From Plan to Plug

A step-by-step guidebook for cities to deploy electric vehicle charging infrastructure

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Executive summary

Electric mobility is essential to achieving zero-emission mobility and liveable cities, alongside active travel, shared mobility and public transport. But it can only scale if charging infrastructure is **adequate in its coverage, affordability and ease of access and use**.

Cities across Europe face similar barriers when rolling out charging: weak coordination, uncertainty about adequate charging locations, gaps in provision and concerns about equity and public space. These challenges are well known - as are many of the solutions.

Drawing on **existing research** and **practical experience from cities across Europe**, this guidebook sets out a clear, **step-by-step** approach to planning, procuring and deploying charging infrastructure that is adequate, fair and future-proof.

There is no single blueprint for charging networks, but there is a **common process**. Successful cities begin by setting up the right governance structures. Next, they develop a Charging Masterplan that aligns with wider mobility, parking and urban goals and intervene in the market only where necessary.

Local conditions differ, yet the most effective responses are often similar. **In most cases, another local authority has already solved the same problem**. This guidebook brings lessons together into a practical framework that any city can adapt.

The Clean Cities approach to rolling out electric vehicle charging infrastructure in cities can be summarised with these 5 principles:

1. **Develop a goal-led masterplan using spatial data and scenarios**: Adopt and maintain a Charging Masterplan that backcasts from the city's mobility, energy and climate goals, uses local spatial analysis and scenarios, and treats grid capacity as a core siting constraint.

2. **Set clear accountability with formal coordination**: Establish accountable governance, ideally with a single lead team, with clear decision-making routines across departments, the distribution network operator(s) and delivery partners.

3. **Prioritise high-impact users early, especially fleets and shared mobility**: Treat shared cars, urban logistics and municipal fleets as priority charging cases, as they create predictable utilisation and can accelerate wider network viability.

4. **Sequence deployment from demand-led to planning-led rollout**: Start with demand-led rollout in earlier stages, then shift to planning-led deployment as the network matures, using utilisation, grid and equity data to refine locations and charger types.

5. **Protect public interest through a desired location mix and procurement rules**: Define a clear desired mix for private, semi-public and public charging across the city (or by district); use city investment and public space only where other solutions fall short; and use contracts to require balanced rollout, step-free access, transparent pricing, service quality and data sharing.

Summary of Clean Cities recommendations

The Clean Cities approach is structured in seven stages, each with practical recommendations, as summarised in the infographic below.

Stages	Recommendation	Best practice examples
Stage 1. Starting point: why a Charging Masterplan and organisational readiness are essential		
1.1 Create strategic, regularly updated Charging Masterplans	Create a clear, comprehensive electric vehicle charging Masterplan that fits into broader mobility, climate, and urban planning goals—and update it regularly.	Oslo Amsterdam Stockholm Berlin
Stage 2. Organising for success: governance, ownership and permitting		
2.1 Establishing clear leadership	Appoint a single lead office or coordinator to be the main point of contact and decision-maker for all charging matters.	London
2.2 Define roles, responsibilities and decision-making mechanisms	Define responsibilities for every stage of charging deployment and support them with formal coordination routines between departments, the grid operator(s), and delivery partners.	See table provided by the ICCT
2.3 Coordinate with neighbouring and regional authorities	Develop a local charging Masterplan aligned at the regional level, ensuring that infrastructure matches real travel patterns.	Amsterdam
2.4 Decide on ownership and market design	Pick an ownership and governance model early that fits your goals and risk appetite, and embed public-interest requirements such as affordability, reliability, and data sharing into contracts.	Rotterdam Madrid
2.5 Streamline permitting procedures	Simplify and standardise electric vehicle charging permits with clear technical requirements, uniform checklists, and one-stop-shop procedures. Publish clear guides with installation steps, timelines, and costs, and pre-identify suitable sites.	London Utrecht Oslo Stockholm
Stage 3. Analysis: understanding charging needs, defining scenarios and priorities		
3.1 Align charging deployment with broader city goals, not just private car use	Deploy charging in ways that advance wider mobility goals: reducing car dependency, boosting liveability and public health, reclaiming public space, and supporting active, public, and shared transport.	Turku Madrid
3.2 Include shared vehicles, freight and municipal fleets	Treat shared cars, urban logistics, and municipal fleets as high-priority charging cases.	Bremen Hamburg
3.3 Use a spatial and data-driven baseline that accounts for uncertainty	Base EV charging plans on local data and spatial analysis aligned with the city's own mobility goals rather than generic ratios or national averages.	Dublin Turku
3.4 Combine demand-driven with planning-oriented deployment	Combine demand-driven with planning-led deployment. Begin with demand-driven rollout to build access, then shift towards planning-led deployment using data on usage, grid capacity, and equity.	Amsterdam
Stage 4. Public procurement: Using market design to deliver equity		
4.1 Use contracts and tender design to safeguard the public interest	Clearly define infrastructure and data ownership in contracts and enforce standards for pricing, interoperability, accessibility, and service quality.	Amsterdam Antwerp Stockholm
4.2 Use pricing and financial incentives to lower barriers to access	Use pricing rules and financial tools to make public EV charging affordable for those who need it most, including apartment residents and high-mileage professional drivers.	Paris Stuttgart London
4.3 Require transparent, fair and comparable pricing	Use procurement and contracts to enforce clear, kWh-based pricing, with both on-site and digital transparency - and set maximum prices where necessary.	Antwerp Rotterdam Reggio Emilia

Summary of Clean Cities recommendations (cont.)

Stages	Recommendation	Best practice examples
Stage 5. Deploying right: priorities, design principles, and accessible infrastructure		
5.1 Define the right mix between private, semi-public and public charge points in line with local needs and strategies	Prioritise private and depot charging first, then semi-public (workplaces, etc), then public hubs, with on-street charging only as a last resort.	Antwerp Amsterdam Paris Stuttgart
5.2 Choose Charging Infrastructure Based on Use Case	Match charging technology to use case: install slow chargers for long-stay locations and rapid chargers in convenient, easy-to-access sites.	Madrid London
5.3 Designed with: accessibility, durability, and safety in mind	Ensure charge points are durable, repairable, and fully accessible. Mandate step-free access, adequate space, clear signage, and safety rules.	Prague Amsterdam
Stage 6. Beyond installation: setting service and operational standards		
6.1 Guarantee open access and set a minimum service quality	Ensure public chargers are usable without prior registration or subscription. Set clear service standards in contracts covering uptime, maintenance, real-time monitoring, and 24/7 support.	Arnhem
6.2 Ensure Vehicle-to-Grid capability	Require open, non-proprietary standards in all tenders to ensure interoperability and roaming. Require future-proof infrastructure through secure software upgrades, standards such as ISO 15118-20 and OCPP 2.1, and bidirectional capability where appropriate.	Utrecht
6.3 Require full data transparency and digital connectivity	Ensure all public chargers are digitally connected and share real-time data, so cities and operators can track usage, identify gaps, enforce standards, and guide future deployment.	Berlin
Stage 7. Cross-cutting considerations for successful deployment		
7.1 Treat the grid as a planning constraint from the outset	Involve the DSO (Distribution System Operator) early, map grid capacity before selecting sites and treat grid availability as a hard constraint. use strategies such as grid-first site selection and smart charging.	Stockholm Nottingham
7.2 Mandate that new and renovated buildings are EV-ready	Mandate EV readiness in building regulations by requiring pre-cabling, adequate electrical capacity, and space for future upgrades in new developments and major renovations. Introduce "right-to-plug" rules where appropriate.	San Francisco Vancouver
4.3 Require transparent, fair and comparable pricing	Use procurement and contracts to enforce clear, kWh-based pricing, with both on-site and digital transparency - and set maximum prices where necessary.	Antwerp Rotterdam Reggio Emilia

Introduction: the case for urban electrification and the purpose of this guidebook

Why electrification is key to zero-emission urban transport

Transport is Europe's largest source of greenhouse gas emissions and a major driver of harmful air pollution, with cities carrying a disproportionate share of the impacts. Around three quarters of Europeans live in urban areas, and 94% are exposed to air pollution above health-based limits, with road transport one of the major contributors. Urban mobility accounts for roughly 23% of the EU's transport-related greenhouse gas emissions. Cutting emissions from cars, vans, trucks and buses is therefore essential for public health, climate action and more liveable cities.

