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Navigating the data challenge of electric urban logistics

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Introduction

Electric vehicles (EVs) are being hailed as a key part of the solution to the challenges of urban logistics that include air pollution, traffic congestion, and the need for sustainable transportation. However, the adoption of EVs in the logistics sector is not without its challenges, namely the cost, availability, location, and power of charging infrastructure.

This report provides insights into these issues by examining the use of EVs in urban logistics, with a focus on charging infrastructure. Both academic publications and grey literature linked to charging infrastructure are reviewed in combination with insights from interviews with urban logistics stakeholders. Additionally, quantitative overviews of the charging infrastructures of two major users of electric vehicles in urban logistics, the Netherlands and France, are provided after reviewing their national strategies regarding fleet electrification and charging infrastructure.
One key aspect of this report is the examination of data and its role in the decision-making process related to EV adoption in urban logistics. The report also explores the role of private and open data in policy and planning, and how it can be leveraged to support the adoption of EVs in urban logistics.

Throughout this report, a comprehensive understanding of the challenges and opportunities related to EV adoption and charging infrastructure in urban logistics is provided. By understanding the needs and perspectives of urban logistics operators, as well as the technical and logistical considerations involved in charging infrastructure, this report aims to contribute to the framework of the decision-making process.

What are the technical differences between public and private EV charging points?

As the adoption of electric vehicles (EVs) in urban logistics continues to grow, understanding the nuances of charging infrastructure becomes increasingly important. One major aspect of this infrastructure is the distinction between public and private charging points.

Public charging points, often found in bustling areas such as city streets and shopping centers, offer accessibility and convenience to all EV drivers. These charging stations may not be as fast as private options, but their wide availability makes them an ideal choice for those without access to charging at home or work.

Semi-public charging stations, on the other hand, are open to specific consumers, such as residents of an apartment complex or patrons of a restaurant. These charging points are not owned by an individual and may have restrictions on usage, such as requiring a purchase in the associated business to use the charging point. These semi-public charging points can be found in underground mall parkings, hotels, restaurants, and service stations.

Finally, private charging points are typically located at private residences or businesses and are intended for exclusive use. These charging stations offer a level of reliability and speed that is crucial for fleet managers and urban logistics operators, but their availability is more limited as their installation costs are substantially higher.

Charging speed	Charging power	Charger's price	Availability	Charging pricing system	Charging duration	Charging fees
Slow charger	3-7 kW	2000€	At-home, on street (*Cities*)	1 €/hour sometimes free	11 hours	11 €
Normal charger	22 kW	4000€	On-street, points of interest (supermarkets), (*Cities*)	1.5€/first hour 0.2€/min after	2.7 hours	20 €
Fast charger	50 kW	25000€	On-street, points of interest (supermarkets), (*Cities*)	2€/access 0.4€/min	1.2 hours	25 €
Ultrafast charger	150 kW	40000€	*Highways*	4€/access 0.8€/min	0.4 hour	30 €

Table 1: Public charging stations typology

Source: chargemap.com

It is worth noting that the adoption of EVs in urban logistics should not be solely based on one type of charging point alone. Both public and private charging infrastructure play an essential role in supporting widespread EV adoption. Together, these two types of charging infrastructure intend to create a well-rounded and sustainable EV ecosystem.

Using data to optimise urban logistics

Electric Vehicles (EVs) are becoming increasingly prominent in the logistics sector as a result of the rising demand for greener transportation. Yet, the adoption of EVs presents particular difficulties for all parties involved, such as the requirement for reliable charging infrastructure.

By leveraging data, urban logistics stakeholders can better understand and plan for the requirements of EVs in their fleet. Charging data in particular helps in designing efficient charging schedules and routes to minimise energy consumption and reduce operational costs.

Additionally, it enables fleet managers to ensure that their vehicles are completely charged and ready to drive, which boosts efficiency and dependability. Therefore, understanding the role of data in both the electrification process, and the decision-making process related to charging infrastructure, is critical in order to fully support the adoption of EVs in urban logistics.

Within the field of urban logistics, two ideas that are gaining traction are eco-charging and eco-routing. While eco-routing involves optimising the routing of vehicles based on environmental factors like air quality, noise, and emissions, eco-charging refers to the improvement of charging schedules based on environmental factors. Accurate and current data on various environmental criteria, such as air quality, noise levels, and emissions, is necessary for the optimisation of charging schedules and routing. The impact of externalities stemming from charging stations can be reduced, for instance, when vehicles can be charged during peak traffic hours to minimise traffic disruptions.

The same is true for eco-routing, which can be made more efficient by using geodata on traffic levels to ensure that vehicles avoid congested areas and travel on the least congested routes. Furthermore, precise routing data on distances, street slopes and signage can be used to optimise the routing of vehicles, taking into account the environmental impact of different routes. This approach to routing can reduce the impact of the transportation sector on the environment and improve the sustainability of urban logistics.

A solid data infrastructure must be in place in order for eco-charging and eco-routing to function as intended. This calls for information on environmental criteria, as well as information on vehicles and the availability and use of charging stations. The appropriate stakeholders, such as fleet managers and urban logistics operators, must have access to this data, which must be gathered, analysed, and made available in real-time.

