on residential streets and in car parks. High-power charging at 150 kW and above is used for rapid charging en route and at destinations. In Madrid and Warsaw, a third tier of medium-speed charging between 22kW and 50kW accounts for 40 to 50% of all chargers.

Paris and Greater London have built their networks primarily around slow AC charging. Paris is the clearest example: over 84% of its charge points are single-phase AC charge points (providing up to 7.4 kW but often less, as more than a third in Paris are standard household plugs which are usually limited to 2.3 kW), and only 2% deliver 50 kW or more. Greater London is similar, with 78% single-phase AC although the share of chargers delivering 50 kW or more is higher at 7%.

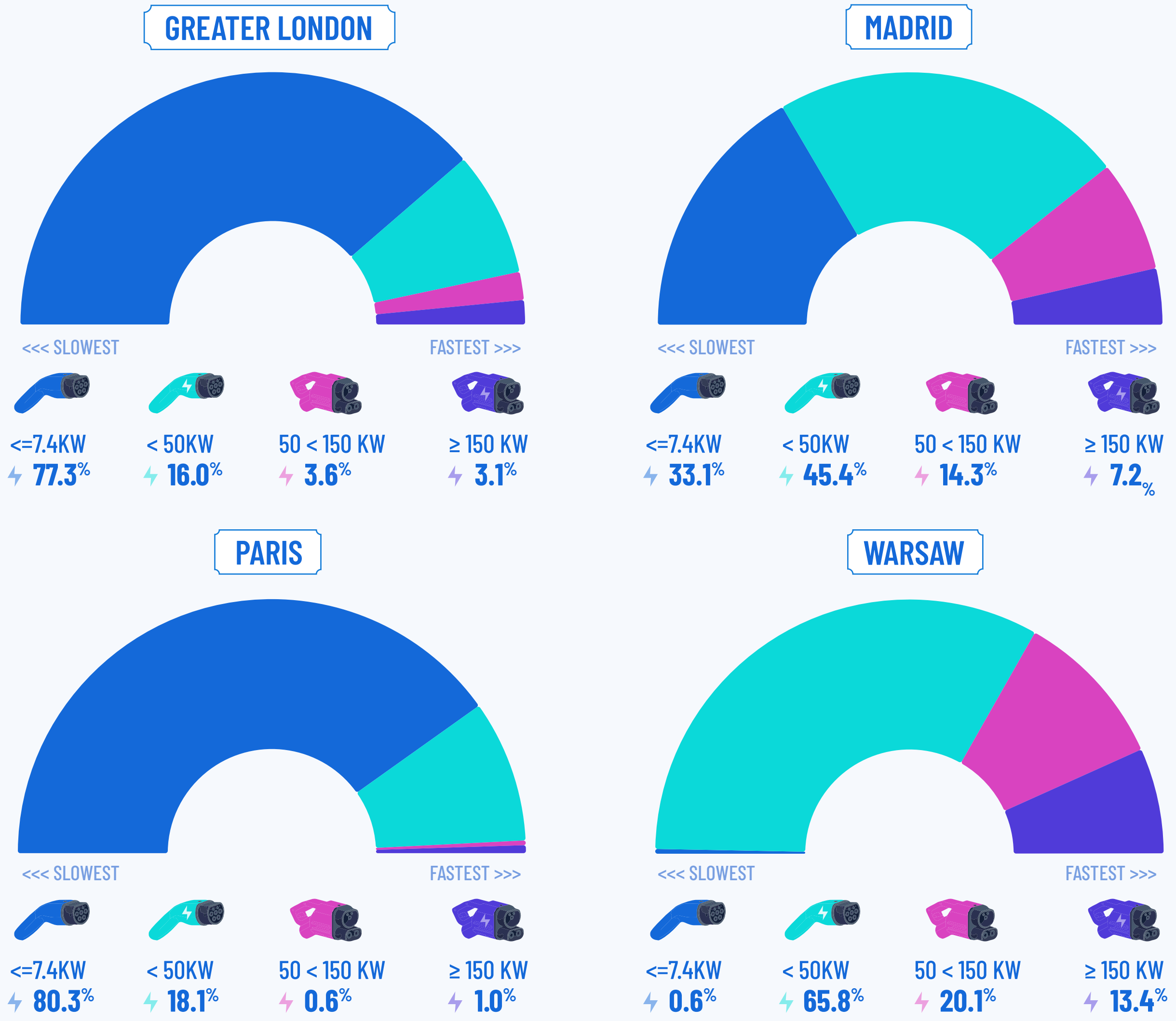
Table 3: Charge point totals and per 1,000 inhabitants

Charge points	Greater London	Madrid	Paris	Warsaw
Total	29,391	3,420	11,157	924
Per 1,000 inhabitants	3.2	1.0	5.3	0.5

Table 4: Installed capacity, total (MW) and per 1,000 inhabitants (kW)

Installed capacity	Greater London	Madrid	Paris	Warsaw
Total	475.1	140.2	124.0	52.6
Per 1,000 inhabitants	52.3	39.8	58.7	28.3

Slow charge points dominate in most cities



Warsaw and Madrid have taken a different path. Warsaw has no meaningful single-phase AC presence at all. Instead, 63% of its chargers are faster three-phase AC, providing up to 22kW, and 36% are DC fast chargers. Madrid sits in between, with roughly equal shares of single- and three-phase AC and a notably higher proportion of DC fast charging (23%) than Paris or London.

Table 5: Share of AC and DC charging (percentage of charge points)

Charge type	Greater London	Madrid	Paris	Warsaw
Single phase AC	78%	38%	84%	1%
Three phase AC	15%	39%	12%	63%
DC	7%	23%	4%	36%

Table 6: Coefficient of variation (charge points and installed capacity per 1,000 inhabitants)

CV	Greater London	Madrid	Paris	Warsaw
Charge points per 1,000 inhabitants	1.01	0.75	1.22	0.90
Installed capacity per 1,000 inhabitants	0.83	1.19	1.01	1.29

High-power charging (HPC), which delivers 150kW or more through DC charging, accounts for widely different shares of charge points in the four cities. It represents only 1% of Paris' charging network, or just under a quarter of existing DC charge points. This rises to 3% in Greater London, and to 7% in Madrid and 13% in Warsaw. Among DC chargers, the HPC share is highest in Greater London, where they account for 43%.

This distinction matters. Slow AC charging is cheaper to install and better suited to residents who park overnight. DC fast charging - including HPC - enables faster charging but tends to be more expensive to install, operate and use. Cities that have leaned heavily on one approach face different challenges as their markets grow.