The Clean Cities Campaign's 2023 modelling study '(E) Mission: Zero' showed that a broad mix of solutions is required to achieve zero-emission urban transport, with electrification essential but not sufficient on its own. Only when cities combine rapid electrification with strong investment in public transport, shared mobility and active travel do they approach emission-free urban transport. Cities that act early and decisively achieve faster and stronger results, delivering cleaner air, quieter streets, safer roads, and better public health - benefits that exceed the costs in most modelled scenarios.

Transport electrification, however, depends on the availability of sufficient, reliable and affordable charging. Scaling up electric vehicle charging infrastructure (for BEVs, PHEVS) is both a critical enabler and a potential bottleneck. While progress has been made, as demonstrated in Clean Cities 'State of Urban Transport 2025' analysis, deployment remains uneven across Europe, with many cities facing shared challenges around business cases, equity, regulation, technology uncertainty, funding and competition for public space.

Despite these challenges, pioneering cities from Amsterdam to Copenhagen, Hamburg, Vienna, Ljubljana and London have rolled out charging infrastructure in ways that enable electrification and offer valuable lessons for others. However, it is important to recognise that a city does not need Oslo's financial resources to deliver efficient, well-functioning electric vehicles charging networks. Whatever a city's starting point, adapting proven solutions to local conditions allows for rapid progress.

Purpose of this publication

Despite a growing body of research, discussions with officials and experts indicate that many cities still lack a practical, operations-focused guide to help them plan and deliver electric vehicle charging infrastructure. This Clean Cities guide provides municipalities with clear, action-oriented guidance on planning and delivering inclusive charging networks as part of the broader transition to zero-emission transport.

It focuses on measures cities can implement directly and draws on proven strategies and case studies. It concentrates on charging systems for light duty vehicles - cars, vans and taxi or ride-hailing vehicles - in urban environments, as charging infrastructure for other vehicles often relies on depot charging built on private land. Where relevant, these challenges are noted here, but for more detail, readers are referred to specific guidance such as T&E's briefing '[Electric depots: the key to electrifying road logistics]'.

Building on existing research, notably by Agora Verkehrswende, the International Council on Clean Transportation (ICCT), the EU's Sustainable Transport Forum and Urban Mobility Observatory - and lessons from past deployments, this guide helps cities avoid common pitfalls and design Charging Masterplans that enable a fast, cost-effective and fair rollout of charge points.

A follow-up publication is planned for mid 2026 and will complement this guide with in-depth, data-driven case studies of selected European capitals under different scenarios.

Definitions

AC: Alternating Current charging (slow charging, P > 50 kW

Ad-hoc payment: ability to pay for a charging session at the charging point without a contract, subscription, or registration.

Ad-hoc price: the price per kWh charged to a driver paying without a contract, subscription, or registration.

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.

Blocking fees: are charges applied to electric vehicle drivers who leave their vehicle plugged in at a charging station after it has finished charging.

Bidirectional charging: ability for the charger and the vehicle to transfer electricity both into the vehicle (charging) and out of it (discharging), enabling the car to supply power back to the grid or a building.

CPO: Charge Point Operator

Charging bay: a designated parking space reserved for an electric vehicle while it is actively charging, typically marked and regulated to prevent non-charging vehicles from using it.

Charging desert: an area with few or no public charge points available, leaving electric vehicle drivers unable to charge away from residence.

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

Depot charging: charging electric vehicles at a centralised, off-street location (a depot) where fleets are parked for extended periods.

Destination charging: charging that is provided at locations where drivers intend to stay for a while: the vehicle charges while the driver is occupied with an activity, such as shopping, dining, working, or staying overnight.

DSO: Distribution System Operator, the company responsible for operating, maintaining and developing the local electricity distribution grid.

Electric vehicles: battery-electric vehicles (BEVs) and plug-in hybrid electric vehicles (PHEVs).

EVPL: electric vehicle-enabled parking lot.

ICEing: the practice of a vehicle, often an internal combustion engine (ICE) car, occupying a designated EV charging space without actively charging, thereby blocking access to the charge point.

Interoperability: chargers, vehicles, apps, and payment systems work seamlessly together across different operators, technologies, and countries, so drivers can charge easily without compatibility barriers.

Opportunity charging: charging an electric vehicle in short sessions whenever it is parked during normal daily activities, such as at workplaces, shopping centres, or mobility hubs, rather than relying on planned charging sessions.

Roaming: ability for drivers to use charge points from different operators through a single app, card, or contract.

Roaming price: the price per kWh charged to a driver accessing a charge point through a third-party app, card, or contract rather than directly with the operator.

Smart charging: the charge point, the vehicle, and an energy management platform exchange data in real time, enabling charging to be scheduled or adjusted to periods when electricity is cheapest or grid demand is lowest.

Uptime: The proportion of time an electric vehicle charger is fully operational and available for use.

V2G: vehicle-to-grid, it is a specific use case of bidirectional charging where the electricity from the electric vehicle is fed back into the grid to support grid stability, provide energy during peak demand, or balance renewable energy supply.

Diagnosis: common challenges in deploying urban charging infrastructure

Existing research and discussions with local administrations show that cities are confronted with a shared set of obstacles that hinder the efficient rollout of charging infrastructure. Table 1 below summarises these challenges. While cities cannot control all of these variables to the same degree, this overview shows that most barriers to efficient charging deployment are either directly shaped by municipal decisions or can be mitigated through proactive planning and coordination. This guidebook aims to support cities in navigating these challenges by translating proven solutions into approaches that can be adapted to local contexts.

Table 1. Common challenges for cities in deploying charging infrastructure

Strategic challenges	Examples of main challenges
1. Providing sufficient charging infrastructure at the right time	• Difficulty forecasting electric vehicle uptake leading to a risk of over- or under-provision. • Charging insufficiently integrated into wider mobility, parking and urban planning leading to poorly planned infrastructure. • Parking misuse (ICEing, overstaying) reducing effective availability. • Public space constraints limiting suitable locations. • Uneven rollout within and between municipalities, creating fragmented networks.
2. Making the business case work	• Low utilisation in early phases deterring private investment. • Volatile electricity prices creating uncertainty for investors. • Unclear allocation discouraging market participation. • High upfront grid connection costs, raising barriers to new installations.. • Market-led deployment focusing on profitable areas, leaving outer or lower-income districts underserved. • Dependence on public funding, constraining long-term investment.
3. Technology & grid uncertainty	• Local grid capacity constraints, long connection timelines, and limited transparency on available capacity, delaying charging deployment. • Costly reinforcements linked to high-power charging, increasing project costs. • Rapidly evolving technologies (fast charging, smart charging, V2G) requiring infrastructure to be future proofed, complicating investment decisions. . • Regulatory fragmentation and evolving EU and national standards for interoperability, roaming, accessibility, and payment systems creating uncertainty for operators and users.
4. Ensure equitable access	• Residents without private parking can't benefit from cheaper home-charging rates creating unequal charging costs. • Risk of "charging deserts" limiting access to charging infrastructure for some. • Barriers to access for people with disabilities, limiting inclusive use of infrastructure. • Poorly designed installations creating safety risks or visual clutter, undermining public acceptance. • Fragmentation across municipal borders creating inconsistent charging access.

Stage 1. Starting point: why organisational readiness and Charging Masterplans are essential

1.1 Create strategic, regularly updated Charging Masterplans

Cities leading the way towards zero-emission transport tend to start with a Masterplan. Instead of reacting to individual requests, short-term funding opportunities or market pressure, they put in place strategies (which we refer to as 'Charging Masterplans') that set clear priorities, define roles and sequence action over time. This gives municipal teams a shared direction, provides certainty for private operators and creates predictability for residents.

Recommendation 1. Cities should develop a comprehensive Charging Masterplan for electric vehicles embedded in wider mobility, climate and urban planning strategies, and review it regularly.

Rather than setting precise long-term infrastructure targets, cities should focus on clear decision-making processes. The Charging Masterplans should function as living frameworks — regularly updated to adapt to real-world data, evolving technologies, and changing mobility patterns.

There is no single "right" number of chargers or ideal technology mix: needs vary widely depending on housing types, car ownership, commuting patterns, fleet profiles, and the pace of electrification.

Best practice examples: Cities such as Amsterdam's Strategic Plan for Charging Infrastructure 2020-2030, Turku's Electromobility Masterplan 2024–2030 and Stockholm's Charging Master Plan for Electric Vehicles show that success lies in building a robust decision-making process rather than predicting the future.

Without a clear Masterplan, cities risk inefficient infrastructure deployment, misallocation of scarce public space, signing inflexible contracts, creating local monopolies and missing opportunities to coordinate charging rollout with grid upgrades or street works.

Put in place internal enabling conditions

A Charging Masterplan can only be delivered if the right enabling conditions are in place. These include clear political and administrative leadership, effective coordination across departments and neighbouring authorities, well-designed market and ownership models, streamlined permitting and targeted risk-sharing mechanisms. Getting these foundations right reduces delivery risks, cuts soft costs while ensuring charging deployment supports public objectives such as equity, affordability and the protection of public space.

Stage 2. Organising for success: governance, ownership and permitting

2.1 Establish clear leadership

Charging roll-out typically requires decisions from multiple municipal departments, including mobility, planning, urban realm and procurement. It also involves external partners such as grid operators and charge point operators. Without clear leadership, cities can face delays, conflicting requirements, and handover failures.

Recommendation 2. Cities should designate a single, centralised office within the municipality as the main point of contact and decision-maker for electric vehicles charging.

Best practice examples: The London Mayor's office brought together all stakeholders - including national and local authorities, boroughs, power companies, grid operators and industry through an Electric Vehicle Infrastructure Taskforce. This helped align expectations, and supported delivery through a structured plan and practical tools.

2.2 Define roles, responsibilities and decision-making mechanisms

Charging deployment often lags due to weak coordination, for example between municipal departments, grid operators, and infrastructure providers. Cities can avoid these bottlenecks by clearly defining responsibilities and decision making processes.

Within the Charging Masterplan, municipalities should establish a clear governance structure with a lead department, strong internal coordination, and formal working arrangements with grid operators and delivery partners.

At a minimum, roles should be clearly assigned - for example for planning, permitting, grid coordination, procurement, operations, and data reporting - supported by permanent coordination mechanisms that resolve issues quickly and avoid siloed decision-making. Table 2 in Annex 1 summarises the responsibilities of the main stakeholders, their main contributions and best practices for city engagement.

Recommendation 3. Clearly define responsibilities across every stage of deployment, and support them with formal coordination routines between departments, grid operators, and delivery partners.

2.3 Coordinate with neighboring and regional authorities

Municipalities lead electric vehicle charging roll-out because they regulate land use, including permitting. However, charging networks do not stop at city borders. Commuting, logistics, and taxi or ride-hailing travel routinely cross municipal boundaries, which makes regional coordination essential.

For many cities, especially smaller ones, acting alone weakens their negotiating position and risks creating fragmented networks. In many cases, coordinating planning and procurement at metropolitan or regional level is necessary to create scale, align standards, lower costs and improve network coherence, while allowing cities to retain local control through their own Charging Masterplans.

Recommendation 4. Cities should develop a Charging Masterplan while coordinating regionally, so infrastructure follows real travel patterns, reduces costs, strengthens competition and improves network coherence.

Best practice examples: The Metropolitan Region Amsterdam Electric (MRA-E)a cooperation between provinces and municipalities that coordinates electric vehicle charging rollout through joint tenders and harmonised requirements. By pooling demand across more than 70 municipalities, MRA-E enabled the joint tendering of around 20,000 charge points. By combining Amsterdam high demand with lower demand of the surrounding region, they created a stronger business case for operators. This approach delivered economies of scale, standardised service levels and interoperability, allowing both small towns and large cities to benefit from high-quality charging networks.

2.4 Decide on ownership and market design

Cities need to decide early who should own and operate charging assets.These choices shape risk allocation, pricing, data access, service quality, and long-term flexibility. There is no single best model. Municipalities should select ownership and governance arrangements that match their objectives, means and risk appetite, and embed public-interest requirements into contracts, such as affordability, uptime, accessibility, interoperability, and data sharing.

Charging Masterplans should therefore clarify the ownership model and how the municipality wants to leverage private investment to support long-term public objectives rather than short-term commercial interests. Cities can choose to own and operate charging infrastructure directly (as in Barcelona), retain ownership while contracting out operations (Madrid), or partner with public utilities or private operators through joint ventures (Vienna) and concession contracts (Amsterdam). Each of these ownership models offers greater or lesser degrees of control, financial exposure, and delivery speed.

Where cities prefer not to invest directly, they can coordinate an open market of competing private operators (London), use hybrid models that mix approaches across different locations (Berlin), or offer risk-sharing mechanisms like revenue floors to unlock private investment where the business case is weak (Rotterdam, more on this below). Table 3 in Annex 2 summarises the main ownership and governance models, their advantages and trade-offs, and examples of cities using each approach.

Provide clarity to de-risk investments and support deployment

In early rollout phases, uncertain demand often deters private investment in public charging infrastructure. To address this, many cities use targeted risk-sharing tools, such as utilisation guarantees or revenue floors, to reduce investor risk without shifting the full costs to the public. These mechanisms help overcome the "chicken-and-egg" problem and support deployment in lower-demand neighbourhoods.

Best practice examples: Rotterdam introduced a "safety-net" mechanism compensating operators when demand fell below forecasts. This reduces investor risk and supports large-scale rollout of public charging infrastructure without full public financing.

Recommendation 5. Choose an ownership and governance model early that matches the city's objectives and risk appetite, and embed public-interest requirements such as affordability, uptime, and data sharing into contracts to ensure that private investment serves long-term public goals.

2.5 Streamline permitting procedures

Permitting and administrative procedures are among the main barriers to rapid deployment. In many cities, soft costs such as permitting, grid coordination, and inspections can exceed the cost of the charging hardware. Unpredictable timelines and fragmented procedures increase costs and deter private investment.

Treat permitting reform as a strategic deployment tool

Centralised permitting can be a key factor in achieving faster deployment and more predictable timelines. Cities should publish user-friendly permitting guides, developed with key stakeholders, that explain the full installation process for slow and rapid chargers and charging hubs. These guides should include checklists or guidelines, indicative timelines, costs, permit requirements, and an overview of business models. They should be regularly updated to reflect market and regulatory developments. This helps reduce delays, administrative burden, and uncertainty for operators and residents.

Best practice examples: The Mayor of London's EV Infrastructure Taskforce developed standardised charge point installation guidance, including urban realm design principles, site selection criteria, and a standardised permitting and inspection checklist. To speed up delivery further, London local authorities use "permitted development rights", which allow certain charging infrastructure to be installed without full planning permission.

Best practice examples: The Metropolitan Region Amsterdam-Electric also uses a highly standardised process from the initial request through to installation of a station, delivering time and cost savings. For the permitting, the Netherlands uses a single online portal, the omgevingsloket. Charge point operators submit a standard form through this digital one-stop-shop, and the system routes the request to the correct authority reducing uncertainty over where to apply.

Best practice examples: In Oslo, installation cost rose due to increasing regulatory complexity. The city responded by introducing a standardised permitting checklist covering grid connection, heritage constraints, and cable routing.

Best practice examples: Stockholm worked with grid operators and planning authorities to identify and publish pre-approved charging sites, typically accommodating 4–10 charge points. By publishing technical details, the city reduced risk and transaction costs for private operators without relying on direct subsidies.

Recommendation 6. Simplify and standardise permitting through clear technical requirements, uniform checklists, and one-stop-shop procedures. Publish user-friendly guides covering the installation process, indicative timelines and costs. Cities can further reduce uncertainty by identifying and pre-approving suitable charging locations in advance.

For further guidance, see:

- **ICCT's** (2021) Efficient planning and implementation of public chargers: Lessons learned from European cities.

3.1 Align charging deployment with broader city goals, not just private car use

Charging infrastructure shapes mobility behaviour and the use of public space. If planned in isolation, it can reinforce car dependency, induce demand and undermine wider objectives such as safer streets, efficient public transport and the reallocation of public space. Leading cities integrate charging strategies into their wider mobility strategies, such as 'Sustainable Urban Mobility Plans' (SUMPs), and into related climate and land-use policies.

Best practice examples: In Turku, Finland, the municipality began by mapping its properties for future charger installations, identified key stakeholders, and setting up an internal working group. It then developed its Electromobility Masterplan using surveys of more than 500 electric vehicle users. Turku then employed the USER-CHI CLICK tool to model and optimise charger placement, integrating modelling results with traffic planning and property mapping to identify strategic locations.