Charging is concentrated in the centre across all four cities

Where chargers are located within a city matters as much as how many there are: a network that looks adequate in aggregate can still leave entire neighbourhoods with little or no provision. The coefficient of variation (CV) measures how unequal a distribution is. A value of 0 means no variation, while 1 means the standard deviation is equal to the mean.

On this measure, Paris has the highest internal disparity in charge point distribution, followed by Greater London, Warsaw and Madrid. For the latter two, this may reflect low overall provision rather than a deliberately equitable distribution. In all four cities, central districts are comparatively well-served, while outer districts are generally less equipped. For installed capacity, the picture changes. The combination of fewer charge points and a higher share of HPCs means Madrid and Warsaw show the most uneven distribution, while Greater London has the most even one. This may reflect policy choices, but it also points to potential spatial disparities in access to charging.

Charge point provision is slightly better in higher-income areas

We have also analysed the relationship between relative district-level income (average income in the district compared to the city-wide average) and charging availability. For both charge points and installed capacity, we find a weak to moderate positive correlation (0.21 to 0.60 for installed charge points, -0.05 to 0.58 for installed capacity), meaning higher income areas tend to have slightly more charge points. The trend is most pronounced in Paris where the correlation is moderately strong, but weaker in Madrid and London. No district-level income data was available for Warsaw.

Table 7: Correlation between relative district-level income and charge points/installed capacity

Correlation with relative income	Greater London	Madrid	Paris	Warsaw
Charge points / 1,000 inhabitants	0.21	0.40	0.60	No data
Installed capacity / 1,000 inhabitants	0.04	-0.05	0.58	No data

Table 8: Average utilisation rate Q2 2025 to Q1 2026 by speed band, EVSE weighted

Average utilisation rate (EVSE weighted)	Greater London	Madrid	Paris	Warsaw
0– ≤22 kW	16%	7%	30%	15%
>22– ≤ 150 kW	22%	5%	7%	11%
>150 kW	21%	12%	22%	21%
Total	**17%**	**7%**	**29%**	**14%**

This is a predictable consequence of demand-led deployment, which remains a valid approach in the early stages of building a charging network. It is also a strong argument for shifting to planning-led approaches beyond the initial stage, as laid out in Clean Cities' urban charging guidebook. However, the link is not systematic and is probably often more closely related to EV ownership, car ownership and commercial attractiveness than income alone. Many lower-income areas are reasonably served, while some higher-income areas are not.

The key equity issue is therefore not only whether lower-income districts have fewer chargers, but whether residents who depend on public charging have reliable and affordable options nearby. This includes people living in flats, rented homes and terraced streets without access to private parking

London and Paris chargers are used more intensively than Madrid

Utilisation rates - the share of time a charger is in use - reveal how well infrastructure matches real demand, when peak usage occurs and whether they are financially viable. Average utilisation was calculated over a full year and weighted by existing charge points (EVSE) for each speed band within each of the three speed categories.

Paris has the highest overall utilisation of 29%, driven by its high utilisation of slow charging, reflecting strong residential demand in a dense, car-light city. Greater London shows the most balanced profile across charger types and locations, with average total utilisation of 17%, suggesting a relatively mature market where multiple kinds of charging are in regular use.

Madrid has the lowest utilisation across all categories (7%), potentially reflecting a combination of lower EV adoption, early-stage infrastructure that has yet to attract a sufficient number of users, or a mismatch between where chargers have been installed and where drivers actually need them. Warsaw shows moderate utilisation rates, suggesting its smaller network is reasonably well matched to current demand. In Madrid and Warsaw, HPC charging is the most used category, while in Paris it is slow charging. In Greater London, fast and HPC charging have similar utilisation rates.

Total network utilisation peaks around midday in most cities. Fast charging peaks are more pronounced in most cities than slow charging peaks. Paris shows the sharpest daily variation overall, with a swing of almost 10 percentage points between peak and off-peak hours. London's profile is the most stable for slow charging and overall utilisation, but shows the strongest peak for fast charging.

When drivers charge: hourly utilisation rates by city and speed band

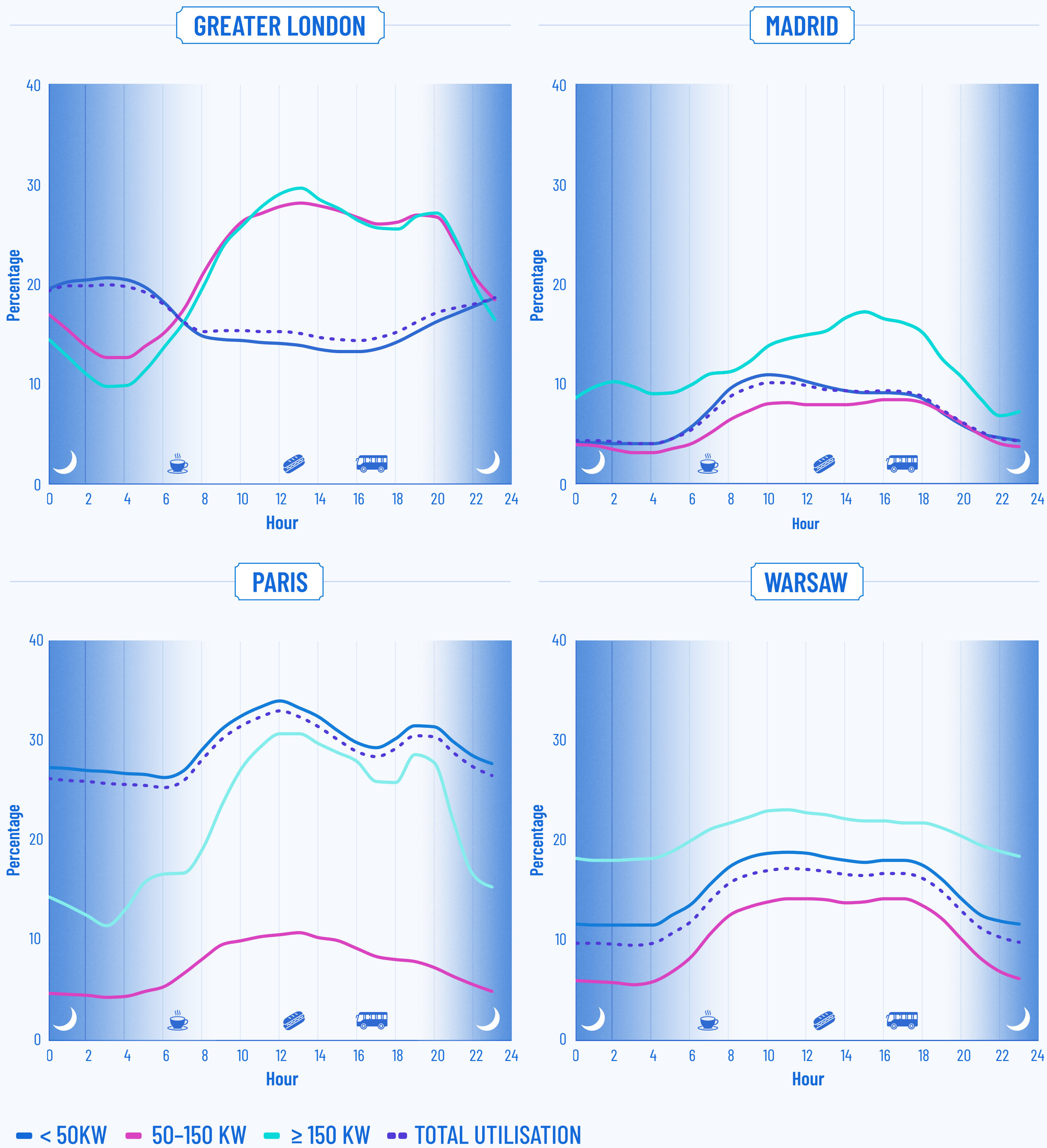


Table 9: Average ad-hoc AC and DC charging prices per kWh in €

Average ad-hoc price (€ / kWh)	Charging type	Greater London	Madrid	Paris	Warsaw
Price incl. VAT	**AC**	0.65	0.38	0.44	0.45
	DC	0.87	0.52	0.55	0.59
Purchasing power-adjusted prices (incl VAT)	**AC**	0.60	0.44	0.51	0.61
	DC	0.90	0.55	0.62	0.81

Ad-hoc charging is most expensive in London

Comparing real costs of EV charging across cities is not straightforward, as previous studies have shown. This is partly because underlying electricity costs and taxation vary considerably between countries. For this comparison, we used the average ad-hoc prices per kWh for AC and DC charging across the four largest local operators in each city. Ad hoc prices, paid without subscriptions, accounts or roaming tariffs, are often not the tariff paid by regular EV drivers. However, they are the most basic and widely accessible payment option, unlike charge point operator subscriptions or mobility service provider roaming and help shape public perceptions of charging costs. To account for different income and price levels, prices including VAT were adjusted for purchasing power.

Greater London is the most expensive city of the four. By comparison, Madrid offers the lowest prices while Paris and Warsaw sit in between. Adjusting for purchasing power slightly reduces the price differences with AC charging in Warsaw becoming as expensive as in Greater London, whereas Madrid remains the most affordable. As expected, DC charging carries a substantial premium over AC in all four cities, ranging from 20% to 51%. One important driver of the observed difference across cities is the difference in electricity prices, though it is unlikely to explain the observed differences on its own.

Affordability matters in practice. EAFO's consumer monitor from 2023, found that only 21% of BEV drivers in Europe live in an apartment, compared with 44% of non-EV drivers and the inability to charge at home is the second most cited disadvantage of owning an EV. This suggests that people without private parking still face barriers to switching. The barrier is not only cost, but also the perceived risk of being unable to charge easily and reliably without major inconvenience. As EV adoption grows, more people will depend on public charging as their main option, particularly those in flats and terraced houses without access to a driveway or private parking. In cities where slow AC residential charging is scarce or expensive, the cost of going electric rises considerably and risks creating a two-tier system between those who can charge at home and those who cannot.

What will be needed by 2030 and 2035?

Following on from the assessment of current provision, a district-level model was developed to project public charging requirements across all four cities to 2030 and 2035. The aim is not to predict an exact number of charge points, but to estimate the scale, distribution and type of infrastructure needed to support a substantially larger electric passenger car and van fleet under different scenarios.

How the model works

The modelling exercise projects how many public charge points each city will require in 2030 and 2035, using a methodology that is explained in more detail in the appendix and accompanying technical report.

It covers battery-electric passenger cars and LCVs not part of a fleet. Commercial van fleets charged in depots, plug-in hybrids, heavy duty vehicles, taxis and powered two-wheelers are excluded, as they follow different charging patterns. Using publicly available data for each city and assumptions presented in the appendix, the model estimates the number of AC (11 kW) and DC (50+ kW) charge points required.

Demand is estimated separately for three user groups, residents, commuters and visitors, with each district assigned one of six typologies reflecting its urban character, and a relative income index applied to reflect the observed relationship between income and EV ownership.

Three scenarios are modelled:

- **Base scenario**: reflects current trends with no major policy or behavioural shift.
- **High Efficiency scenario**: assumes a gradual move away from residential public charging towards workplace, destination and opportunity charging, and greater use of HPC charging, reducing overall public infrastructure needs.
- **High Efficiency + Modal Shift scenario**: Adds a 10% reduction in total private car ownership and use on top of the efficiency gains, reflecting more ambitious urban mobility policies such as expanded public transport, cycling and car sharing. Cities such as London, Paris, Oslo and Vienna have achieved similar or higher modal shifts through sustained mobility policies.

All four cities require substantial expansion of public charging infrastructure

In each of the four cities, the model predicts that public charging networks will have to be expanded substantially by 2030, and even more so by 2035, to meet the demand from a rapidly electrifying fleet. The smaller the current charging network, the greater the growth required.

A consistent finding across all four cities is that future pressure will be strongest in dense, mixed-use central districts, where residents, commuters and visitors all compete for the same limited kerbside space. Residential suburban districts generate proportionally lower public charging demand because more residents have access to private parking and home charging.

Yet the most critical challenge may lie in residential neighbourhoods with little or no off-street parking, where on-street public charging is the only option for most residents. Several outer residential districts in all cities also start from a very low installed base, compounding the challenge. Cities have so far taken different approaches, from dense networks of on-street slow charging to local HPC charging hubs, or a combination of both. This means that simply building more charge points is not enough. Where they are built matters enormously.

The model estimates future charging demand in terms of required charging capacity. To present this as a number of charge points, this capacity is converted into standardised units: 11 kW for AC charging and 50 kW for DC charging. This allows the scale of future need to be shown more clearly, but it also means the model outputs are not directly comparable with the existing number of charge points. Existing networks contain chargers with a wide range of power ratings, not only 11 kW and 50 kW units, so the actual number of charge points needed will depend on the power mix deployed in practice.