Best practice examples: In Madrid, charging supports a shift away from on-street parking. The city has concentrated a significant part of its public charging in parking facilities, park-and-ride sites and mobility hubs such as Canalejas 360, freeing surface space for pedestrians and public life.

Recommendation 7. Cities should ensure charging deployment actively supports broader mobility and urban goals, such as reducing car dependency, improving liveability and public health, reallocating public space and strengthening active, public and shared transport, rather than simply accommodating private car use.

Charging infrastructure should never be used to justify maintaining excessive parking supply or delaying necessary parking and traffic reforms, as doing so would ultimately encourage greater private car dependency.

For further guidance, see:

- **POLIS, Rupprecht Consult** (2019) Topic Guide: Electrification - Planning for electric road transport in the SUMP context
- **Rupprecht Consult's**, Guidelines for Developing and Implementing a Sustainable Urban Mobility Plan, Second Edition, 2019

3.2 Include shared vehicles, freight and municipal fleets

Use shared mobility to reduce charging and parking pressure

Charging demand is strongly influenced by how many private vehicles are used in a city and its functional urban area. The experience of many European cities shows that car sharing can reduce vehicle ownership, free up kerb space, improve charge point utilisation rates and reduce the need for widespread low-utilisation chargers. This is particularly the case when car sharing is paired with strong parking and access policies.

Best practice examples: In Bremen, Germany, shows how car sharing, including electric vehicles, can reduce private car ownership when it is planned at scale and integrated into city policy. By 2022, the city had more than 21,000 active car-sharing users, around 80% of whom did not own a private car. The scheme helped replace an estimated 6,000 private vehicles, freed up the equivalent of 30 km of street space, and supported a network of over 400 shared cars across 135+ stations. An increasing number of these vehicles are electric.

Urban logistics can accelerate electrification

Urban logistics, including service vehicles and construction logistics, account for a substantial share of urban emissions and have distinct charging needs. Delivery vans and service vehicles often cannot rely on slow kerbside charging alone. Operations may require rapid opportunity charging during the day, or well-planned depot charging. Depot charging can be effective but it depends on early coordination with grid operators and site owner, as well as sufficient space, and long-term fleet planning.

Best practice examples: Rotterdam's Laadscan Logistiek enables companies to check online whether grid capacity is available and what alternative solutions exist, such as battery storage or shared charging infrastructure.

Best practice examples: To support its requirement that all new taxis be emission-free from January 2025, Hamburg has been subsidising dedicated fast-chargers in central locations.

Practical measures include designating high-power charging zones for logistics in suitable locations, such as industrial areas. Cities should also align charging rollout with low- and zero-emission zone requirements, so logistics operators can plan investments with confidence.

Electrifying municipal and public-service fleets can also support early rollout. Cities can influence these fleets directly, creating demand for infrastructure and supporting timely grid planning and upgrades.

Best practice examples: The Netherlands, through its Zero Emission Freight Zone (ZEZ-F) policy, shows how clear long-term policies, financial support and charging infrastructure can support freight electrification. By the end of 2025, 84% of newly registered vans in the Netherlands were electric (versus 11% EU-wide), and electric truck sales surged 199%, far above the European average of 68%. The electrification of trucks and vans should be a priority given that while these vehicles make up a small portion of urban traffic, they contribute disproportionately to greenhouse gas emissions and air pollution.

Best practice examples: Hamburg also used the electrification of its public fleets as a "first mover" strategy. The electrification of Hamburg public buses required dedicated depot charging infrastructure, illustrating how depot electrification can trigger early investment and grid readiness.

Recommendation 8. Include shared vehicles, urban logistics, and municipal fleets as distinct, high-priority charging use cases. Shared vehicles need dedicated on-street charging bays. Logistics planning should be anchored in a Sustainable Urban Logistics Plan (SULP) that compliments depot and destination charging. Electrifying public-service fleets can provide predictable demand that supports infrastructure rollout.

For further guidance, see:

- **Sustainable Transport Forum's** 2025 publication Recommendations for public authorities supporting the expansion of recharging infrastructure tailored for specialised and captive fleets
- **Expert Group on Urban Mobility's** 2024 publication Recommendations on Urban Logistics
- **Elpida Xenou and Georgia Aifandopoulou's** 2019 Topic Guide Sustainable Urban Logistics Planning - Sustainable urban logistics planning (SULP)
- **Transport Decarbonisation Alliance's** Zero-Emission Zones in the City: Don't Wait to Start with Freight!

3.3 Use a spatial and data-driven baseline that accounts for uncertainty

Before defining a charging strategy, cities need a clear picture of their starting point based on local data such as location and utilisation rate of chargers, not generic ratios. Charging Masterplans should be built on a robust baseline that reflects use cases and local conditions such as mobility patterns and specific needs.

Market-led deployment alone does not guarantee fair access to charging, especially in dense cities where residents without private parking are more exposed to higher costs and limited availability. By combining demand modelling with spatial analysis, cities can identify "charging deserts", such as dense residential areas, streets without off street parking, mixed-use developments, and logistics corridors. This helps prioritise deployment where charging is most needed, rather than relying only on operator-led proposals.

Chapter 7 provides further details on geographical equity.

Best practice examples: Dublin and the Finnish city of Turku carried out comprehensive geospatial analysis to identify priority areas for deployment, as mentioned in section 3.1 for Turku.

Recommendation 9. Cities should base charging strategies on local data and spatial analysis, not generic ratios or national averages. Cities should map vehicles and fleets, travel patterns, existing infrastructure, housing and parking conditions and expected EV uptake by area, and assess needs against the city's own mobility goals and desirable scenarios, not only demand forecasts

Precise prediction of EV uptake is less important than planning for uncertainty. Charging demand varies with housing types, access to private charging, fleet electrification and mobility policies. Fixed "chargers per EV" ratios quickly become outdated. Leading cities therefore use scenario-based forecasting to test plausible futures and guide both the quantity and location of infrastructure – in some cases, clustering might be the better option, while in others a bigger spatial distribution could work best. This approach combines use-case planning, a clear mix of public, semi-public and private charging and continuous monitoring of utilisation data, such as occupancy rates, charging sessions and energy delivered, to identify gaps and prioritise expansion.

Best practice examples: Amsterdam and Rotterdam use data from operators, grid companies and users to identify under- and over-served areas and adjust deployment plans over time, supporting geographical equity and alignment with wider mobility goals.

3.4 Combine demand-driven with planning-oriented deployment

When moving from strategy to delivery, cities need to decide how charging infrastructure is rolled out in practice. Across Europe, two main approaches are used: demand-driven deployment, which responds to verified user needs, and planning-oriented deployment, which proactively steers rollout based on data, grid capacity, and policy goals. There is no one-size-fits-all model. Successful cities usually combine both approaches and adjust the balance over time.

The right balance depends on local conditions, including electric vehicle uptake, access to private and semi-public charging, and grid and public-space constraints. Experience from leading cities shows that in early stages, demand-driven deployment helps ensure baseline access and avoid overbuilding. As uptake grows, planning-oriented deployment becomes essential to scale efficiently, manage constraints, and ensure equitable coverage.

Table 4 in Annex 3 compares strengths and weaknesses of the demand-driven and planning-oriented deployment approaches.

Best practice examples: Amsterdam initially relied on demand-driven kerbside chargers to support early adoption. The Dutch city has its own map showing current and planned public charging points, including charging costs, accessible via the city's website. As electric vehicle uptake increased, it gradually shifted towards a planning-oriented approach, using utilisation data to identify priority areas and develop charging hubs.

Best practice examples: Rotterdam, which has a relatively mature charging landscape, has shifted from expanding charger numbers to maximising utilisation of existing infrastructure, adding new public chargers only where clear gaps remain.

Recommendation 10. Define a deployment strategy that combines demand-driven and planning-oriented approaches, start with demand-driven deployment to build baseline access and confidence, then shift gradually toward planning-oriented deployment as uptake grows. Use data on utilisation, grid capacity and equity to calibrate the balance regularly.

For more detail, see Annex 3 which compares demand-driven and planning-oriented approaches, highlighting their respective strengths, limitations, and the actions municipalities can take at different stages of market development.

For further guidance on public procurement, see: , see ICCT's (2021) Efficient planning and implementation of public chargers: Lessons learned from European cities.