The forecasts predict future demand from BEV passenger cars and LCV not part of a fleet. They do not include charging demand from PHEVs, taxis, private hire vehicles, heavy duty vehicles, nor does it account for population or fleet growth.

The following three tables present the forecast charging demand in 2030 and 2035 for each scenario, expressed in terms of standardised 11 kW AC and 50 kW DC charge point units required.

Table 10: Forecast future charging infrastructure needs in the Base scenario

City	Charger type	2030	2035
Greater London	AC (11kW)	56,855	94,439
	DC (50kW)	2,369	3,935
Madrid	AC (11kW)	13,985	35,838
	DC (50kW)	583	1,493
Paris	AC (11kW)	10,743	23,473
	DC (50kW)	448	978
Warsaw	AC (11kW)	5,356	23,317
	DC (50kW)	223	972

Table 11: Forecast future charging infrastructure needs in the High Efficiency scenario

City	Charger type	2030	2035
Greater London	AC (11kW)	44,614	74,080
	DC (50kW)	2,479	4,116
Madrid	AC (11kW)	10,998	28,184
	DC (50kW)	611	1,566
Paris	AC (11kW)	8,666	18,936
	DC (50kW)	481	1,052
Warsaw	AC (11kW)	4,321	18,809
	DC (50kW)	240	1,045

Table 12: Forecast future charging infrastructure needs in the High Efficiency + Modal Shift scenario

City	Charger type	2030	2035
Greater London	AC (11kW)	40,153	66,672
	DC (50kW)	2,231	3,704
Madrid	AC (11kW)	9,898	25,365
	DC (50kW)	550	1,409
Paris	AC (11kW)	7,800	17,042
	DC (50kW)	433	947
Warsaw	AC (11kW)	3,888	16,928
	DC (50kW)	216	940

Measured against the EU's AFIR regulation, which sets a minimum charging power target of 1.3 kW per registered battery-electric vehicle, the picture is mixed. Paris is furthest along, with its existing base meeting roughly 84% of the 2030 AFIR target while Madrid reaches only 51%.

More efficient charging networks require fewer public charge points

The three scenarios modelled (Base, High Efficiency and High Efficiency + Modal Shift) produce systematically different infrastructure requirements, but they differ in the assumptions used rather than in their overall direction of travel.

The Base scenario, which reflects business as usual, requires the largest absolute and relative increases in all cities and should therefore be read as an upper boundary for required charge points.

The High Efficiency scenario introduces a shift towards home, workplace and fast charging, alongside greater use of HPC charging. This reduces total public charge point demand, and the required number of charge points across cities, by 18 to 21%, or roughly a fifth.

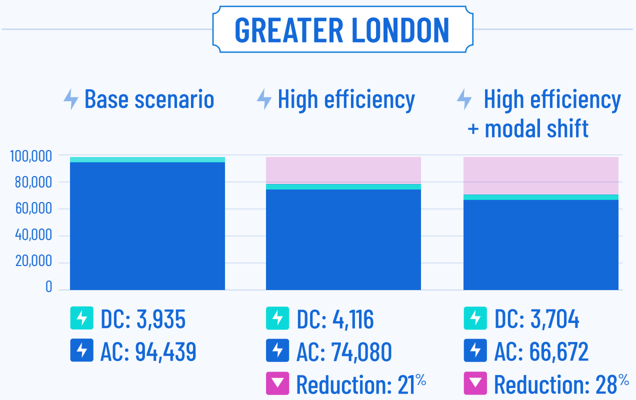
Finally, the High Efficiency + Modal Shift scenario adds a 10% reduction in the total car fleet on top of the High Efficiency assumptions, representing a meaningful shift towards public transport, walking, cycling and shared mobility, reducing the need for charge points. Compared to the Base scenario, this cuts total demand by 26 to 29%, more than a quarter, across the four cities, representing several thousand charge points.

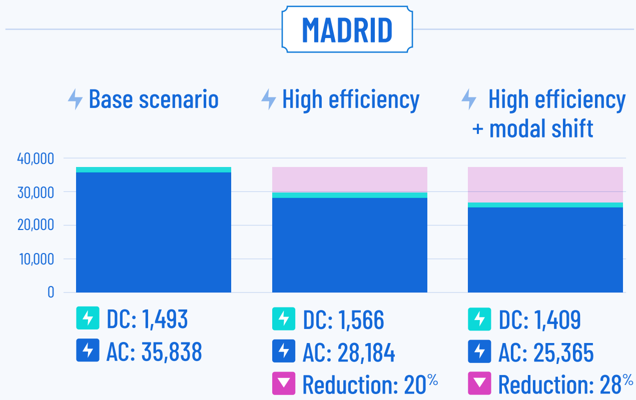
Smart policies reduce the number of required charge points

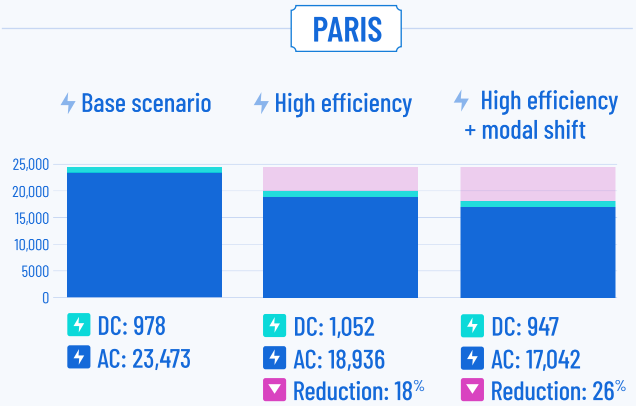
The scenarios confirm that increasing private and semi-public charging at workplaces, retail car parks and residential garages and driveways can reduce the pressure on the public network. Policy choices matter. The High Efficiency scenario reduces the future requirement for public charging by around a fifth in the four cities. This is largely driven by the reduction of AC charge points needed, whereas DC charging demand sees a small increase. Combined with a 10% modal shift away from the car, this reduces the number of charge points needed by more than a quarter by 2030 and 2035.