Stage 4. Public procurement: using market design to deliver equity

Once cities identify priority areas through spatial and demand analysis, procurement and market design can steer public and private investment towards balanced rollout including in underserved neighbourhoods and for specific user groups.

4.1 Use contracts and tender design to safeguard the public interest

Procurement choices and contract design shape where and how charging infrastructure is deployed. Tender design is therefore one of the strongest tools municipalities have to ensure a balanced rollout across a city.

Experience across Europe highlights several effective approaches:

- **Batch locations**. **Combining high- and low-demand sites** within the same tender lots to reduce cherry-picking and ensure coverage beyond city centres.
  Best practice examples: Metropolitan Region Amsterdam Electric (MRA-E) shows how bundling demand across municipalities, combining high-demand Amsterdam with lower-demand surrounding areas in a single joint tender, can create a strong business case for operators while delivering economies of scale. This is particularly effective, as it prevents uncertain demand from deterring private investment in public charging infrastructure.

- **Limit exclusivity**. Avoid overly long or exclusive concessions that reduce flexibility and lock cities into outdated arrangements.
  Best practice examples:: The Belgian city of Antwerp used shorter concessions to remain flexible and respond to technological change. Deployment and operating periods were limited to 1 year and 9 years respectively, each with the possibility of two one-year extensions.

- **Splitting tenders into manageable lots**. This enables smaller operators to participate and reduces the risk of market domination.
  Best practice examples: Stockholm applies a cap on the number of locations a single operator can apply for. In one tender round, an operator could apply for a maximum of 30 locations, ensuring competition.

When combined with targeted risk-sharing mechanisms, such as limited demand guarantees or support in low-uptake areas, these tools can help unlock private investment while supporting equity, service quality, and long-term public objectives.

Recommendation 11. Contracts and concessions should clearly define ownership of infrastructure and data, and require compliance with pricing, interoperability, accessibility and service-quality standards. Cities can batch high- and low-demand sites, avoid exclusivity and carefully design concession periods, and split tenders into lots to enable a diverse range of operators.

4.2 Use contracts and tender design to lower public charging costs.

Transparent, fair, and comparable pricing is essential to build trust in public charging and ensure consumer protection, especially for drivers who depend on it as their main option.

To ensure comparability, pricing should be based on cost per kWh, with time-based fees added where parking turnover management is needed (see section 4.3). Operators should also display ad-hoc prices physically at all charging stations, rather than restricting this information to digital platforms, as required by the EU's Alternative Fuels Infrastructure Regulation (AFIR).

To ensure affordable public charging, leading cities use the following policies.

- **Set price caps** or select the bidder that can offer the best price to the end user. Cities can set price caps in concession contracts protecting users from unexpected price increases.
  Best practice examples: Rotterdam sets a maximum price (26 cent per kWh excluding VAT, in 2020).

- **Differentiate charging tariffs to take advantage of off-peak prices.** This makes public slow-charging more affordable for residents without home charging. Smart charging and V2G make it possible to financially reward residents, saving them money while helping the city prevent costly peak-hour grid congestion (more on this in section 6.2).
  Best practice examples: Amsterdam allows charge point operators to adjust tariffs to offer lower rates at night and higher rates during peak hours to support uptake while managing grid constraints.

- **Create local pricing advantages.** Through public tenders, cities can impose pricing conditions on operators of public chargers, including €/kWh caps for contract-based charging via a local charging card or app. This gives residents access to a regulated price while visitors pay standard ad hoc or roaming prices.
  Best practice examples: In its tendering process, Antwerp scores competing private operators partly on the maximum price per kWh they commit to charging for contract-based recharging via card or app. By forcing operators to compete on this rate, the city secures favourable pricing that benefits local citizens who regularly use the service.

Recommendation 12. In order to make public charging more affordable, cities should use public procurement and concession contracts to set maximum prices, mandate dynamic pricing for slow chargers and help create local pricing advantages, where appropriate.

4.3 Use parking policy, pricing policy and financial incentives to lower barriers to access

Cities should pay particular attention to residents without home charging access and high-mileage professional drivers, and can deploy a combination of complementary tools to ensure these groups pay less for public charging:

Parking policy. Parking policy is one of the most important levers in the hands of municipalities to reduce charging costs for drivers while maximising utilisation rates by improving the visibility and perceived reliability of charging points:

Leading cities implement the following policies to ensure affordable charging:

- **Ensuring that only electric vehicles park at electric vehicle-enabled parking lots (EVPLs)** through effective enforcement of parking regulations.

- **Lower municipal parking fees for electric vehicles.**
  Best practice examples: The Dutch government has introduced a legal framework allowing municipalities to charge different parking rates based on whether a vehicle is zero-emission or combustion-powered.

- **Blocking fees:** Progressive parking pricing can deter non-charging vehicles from occupying spots at fast chargers and in busy locations. Municipalities can require a hybrid pricing model for public chargers: a base €/kWh charge for transparency and comparability, topped up by a €/minute fee that kicks in once the battery is charged to deter drivers from occupying EVPLs longer than necessary. Both components must be clearly displayed before the session begins. This model works best in high-turnover locations but is poorly suited to overnight charging scenarios, where residents could be frustrated.
  Best practice examples: In Reggio Emilia, Italy, operators must use clear, consumption-based pricing based on kWh and time, to discourage long sessions at rapid chargers and ensure fees are communicated clearly to all users before charging.

4.3 Use parking policy, pricing policy and financial incentives to lower barriers to access (cont.)

Financial incentives:

- **Subsidies for shared charging apartment buildings.** Cities can provide grants to support the installation of shared charge points in multi-unit housing. Priority should be given to social housing.
  Best practice examples: Stuttgart offers funding for building owners, tenants and charge point operators, including grants linked to photovoltaicss. A subsidy covers up to 50% of eligible costs, with a maximum of €1,000 per charging point and €250 per parking space prepared for future connection.

- **Subsidies or other financial incentives for public slow charging at the workplace.**
  Best practice examples: Berlin offers a 50% subsidy (for both the hardware and the grid connection) to install public slow charging stations for small- and medium-sized businesses, helping employees without access to home charging.

- **Targeted support for high-use groups** such as taxi drivers, ride-hailing services, and delivery fleets with dedicated infrastructure, access arrangements or financial incentives.
  Best practice examples: London identified priority locations for rapid charging infrastructure and established dedicated parking areas with free access for zero-emission capable taxis. London also contributed to a UK fund that provided grants to taxi drivers for the purchase of zero-emissions cars.

Best practice examples: Paris links parking reform with financial incentives for apartment charging and targeted support for taxi drivers. Paris offers incentives cover ing 50% of installation and labour costs for charging infrastructure in apartment buildings, as well as a 50% subsidy for home charging for taxi drivers. Under its 2021 parking reform, the city has added 2,400 new on-street charging points, 10 charging hubs, and 6,000 new underground charging spaces to free up surface space. Paris also selects locations to ensure even coverage across the city.

Recommendation 13. Cities should also use parking policy, pricing regulations and targeted financial tools to make public charging affordable for users who depend on it most, including drivers without access to home charging and professional drivers.

For further guidance on public procurement, see:

- The publication of the EU's Sustainable Transport Forum's sub-group on public authorities guidelines for tender procedure for deployment of public electric recharging infrastructure for cars and vans.

- Task Force 1 of the Sustainable Transport Forum sub-group on best practices of public authorities to support the deployment of recharging infrastructure's 2023 publication on best practices for permitting and grid connection procedures for recharging infrastructure.

- European Commission, POLIS and TNO's 2020 Recommendations for public authorities on procuring, awarding concessions, licences and/or granting support for electric recharging infrastructure for passenger cars and vans and its Summary Handbook.

Stage 5. Deploying well: priorities, design principles, and accessible infrastructure

Once cities have put in place market design, procurement tools and safeguards, the focus shifts from how charging is procured to how it is deployed on the ground. Cities need to decide where charge points should be located, which technologies fit which use cases, and how infrastructure can be integrated without undermining public space, accessibility or wider mobility goals.

5.1 Define the right mix between private, semi-public and public charge points in line with local needs and strategies

Most electric vehicle charging does not take place on public streets. Urban public space is scarce, contested and costly to manage.

Across Europe, leading cities often prioritise private and semi-public charging, with public charging playing a complementary role. Cities should therefore apply a clear mix of public, semi-public and private charging that reflects their preferences and meets their local conditions and needs.