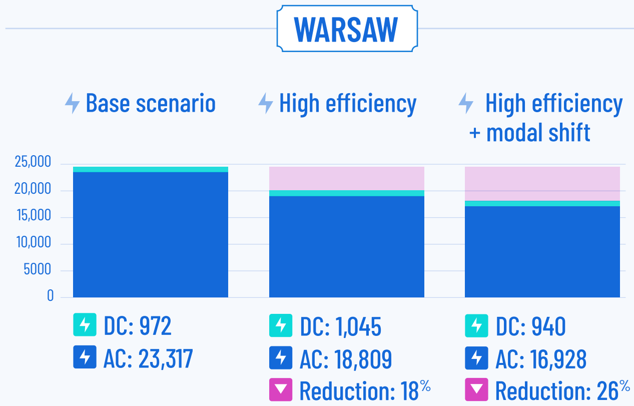
The implication is clear: more efficient use of existing infrastructure, a shift to faster charging, better workplace and home charging provision, and reduced car dependency can meaningfully reduce the scale and cost of future public charging deployment. However, reducing the number of charge points does not remove the need for grid planning, investment and careful site selection, especially where cities rely more heavily on higher-power charging. None of these measures, however, remove the need for large-scale expansion. Even under the most favourable scenario, all four cities still require far more charging infrastructure than exists today.

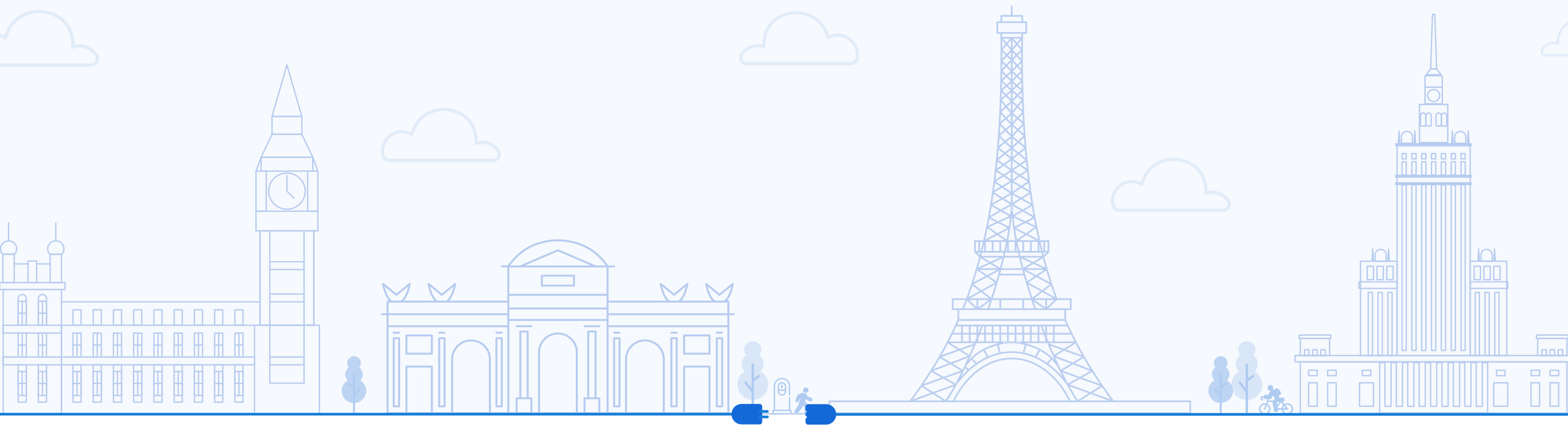
Number of charge points required (2035) under the three scenarios











Policy recommendations

Building charging networks that work for everyone requires action at every level of government. Based on the findings of this study, Clean Cities calls on cities, national governments and the EU to act on the following priorities:

Cities

- **Plan strategically, not reactively**. Develop or update a Charging Masterplan that maps projected demand by district, identifies grid constraints early, and sequences rollout over time. Spatial inequalities will not self-correct. Districts with high public charging dependency, such as dense mixed-use areas, apartment-dominated neighbourhoods, and residential areas without off street parking should be prioritised.

- **Align charging with broader urban mobility goals**. Pairing a more efficient rollout of EV infrastructure with investment in public transport, cycling and shared mobility can cut infrastructure requirements by almost 30%. Fewer cars means less infrastructure, lower costs and more public space for other uses. Rolling out charging infrastructure should not entrench car dependency in cities.

- **Shift demand away from the street**. Reduce public charging needs by steering residential demand towards workplaces, semi-public spaces, car parks and private garages using spatial planning and procurement. On-street charging should primarily serve households with no viable alternative.

- **Use data and utilisation thresholds to guide expansion**. Require charge point operators to share real-time utilisation data as a condition of operating on public land. Define utilisation thresholds that trigger new capacity, rather than deploying infrastructure speculatively.

- **Make charging affordable for all**. Use procurement and concession contracts to require transparent kWh-based pricing and set maximum ad-hoc prices where appropriate.

National governments and grid operators

- **Remove the bottlenecks cities cannot solve alone.** Grid operators of the low- and medium voltage grids need to engage pro-actively with cities on future needs for urban charging infrastructure and how grid planning can anticipate the roll-out of charging sites. To help such a coordinated roll-out, grid operators should publish and regularly update granular grid capacity data.

- **Right to plug:** National governments should go beyond the minimum requirements of the EU's Energy Performance of Buildings Directive (EPBD) by introducing effective and enforceable right-to-plug rules for tenants and owners and mandating full EV-readiness in all new builds and major renovations.

European Union

- **Maintain integrity of CO_2 standards for cars and vans**. Ambitious and predictable targets, such as the CO_2 standards and the proposed Clean Corporate Vehicles regulation, are the single most important driver of EV adoption at EU level. Without a large and growing EV fleet, the case for investing in public charging weakens. Standards must remain robust and stable to give manufacturers, operators and cities the certainty they need to invest.

- **Strengthen AFIR price transparency rules.** Pricing should be limited to energy price in €/kWh, a standardised idle fee, and any roaming charges. It should be displayed in full before each session begins, alongside reference costs to help drivers compare prices across stations. Ad-hoc access must require no prior registration, app or contract. Standard card payment should be enforced across all chargers, including DC.

Appendix: Methodology

This appendix summarises the overall approach, main data sources, and key parameters, assumptions and limitations used in the analysis and modelling. For a more detailed methodology, see the accompanying technical report by EVConsult, which conducted the detailed data analysis for Clean Cities.

Assessment of the existing charging infrastructure

To assess the existing charging infrastructure in each of the four cities, we used data compiled by Eco-Movement. This includes the location, operator, power type and activity status of every recorded semi-public and public charge point, as well as utilisation and pricing data. Charge points were assigned to districts using their geolocation and analysed across six indicators. Population, vehicle registration and income data were drawn from official local or national government sources for each city. The data reflects the situation as of February 2026.

Data sources

Charge point data was sourced from Eco-Movement in February 2026, covering connector type, utilisation and pricing across all four cities. City-level data on registered vehicles, population and income was drawn from official sources: ONS census and the London Datastore for Greater London; Panorama Warsaw for Warsaw; INSEE and Apur for Paris; Estudio Sociodemográfico de Madrid and the Dirección General de Tráfico for Madrid. The data sources for the four metrics presented in table 1 can be found in table 13.

Model scope

The model covers only passenger cars and LCV not part of a fleet, and (semi-)public charging. Commercial van fleets charged in depots, plug-in hybrids, heavy duty vehicles, taxis and powered two-wheelers are excluded, as they follow different charging patterns. Private (home and workplace) charging is accounted for in the scenario assumptions but not modelled in its own right.

Table 13: Data sources used for the four metrics presented in table 1 (all figures for 2024)

	Greater London	Madrid	Paris	Warsaw
Population	ONS mid-2024 MYE	INE Padrón Municipal	INSEE	GUS, via City of Warsaw
Surface area	GLA London datastore	IGN	INSEE	UM Warszawa
Passenger car fleet	DfT VEH0105	DGT	SDES	GUS Bank Danych Lokalnych
Number of EV passenger cars	DfT VEH0105	DGT	SDES	PSNM (1), (2)

Table 14: Share of EVs assumptions by year and city

City	2024 (actual)	2030 (projected)	2035 (projected)	Source
Greater London	6%	36%	59%	London EV Infrastructure Strategy 2025, upper bound
Madrid	1.8%	17.0%	43.9%	Clean Cities (E)Mission Zero study
Paris	4.9%	25.1%	54.5%	French national target; applied growth trajectory to current Paris share
Warsaw	1.1%	5.0%	24.9%	Clean Cities (E)Mission Zero study

Modelling approach

The starting point is each city's current registered car fleet, broken down by district. Van numbers, where unavailable at district level, are estimated as a fixed share of the car fleet (10%). Given limited district-level data on parking, commuter and visitor flows, demand is estimated separately for three user groups: residents, commuters and visitors.

Within cities, a relative income index adjusts these projections, reflecting the observed relationship between income and EV uptake in passenger cars. This income effect is not applied to vans, whose electrification is assumed to be driven primarily by total cost of ownership (TCO).

From these inputs and using the parameters and assumptions described further below, the model estimates the number of AC (11 kW) and DC (50+ kW) charge points required, applying a charge-point-per-EV ratio calibrated from European benchmarks.

EV adoption rates

EV adoption forecasts draw either on official city or national targets where available (Greater London, Paris), or on Clean Cities' (E)Mission: Zero study (Madrid and Warsaw), with IEA EV market projections for Europe used to fill remaining gaps, including 2035 uptake where city-specific projections were unavailable.

While ambitious, the resulting adoption rates reflect the cities' very different starting points and remain plausible if supported by the right policies and incentives. Van electrification is modelled separately using the IEA's European EV market forecast, reaching 16% of the total van fleet by 2030 and 38% by 2035, reflecting a TCO-driven rather than income-driven adoption pattern.

District typology

Each district in a city is assigned one of six typologies based on its characteristics, which determine the assumed split between the three user groups and between parking provided publicly and privately.

Table 15: District typologies used

District type
Historic centre
Classic inner district
Mixed-use urban
Transit hub
Residential suburbia
Industrial fringe

Key modelling parameters

The model is built around eight key parameters that translate estimated EV populations into charge point demand. Vans are incorporated as a flat share of the car fleet in each district, reflecting European city averages. The charge point-to-EV ratios vary by user type, reflecting differences in charging behaviour. A double-use factor is applied to correct for the partial overlap in charge point use between user groups, accounting for the fact that a single charge point can serve multiple users over time, reducing the gross number of units required.

The model also distinguishes between AC and DC infrastructure, with the DC equivalence ratio allowing aggregate demand to be expressed in a consistent unit. Finally, an income weight factor modulates charge point need across districts of different socioeconomic character, reflecting the impact of income on EV ownership.

Table 16: Key modelling parameters used

Parameter	Value (Base scenario)	Basis
Vans as share of car fleet (per district)	10%	Simplified assumption reflecting averages across European cities
Charge points per resident EV	1 per 8 EVs (0.125)	European benchmarks, EVConsult
Charge points per commuter EV	1 per 13 EVs (0.075)	European benchmarks, EVConsult
Charge points per visitor EV	1 per 25 EVs (0.04)	European benchmarks, EVConsult
Double use factor	0.6	Expert judgement
AC/DC split	80% AC / 20% DC	Expert judgment based on observed current rollout splits
DC equivalence ratio	1 DC charger = 6 AC chargers	Estimate of equivalent electricity throughput in real-world setting
Income weight factor	0.5	Expert judgement

Scenario parameters

The table below presents the four parameters and their values used to define the three scenarios.

Table 17: Overview of key scenario parameters

Parameter	Base	High Efficiency	HE + Modal Shift
Residential public charging dependency	100%	85%	85%
Public-to-private parking shift	0 pp	−2.5 pp	−2.5 pp
AC/DC split of new chargers	80/20	75/25	75/25
Total car fleet (modal shift to public transport and active travel)	100%	100%	90%

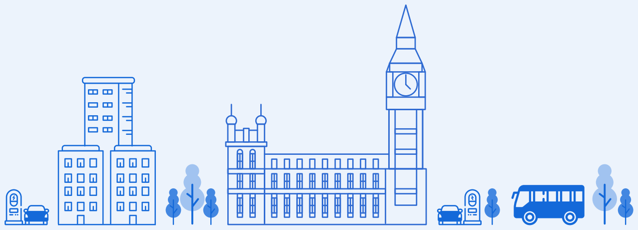
Sensitivity analysis

Model sensitivity to two key parameters was tested to assess the robustness of the model outputs. The charge points per EV ratio acts as a direct linear multiplier: adjusting it by ±10% shifts all city totals by the same amount. The double use factor has a smaller effect. Changing it by ±20% alters projected city totals by only around 3%, because results are driven more by the size of the dominant user group in each district than by the overlap between user groups.