Many leading cities for instance use this mix of public, semi-public and private charging:

Priority to: **private charging at homes, depots, and private garages**;

Followed by: **semi-public charging at workplaces, parking garages, and retail or commercial car parks**, **open to the public depending on opening hours**;

Then, **public charging hubs** at mobility hubs, park-and-ride facilities, or rapid-charging clusters;

Finally, as a last resort: **kerbside on-street charging**, used only when there is no viable alternative.

Public charging remains essential in dense neighbourhoods with high shares of multi-unit residential buildings and for high-impact users such as taxis, ride-hailing and urban logistics. However, it uses valuable space. It tends to work best when concentrated in suitable locations rather than widely dispersed.

Best practice examples: Antwerp, Amsterdam and Rotterdam apply this mix of public, semi-public and private charging explicitly, requiring residents to demonstrate that no private or semi-public option is available before an on-street charger is installed. This keeps kerbside charging as a last resort rather than a default response.

A consistent lesson from leading cities is to move charging off pavements wherever possible. Concentrating chargers in parking facilities and mobility hubs reduces conflicts with pedestrians and cyclists, improves utilisation and protects the public realm.

Best practice examples: Madrid has installed a significant part of its charging infrastructure into underground parking facilities and mobility hubs such as Canalejas 360, combining rapid charging with public transport, shared mobility, and urban logistics.

5.1 Define the right mix between private, semi-public and public charge points in line with local needs and strategies (cont.)

Given uncertainty around future technologies and demand, cities should prioritise their own resources on "no-regret" investments that remain useful across different scenarios. These include charging in multi-unit residential buildings, workplace and depot charging, and public rapid charging hubs serving multiple users. By contrast, widespread slow kerbside charging on residential streets occupies scarce parking space and can be underutilised, so cities should give greater consideration to how these are funded and integrated into the streetscape.

Cities can incentivise semi-public charging by enabling residential retrofits, simplifying permitting and coordinating depot electrification for fleets.

Best practice examples: Stuttgart subsidises upstream grid connections for housing associations and private garages, reducing long-term pressure on kerbside infrastructure.

Municipalities can benefit from clustered charging solutions rather than dispersed individual installations. Shared grid connections, coordinated siting and pre-cabling, particularly when combined with road works can reduce costs, limit disruption, and improve accessibility, particularly in dense neighbourhoods.

Recommendation 14. Cities should define their desired mix of private, semi-public, and public charging infrastructure. Most leading cities prioritise home, depot and semi-public charge points (e.g., workplaces, supermarkets), then public hubs, deploying on-street charging only where necessary.

5.2 Choose charging infrastructure based on use case

Deploying the right mix of charging infrastructure in the right places is essential for an efficient, equitable and future-proof network. Matching charging technologies to parking duration, user needs, public space management and grid constraints, rather than installing identical chargers everywhere, helps avoid underused assets, protects public space, and limits pressure on both the grid and public budgets:

- **Slow charging** suits locations where vehicles are parked for several hours, such as residential neighbourhoods (especially overnight), workplaces, and off-street parking facilities. It is generally cheaper to install and places lower peak demand on the grid, making it well adapted to long-stay contexts and locations where large numbers of vehicles need to charge from the same grid connection.

- **Rapid charging** suits high use vehicles and services, such as private cars, taxis and ride-hailing vehicles, delivery and logistics fleets. It is typically located at mobility hubs and along urban corridors. Well-planned rapid charging hubs can offer an alternative to home charging for apartment residents, provided they are concentrated in managed hubs and offer competitive prices.

The bottom line is that slow charging should be prioritised in off-street parking (at home or at work) while opportunity charging (slow chargers at workplaces, rapid chargers at supermarkets, etc.) complements this. Rapid charging hubs are deployed in densely populated areas where kerbside space is limited and slow on-street charging should be seen as a last resort.

Recommendation 15. Align charging speed and technology with location and use case. Prioritise slow charging for long-stay locations such as homes, workplaces, and residential streets. Concentrate rapid charging in dedicated hubs, such as mobility hubs, park-and-ride facilities and high-turnover locations.

Best practice examples: Paris places particular emphasis on off-street sites, for example by requiring existing fuel stations to install rapid chargers and limiting their deployment on residential streets.

Best practice examples: London places most rapid chargers on arterial roads, taxi hubs, and fleet sites, based on taxi travel patterns and grid capacity, while using lamppost slow chargers on residential streets where pavements allow.

5.3 Designed with: accessibility, durability, and safety in mind

Electric vehicle charging infrastructure has a direct and visible impact on public space. Where and how chargers are installed affects pedestrian safety, accessibility, urban quality and public acceptance of electrification. Cities should therefore treat charging as urban infrastructure, not just energy equipment.

Designing to last

Municipalities can help prevent premature infrastructure obsolescence by setting quality standards for chargers. **Best practice examples:** Amsterdam requires chargers to meet standards on durability (weatherproof, non-corrosive materials), modularity (replaceable components without full unit replacement), and open hard- and software interfaces to ensure interoperability and smooth operator transitions.

Recognising the importance of design choices

Experience from European cities shows that early choices on design and placement matter. Poorly integrated solutions can trigger opposition and lead to costly retrofits. Well-planned approaches support efficient use of space and long-term scalability.

Protecting safety of public space

Cities should ensure charging infrastructure never compromises the safety or accessibility of public space. Cables should never cross pavements, and charging units should be positioned on the roadway rather than on the pavement to keep walkways clear and unobstructed. Even technically compliant installations can create barriers if they reduce walking space or introduce obstacles. Pedestrians and cyclists, and especially people with reduced mobility, should always have priority.

Integrating accessibility requirements

Public charging must be accessible to everyone, including older people and persons with disabilities. This requires cities to go beyond minimum technical compliance and apply universal design principles. Digital accessibility is equally important. Standardised data on charger status, accessibility features, and location helps users plan trips and reduces uncertainty.

Where full accessibility cannot be guaranteed at every site, municipalities should ensure network-level accessibility. This can mean providing at least one fully accessible charging point within a defined radius, supported by reliable digital information.

Recommendation 16. Specify durable, repairable, and accessible infrastructure in procurement requirements, and mandate accessibility standards covering step-free access, adequate space, and clear signage. Prohibit loose cables and temporary mats and embed safety requirements in local bylaws and permit conditions.

Best practice examples: Ireland's Universal Design Guidelines define accessibility standards for designing, installing, and operating EV charging stations.

Best practice examples: Prague uses design-led approaches, integrating chargers into existing street furniture such as lampposts where appropriate. Thoughtful design supports public acceptance and accessibility while protecting the quality of the urban realm.

5.3 Designed with: accessibility, durability, and safety in mind (cont.)

Best practice examples: The Dutch institute CROW recommends rules to ensure accessibility around charging stations. These rules should be embedded in local bylaws and permits, with accessibility assessed from the perspective of users, supported by monitoring and testing.

5.4 Parking policy is charging policy and a key lever to reduce costs for consumers

- **Lower parking prices for electric vehicle owners and easier access to parking licenses. Best practice examples:** To boost electric vehicle adoption, Amsterdam initially offered free parking for electric vehicles at charging points though this risks inefficient use of charging infrastructure, as electric vehicle drivers can exploit the policy to avoid paying for regular parking. To avoid this, this parking policy can be combined with 'recharging-exclusive parking'. Amsterdam residents who own an electric vehicle can apply for a special e-parking licence, which is prioritised, giving a significant advantage over regular combustion engine vehicles. Additionally, the Dutch national government has introduced a legal framework allowing municipalities to charge different parking rates based on whether a vehicle is zero-emission or combustion-powered.
- **Progressive parking pricing: Progressive pricing** at electric vehicle charging lots can deter non-charging vehicles from occupying spots. by applying higher parking fees the longer a vehicle stays, drivers are nudged to free up the space once their battery is full or adequately charged, rather than leaving their car parked. Compared to flat-rate or free parking policies, this approach increases the average energy delivered per session and improves overall utilization, meaning fewer charging lots need to be built, which keeps infrastructure costs down. This model works best in high-turnover locations like city centres or highway stops, but is poorly suited to overnight charging scenarios, where long stays are the whole point and progressive rates would frustrate users. A potential alternative, as explained by the Sustainable Transport Forum is to apply progressive pricing during daytime hours only, switching to free or flat-rate pricing overnight. The tradeoff, however, is added complexity that can make pricing harder for drivers to understand at a glance.

For further guidance, see:

- **Sustainable Transport Forum's** publication Guidelines on accessibility of electric recharging infrastructure in the EU, and
- **Crow's** Charging cables and charging stations: how do you keep the sidewalk safe and accessible? (in Dutch).

Stage 6. Beyond installation: setting service and operational standards

A successful transition to electric mobility requires more than installing charge points. Cities play a decisive role in setting the rules that determine whether public charging is easy to use, fairly priced, interoperable and reliable, especially for residents without access to home charging and in underserved areas.

6.1 Guarantee open access, interoperability and set a minimum service quality

A user-friendly and competitive charging network depends on open access and interoperability. Any electric vehicle driver should be able to use any public charger, regardless of operator, mobility service provider or country, without barriers such as prior registration or subscription. Interoperability prevents "lock-in" to a single provider and encourages price competition between service providers. The EU requires public chargers to support ad-hoc payment, including widely accepted card and contactless methods, and ensure non-discriminatory access under the AFIR, Regulation (EU) 2023/1804.

Recommendation 17. Cities should set clear minimum service standards in all tenders and contracts, covering uptime, preventive maintenance, real-time monitoring, transparent on-site pricing, and 24/7 user support. Cities should also require interoperability and roaming, based on open and non-proprietary standards, to avoid market lock-in and support seamless cross-border use.

Best practice examples: Under Arnhem's service level agreement, the concession holder provides 24/7 Dutch-language remote support via a free emergency number, with immediate escalation to on-site service if needed. Urgent issues, including non-functioning chargers without nearby alternatives, stuck connectors or unsafe situations, must be resolved within two hours. Other faults must be resolved within 24 hours.

6.2 Ensure Vehicle-to-Grid capability

Smart charging controls when and how a vehicle charges, shifting demand to cheaper, greener periods. Vehicle-to-Grid (V2G) goes further, allowing vehicles to send energy back to the grid, turning EV batteries into distributed storage.
Integrating smart charging into urban planning requires cities to develop charging infrastructure that reflects both current needs and future demand, taking account of grid capacity, transport patterns, and user behaviour, particularly in long-stay parking areas. Cities should plan for expansion where space or grid capacity is constrained and ensure local grid infrastructure can support smart charging from the outset.

To support V2G, cities should include functional requirements into public tenders that align with emerging EU V2G policy.

6.2 Ensure Vehicle-to-Grid capability (cont.)

To support V2G, cities should include functional requirements into public tenders that align with emerging EU V2G policy.

These can include:

- **Support bidirectional charging capability for AC and DC where relevant;**
- **Compliance with ISO 15118-20 for communication between the vehicle and the charger**

Support Open Charge Point Protocol (OCPP), at least version 2.1 or equivalent, facilitating communication between the charger and the operator.

This approach defines functional requirements rather than technical implementation details, allowing flexibility while supporting openness and future-proofing.

Recommendation 18. Require future-proof infrastructure by specifying support for bidirectional charging, including ISO 15118-20, OCPP 2.1, and secure remote software updates.

Time-varying, or dynamic pricing and grid tariffs can help to reduce system costs and limit the need for grid upgrades by shifting charging to the off-peak periods. This can lower costs for drivers, ease grid pressure and support renewable integration.

Best practice examples: Utrecht uses smart charging with V2G capability, allowing its electric vehicles to act as storage and helping reduce peak demand. Dynamic pricing at public slow charging stations encourages charging during off-peak periods, supporting grid balancing, renewable integration. This approach is not applied to Rapid chargers, where the operational model depends on high utilisation.

For more guidance, see T&E's upcoming briefing on how to make electric vehicles ready for working with the grid and Regulatory Assistance Project's (2023) How to develop smart EV charging infrastructure - A guide for public authorities.

6.3 Require full data transparency and digital connectivity

Data transparency is essential for planning, oversight and enforcement of charging networks. Cities should require both static data, such as location, power rating, connector types, and payment options and dynamic data such as availability, occupancy, outages, and pricing. Sharing this information in line with EU standards helps keep charging networks transparent, accountable, and aligned with public objectives.

Recommendation 19. Cities should require full digital connectivity and real-time data sharing for all public chargers enabling monitoring of utilisation, identification of gaps, enforcement of service standards, and steering of future deployment.

Best practice examples: Berlin operates a CPO independent city platform providing static and real-time information on charging infrastructure. Rotterdam uses real-time utilisation data to automatically trigger the first stage of new installations when chargers reach high usage, enabling demand-responsive expansion without overbuilding.

For further guidance, see the T&E and BEUC's upcoming briefing on user-friendly provisions in AFIR on public charging prices and data.

Stage 7. Cross-cutting considerations for successful deployment

7.1 Treat the grid as a planning constraint from the outset

Cities should consider grid capacity from the outset and throughout the process. Grid constraints can delay projects for years and lead to high connection costs.

Two practices stand out:

- **Grid-first site selection.** Treat grid capacity as a starting point. If a preferred location is constrained, relocating a charging hub a few streets away can often be faster and cheaper than waiting for grid reinforcement.

Best practice examples: Stockholm maps and publishes pre-approved sites where grid feasibility is verified upfront, reducing risk and delays.

- **Active load management.** Where congestion exists, cities should require smart charging and load balancing so demand does not peak simultaneously.

Best practice examples: In the UK, Nottingham has demonstrated the potential of depot sites as flexibility assets through a V2G demonstrator integrating 40 bidirectional chargers with solar and batteries at a municipal depot.

Recommendation 20. Engage the Distribution System Operator early, map grid capacity before tendering sites and treat grid availability as a planning constraint. Apply approaches such as grid-first site selection and smart charging.

For further guidance see:

- **RAP's** (2020) Building a market for EV charging infrastructure: A clear path for policymakers and planners.
- **RAP and ECOS's** (2022) Standards for EV smart charging – A guide for local authorities.
- **RAP's** (2024) How to develop smart EV charging infrastructure: A guide for public authorities.

7.2 Mandate that new and renovated buildings are EV-ready

In dense cities, many residents lack access to home charging. This creates equity challenges and increases reliance on costly public infrastructure. Around 42% of European plug-in vehicle drivers live in cities without access to home charging. Embedding electric vehicle ready requirements in building rules can be a cost-effective way to expand private charging and reduce long-term pressure on public networks.

Current EU and national legislation fails to guarantee easy access to charging in existing residential buildings. In countries where the legal framework allows it, cities should support residents' ability to install chargers in their own parking spaces, provide financial incentives, and introduce targeted obligations to accelerate deployment of private charging.

Best practice examples: Leading cities increasingly treat building codes as charging policy. By requiring pre-cabling and electrical capacity in new buildings and major renovations, cities like San Francisco mandate that all parking spaces in new commercial and residential buildings be 'EV ready.' Ten percent must be fully equipped with outlets and panel capacity ('turnkey ready'), while the rest must have wiring or conduit installed to lower future installation costs. Many cities go further with Vancouver where 100% of residential spaces are required to have outlets and panel capacity. Several major cities in China require 100% of residential spaces to have outlets or charge points.

Recommendation 21. Cities should treat building rules as charging policy by making electric vehicle-readiness the default. This should require pre-cabling, sufficient electrical capacity, and space for future upgrades in new buildings and major renovations. Cities should also adopt right-to-plug rules where feasible so that apartment residents can install a charger in their own parking space at their own expense.

Conclusion

Electric mobility is one of several shifts cities must make to become liveable, healthy and resilient, alongside expanding public and active transport and reallocating public space. When integrated into a broader sustainable mobility strategy, the transition to electric vehicles supports cleaner air, quieter streets, and a more equitable urban environment.

Realising that potential depends not only on vehicles but on efficient and strategically deployed charging infrastructure. Cities are well placed to guide this deployment, but success demands clear strategies with measurable goals, coordination across departments and partners, and planning ahead of demand.

By adopting a phased approach, such as the one presented in this guidebook, local authorities can build charging networks that are efficient, equitable and resilient. The case studies and best practices presented above show that cities can apply proven approaches, supported by clear governance and effective use of data.

Local contexts differ, but many challenges and solutions are often strikingly similar. Learning from other cities therefore helps accelerate delivery. Combined into a coherent Charging Masterplan, these lessons can deliver affordable and fair charging networks at pace.