The model is therefore most sensitive to assumptions about charging demand per EV, while the correction for shared use between user groups has limited effect on the outputs. EV uptake was treated as a fixed model input rather than a sensitivity variable. However, because it directly scales projected charging demand, any deviation from the assumed adoption trajectory would shift city-level outputs proportionally.

Key limitations

- The analysis relies on Eco-Movement charge point data, which, like any large-scale infrastructure dataset, may be subject to reporting lags, classification inconsistencies, or incomplete coverage across all markets.
- The charge point per EV ratios are calibrated from Dutch and European benchmarks, not from direct measurement in any of the four study cities. They represent the most consequential assumption in the model.
- EV adoption rates are applied uniformly within cities and adjusted only for relative district income. Spatial variation in adoption beyond the income effect, including differences linked to housing type or parking availability, is only partially captured through the district typology.
- Taxis, ride-hailing, heavy commercial vehicles and powered two-wheelers are excluded from projected demand but are present in the installed base figures drawn from Eco-Movement. Direct comparison between projected demand and installed base therefore overstates coverage, particularly for DC charge points.
- The model expresses projected demand in standardised charge point units: 11 kW for AC, 50 kW for DC. These are not directly comparable on a one-to-one basis with the numbers of currently installed charge points, which reflect the actual mix of charger types. The two datasets should therefore be read alongside each other, rather than subtracted from each other.
- The four cities use different administrative boundaries, which limits the direct comparison between them. This is particularly important for Paris, given the city's comparatively small size and high density.
- The model does not account for any future population or car fleet growth, apart from the assumed 10% reduction in car ownership in the High Efficiency + Modal Shift scenario. It also assumes urban structure, commuter and visitor flows, parking supply and parking behaviour remain constant. Changes in these would affect charging demand and therefore the number of charge points required.



GREATER LONDON

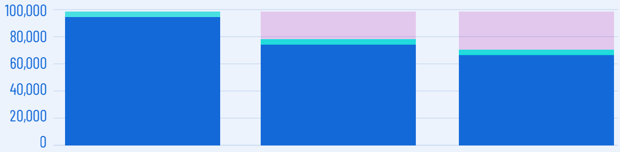
Existing charging points (2026)

DC: 2,127
AC: 27,264

Electric Vehicle share of passenger car fleet

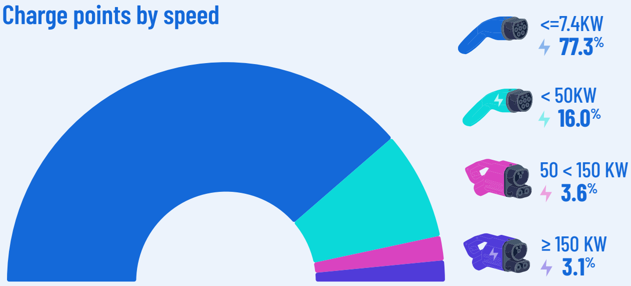
2024: 6%
2035: 59%

Number of charge points required (2035) under the three scenarios

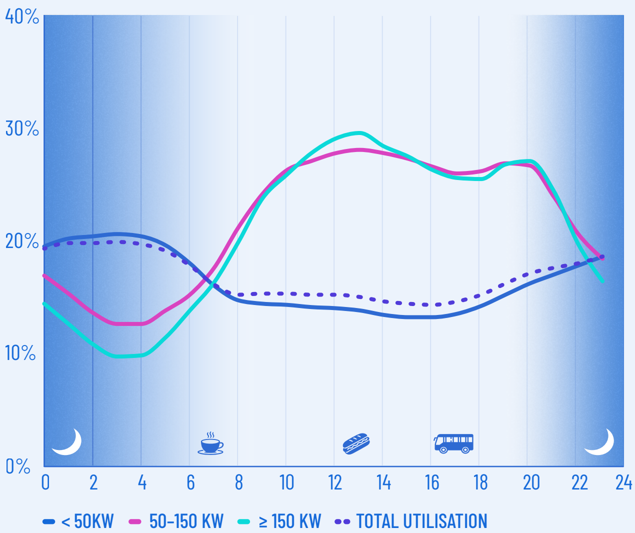


Base scenario	High efficiency	High efficiency + modal shift
DC: 3,935	DC: 4,116	DC: 3,704
AC: 94,439	AC: 74,080	AC: 66,672
	Reduction: 21%	Reduction: 28%

Charge points by speed



Hourly utilisation rates by speed band



MADRID

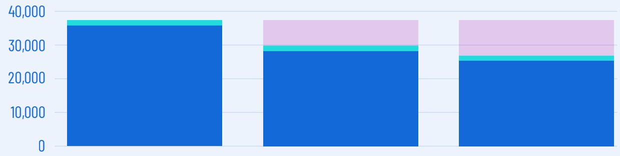
Existing charging points (2026)

DC: 780
AC: 2,640

Electric Vehicle share of passenger car fleet

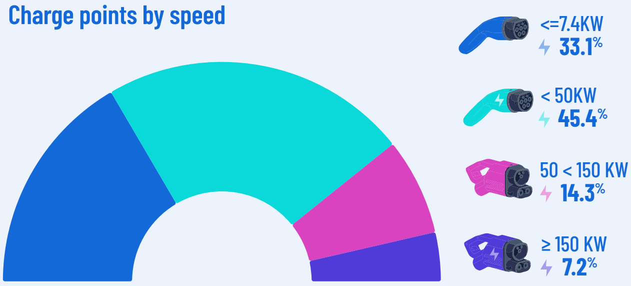
2024: 1.8%
2035: 43.9%

Number of charge points required (2035) under the three scenarios

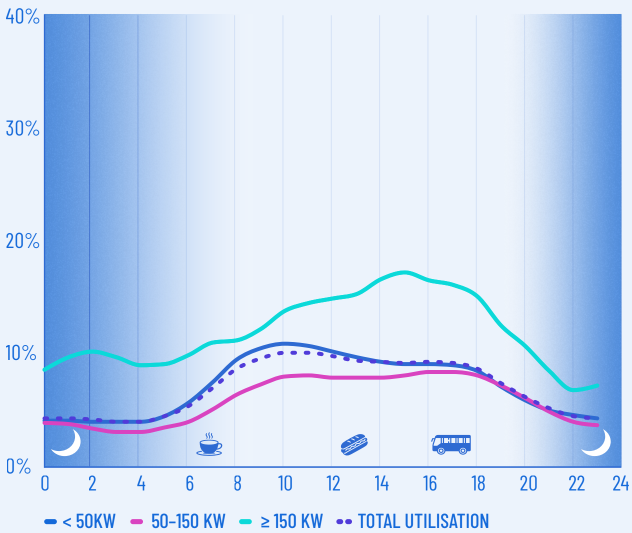


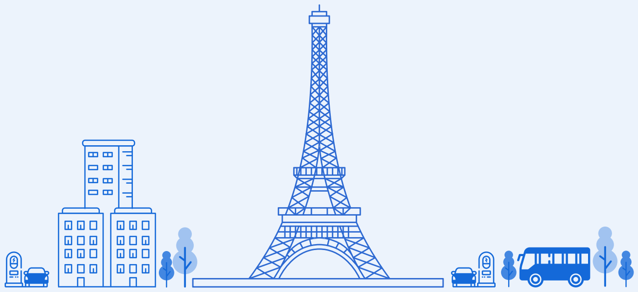
Base scenario	High efficiency	High efficiency + modal shift
DC: 1,493	DC: 1,566	DC: 1,409
AC: 35,838	AC: 28,184	AC: 25,365
	Reduction: 20%	Reduction: 28%

Charge points by speed



Hourly utilisation rates by speed band





PARIS

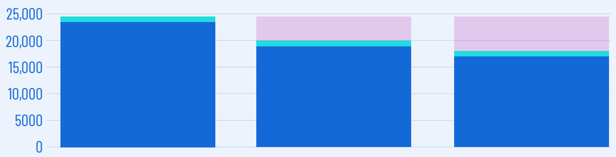
Existing charging points (2026)

DC: 451
AC: 10,706

Electric Vehicle share of passenger car fleet

2024: 4.9%
2035: 54.5%

Number of charge points required (2035) under the three scenarios

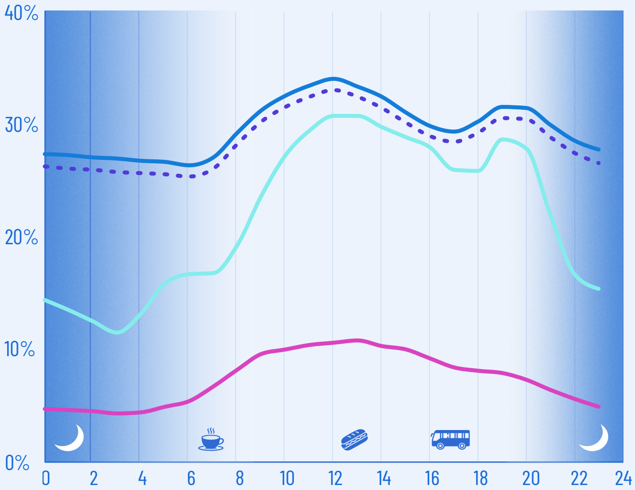


Base scenario	High efficiency	High efficiency + modal shift
DC: 978	DC: 1,052	DC: 947
AC: 23,473	AC: 18,936	AC: 17,042
	Reduction: 18%	Reduction: 26%

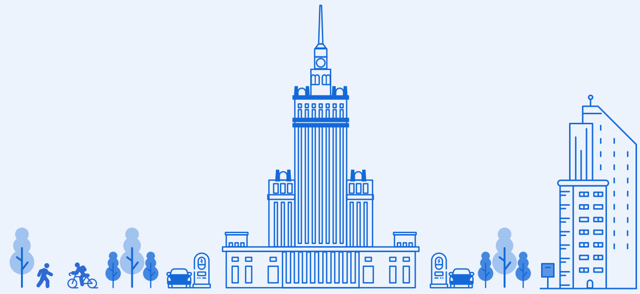
Charge points by speed

- <=7.4KW: 80.3%
- < 50KW: 18.1%
- 50 < 150 KW: 0.6%
- ≥ 150 KW: 1.0%

Hourly utilisation rates by speed band



< 50KW · 50-150 KW · ≥ 150 KW · TOTAL UTILISATION



WARSAW

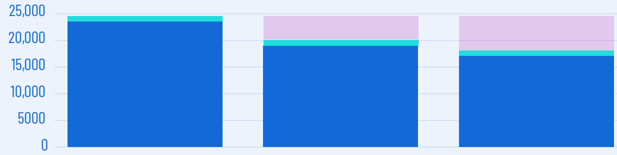
Existing charging points (2026)

DC: 332
AC: 592

Electric Vehicle share of passenger car fleet

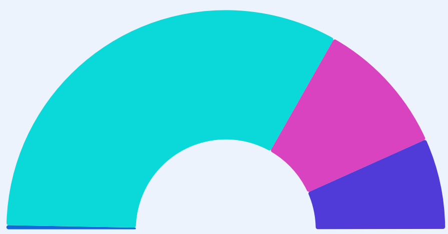
2024: 1.1%
2035: 24.9%

Number of charge points required (2035) under the three scenarios



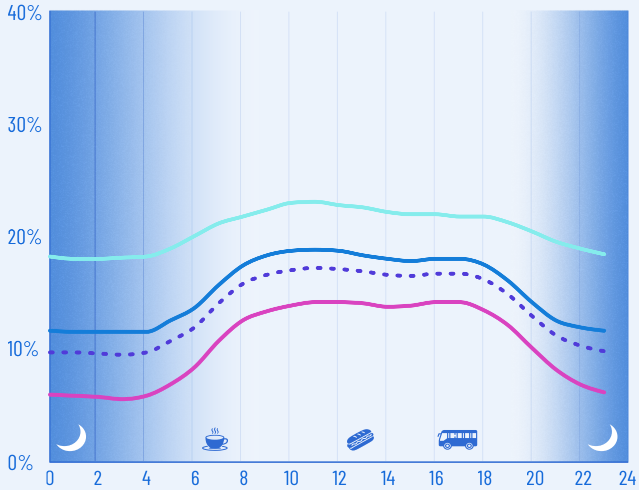
Base scenario	High efficiency	High efficiency + modal shift
DC: 972	DC: 1,045	DC: 940
AC: 23,317	AC: 18,809	AC: 16,928
	Reduction: 18%	Reduction: 26%

Charge points by speed



- <=7.4KW: 0.6%
- < 50KW: 65.8%
- 50 < 150 KW: 20.1%
- ≥ 150 KW: 13.4%

Hourly utilisation rates by speed band



< 50KW · 50-150 KW · ≥ 150 KW · TOTAL UTILISATION

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Find out more

Clean Cities is Europe's largest network of organisations on a mission to build public support for cities to shift from polluting cars to active, shared and electric mobility.

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