Annex 1

Table 2. Key stakeholders, their contributions and best practices for city engagement

Stakeholder	Primary contribution(s)	Best practices for city engagement
Fully Public Ownership & Operation	Provide a map to identify energy grid constraints and locations with suitable charging capacity and easy grid connection. This map should be dynamic, searchable, and regularly updated. This can also show where upgrading will be done to other projects in the area. Provide a guide on how to fill out a request for grid connection.	Contact grid operator(s) early in the process to ask for the heatmap mentioned on the left. Identify one point of contact or an "EV-expert" team to deal with stakeholders' questions on requests for grid upgrade and connection.
City agencies (city planning, transportation, green space, public works)	Provide a map of pre-selected areas where charging station deployment would be immediately approved. These include locations with no or limited accessibility issues, other obstacles, or nearby conflicts with underground utilities, or conflicts with sites such as historic district preservation.	Engage with all public agencies that own land on which publicly accessible charging stations could be implemented (e.g., housing, parks, schools, transit, healthcare).
Private landowners and businesses (retail stores, publicly accessible car parks, fueling stations)	Request to display their land on the map showing suitable charging station locations if they are interested in installing either AC regular or DC fast public-accessible chargers on their property.	Match private landowners with operators if there is a plan to install public accessible charging stations. Establish a list of information required for a private landowner to be matched with a charging station operator. This list would include the number, type, and exact location of chargers, and business model desired.
Charging station operators	Provide information on charging stations type, location, and utilization data. Ensure interoperability of their charging stations and ability to pay with any means of payment.	Require public charging station operators to access data in order to inform decision-making process. This could be done if exchange for the right to operate, especially if the station is located on public land. Require interoperability of the charging stations and the ability to pay with any means of payment.

Table 2. Key stakeholders, their contributions and best practices for city engagement

Stakeholder	Primary contribution(s)	Best practices for city engagement
Taxi, ride-hailing, and car sharing companies	Provide information on fleet electrification rate, pick up and drop off location drivers' residence location and home charging accessibility. Potentially provide funding to ensure drivers' access to charging infrastructure.	Engage with companies to discuss charging stations locations and fleet electrification goals.
Public	Join EV driver associations to voice your opinion, needs, and concerns. Engage with city regarding proposed charging station installations. Suggest a charging station location.	Engage with the community to hear their concerns and answer their questions. Adopt a demand-driver approach or allow electric vehicle drivers to suggest a charging station location to know where to install charging stations.

Annex 2

Table 3. Charging infrastructure ownership and governance models: Overview of city examples.

Ownership / Governance Model	Description	Main advantages for Cities	Main trade-offs / Risks	City examples
Fully Public Ownership & Operation	The municipality owns, finances, and operates charging infrastructure directly, treating it as a public utility.	· Full control over location, pricing, access, and design · Strong ability to pursue equity and broad coverage · Direct alignment with public space and mobility policies	· High financial and operational burden · Requires in-house technical expertise · Slower scalability and higher public risk exposure	Barcelona (municipal control of on-street charging)
Public Ownership, Private Operation	The municipality owns the assets but contracts private operators for installation, operation, and maintenance.	· Retains public control over strategic decisions · Draws on private sector expertise and delivery efficiency · Clear separation between policy objectives and operations	· Requires strong contracts and enforcement · Risk of misalignment if incentives are poorly designed	Madrid (EMT Madrid owns chargers; private operators manage operation & maintenance)
Public-Private Joint Venture / Utility-Led Model	Infrastructure is developed and operated by a publicly owned utility or a joint venture between the city and an operator.	· Strong alignment with grid planning and energy systems · Can integrate with public transport and fleets · Lower market risk than fully private models	· Less competitive pressure if poorly regulated · Requires strong governance and transparency	Vienna (Wiener Stadtwerke manages taxi fast charging)
Concession Model (Private ownership & operation on public land relies on exclusive contracts, (concessions))	The city grants private operators the exclusive right to install and operate chargers on public land under defined conditions.	· Mobilises private investment at scale · Limits public financial exposure · Can deliver rapid rollout if concessions are well designed	· Risk of lock-in if concessions are too long · Requires strong conditions on uptime, pricing, and data	Amsterdam (Metropolitan Region Amsterdam-Electric - relies on controlled partnerships through exclusive contracts, concessions)

Table 3. Charging infrastructure ownership and governance models: Overview of city examples (cont.)

Ownership / Governance Model	Description	Main advantages for Cities	Main trade-offs / Risks	City examples
Open Market with Municipal Coordination (relies on competition in an open market)	Multiple private operators deploy infrastructure, while the city sets rules, standards, and spatial priorities.	· Encourages competition and innovation · Limited direct public investment · Flexible and adaptable over time	· Risk of fragmented networks without strong coordination	London (Transport for London - relies on competition in an open market)
Hybrid or Mixed Ownership Models	A combination of public, private, and concession-based assets across different locations and use cases.	· Lets cities match models to specific needs · Public investment can target market gaps where the business case is weaker · Flexibility across neighbourhoods and charging types	· More complex governance and coordination · Requires a clear Masterplan to avoid incoherence	Berlin
Market-Driven with Risk-Sharing Mechanisms	Private operators own and operate infrastructure, supported by limited public safeguards such as revenue floors.	· Can address early business-case uncertainty and unlock private investment. · Can support wider coverage if safeguards are well targeted.	· Requires robust demand assumptions · Public exposure if safeguards are poorly calibrated	Rotterdam (utilisation safety-net model)

Source: Clean Cities research

Annex 3

Table 4. Comparison between demand-driven and planning-oriented deployment approaches

Deployment approach	Demand-driven (Reactive)	Planning-oriented (Proactive, data-driven)	Municipal Action
Core principle	Chargers are installed in response to verified requests from plug-in vehicle users, typically residents without access to private charging.	Chargers are installed at locations proactively identified by the municipality based on data, grid capacity, land use, and mobility goals.	Define in the Charging Masterplan how requests are handled and when the city will move to proactive site selection.
Trigger for deployment	Individual electric vehicle owners request a charger.	Municipality or operator initiates installation at pre-selected sites.	Set clear criteria for switching from request-based decisions to planned deployment, for example utilisation thresholds or EV electric vehicle uptake levels.
Best suited to market stage	Early deployment phases with low plug-in vehicle uptake and high uncertainty.	Later or rapidly growing markets that require coordination and scale.	Use demand-driven deployment to ensure early access, then progressively shift to planning-oriented rollout as uptake increases.
Typical use cases	On-street residential slow charging for residents without off-street parking.	Rapid charging hubs, fleet and logistics charging, destination charging, neighbourhood charging clusters.	Retain demand-driven access for residential needs while planning hubs, fleets, and high-power charging proactively.
Key strengths	· High initial utilisation. · Builds trust among early adopters. · Avoids premature overbuilding.	· Coherent city-wide network design· Better grid and public-space integration. · Faster deployment through pre-approved sites. · More cost-effective as you can roll out many charge points at once.	Combine both approaches to maintain access while scaling efficiently and equitably.
Key limitations	· Can become fragmented if used alone. · Limited ability to address future demand or equity gaps. · Risks grid bottlenecks.	· Requires upfront analysis and coordination. · Risk of underutilisation if demand is misjudged.	Mitigate risks by maintaining a hybrid approach and updating priorities based on real-world utilisation data.

Annex 3

Table 4. Comparison between demand-driven and planning-oriented deployment approaches (cont)

Deployment approach	Demand-driven (Reactive)	Planning-oriented (Proactive, data-driven)	Municipal Action
Illustrative examples	Amsterdam: Residents without home charging could request a nearby public charger, ensuring high utilisation.	Stockholm: The city pre-approves sites with verified grid capacity, supporting faster, strategic rollout.	Allow individual requests, while progressively developing hubs and plan deployment in high demand areas.
Strategic takeaway	Effective for kick-starting electric vehicle adoption.	Essential for scaling efficiently and managing grid and space constraints.	Adopt a hybrid deployment strategy anchored in a Charging Masterplan and adapt it as the market matures.

Source: Clean Cities research, inspired by the ICCT (2021)

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About the Clean Cities Campaign

Clean Cities is a European coalition of organisations hosted by Transport & Environment. We build public support for cities to shift from polluting cars to active, shared and electric mobility.

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