As we've seen, eco-charging and eco-routing are two promising ideas that can help make urban logistics more sustainable. However, for these concepts to succeed, we need to ensure that stakeholders have access to accurate and up-to-date data. That's where public policies come in. By promoting data collection and sharing, and by developing a strong data infrastructure, we can make it easier for logistics players to optimise their operations in an environmentally friendly way. This may involve creating open data platforms, standardising data formats and protocols, and fostering information sharing and cooperation among the various actors in the logistics ecosystem.

Jolijn van Dijk, consultant at EVconsult, highlights the role of data in informing policy and planning decisions related to charging infrastructure. She believes that data can significantly support municipalities in planning their charging infrastructure; however, it depends on how proactive and capable they are in terms of data handling. Fleet managers and urban logistics managers can use data to help them make decisions about EV charging by giving them up-to-the-minute information on the demand for and availability of charging stations. For instance, real-time data from charging terminals combined with remote webcams can be used to estimate how many users are using or

waiting for a charger at a charging station, indicating whether extra charging points are needed, and where.

The value of data in the decision-making process has also been demonstrated by research in the area of electric vehicle routing problems (E-VRPs). To optimise charging schedules and routing choices, researchers (Kullman et. al) have been using charging station and real-time charging terminal data. Moreover, according to ElaadNL, a grid company research institute which predicted the logistics demand in specific areas, data also aids in identifying areas with a high demand for charging. For example, when it is detected that a charger is used more than 80% of the time at a specific location, that indicates a necessity for installing another charger at this location

Leveraging data for policy & planning: private versus open data, which role ?

When it comes to the adoption of electric vehicles (EVs) in urban logistics, understanding the charging infrastructure is crucial. But why exactly is data so important? Let's take a closer look.
Most of the data on charging infrastructure comes from the private sector, which typically focuses on public charging stations. This data is gathered through partnerships with Charging Point Operators (CPOs) or through crowdsourcing from EV drivers. However, this information alone may not be enough.
To enhance the data, charge card information, data enhancement methods, and market research can be added to the mix. This can provide a more complete picture of the charging infrastructure and enable logistics stakeholders to make informed decisions about adopting EVs for their operations.

Governments and navigation companies (e.g., TomTom) who purchase this data for their citizens or customers, find the private sector data on charging infrastructure valuable. Navigators, route planners, online maps, original equipment manufacturers (OEMs), Mobility Service Providers, and others are also customers of private charging point data.

While there is plenty of data on charging infrastructure in the private sector, government transportation agencies, EV associations, and larger CPOs also gather and make use of this type of data. As it offers insightful information about the requirements and viewpoints of urban logistics operators as well as the technical and logistical issues related to charging infrastructure, this data can be used for policy and planning purposes. Choosing between private and open data and how to use it in policy and planning is a dilemma for policymakers. Although there is greater availability of data from the private sector, open data from the government and EV associations can be more dependable and trustworthy, as well as significantly cheaper. To support the adoption of EVs in urban logistics, there is a need to find a balance between the perks of both private and open data.

A cross-country sectorial analysis: the case of France and the Netherlands:

From policies to implementation: different strategies, different outcomes?

Although data quality and availability are crucial for the development of charging infrastructure and thus, the uptake of EVs, financial incentives play an important role too. The following sections focus on these types of policies, taking a closer look at the cases of the Netherlands and France. Subsequently, the development of charging points in these countries is examined.

Dutch policies for purchasing electric vehicles

The Dutch National Climate Agreement includes a target for emission-free road mobility in 2030. In line with this, 30 Dutch cities are expected to implement zero emission zones in 2025, aiming for emission free supply of goods to city centers. Currently, the government provides mainly supportive measures, such as financial incentives for companies purchasing electric vehicles. Besides the subsidies and tax incentives listed in Table 1, fully electric cars are also exempted from road tax (MRB) and tax on passenger cars and motorcycles (BPM). Furthermore, there is a lower additional tax liability for electric cars in comparison to conventional cars. Some financial incentives have only recently been introduced, such as the SEBA (subsidy for emission free business vehicles) that has beenin service since March 2021.

Program	Typeofincentive	Eligiblecases	Range
SEBA	Subsidy	Businesses and non-profits that buy or lease zero-emission N1 and N2 types, max. 4250 kg	10% - 12%, max. €5.000 per vehicle
AanZET	Subsidy	Businesses and non-profits that buy or lease zero-emission N2 and N3 types	12.5% - 37% per vehicle
MIA\Vamil	Investment tax deduction	Environmentally friendly investments (means or techniques that are included in the *environment list*) by businesses, non-profits, or governments	Investment tax deduction of up to 45% (MIA) or 75% (Vamil)

Table 1 : Dutch policies on electric vehicles purchases

Dutch policies for developing charging infrastructure

The Netherlands has one of the most extensive public charging networks in Europe. However, the expected growth in electric transport due to the National Climate Agreement requires further development of charging infrastructure – an eight-times increase in the current number of charging

points by 2030. Similar to the policies surrounding the purchase of electric vehicles for logistics, current measures for charging infrastructure include mainly financial incentives (see Table 2). The tax incentive MIA\Vamil has only recently – since 2022 – included charging points in their *environment list* of eligible investments. Additionally, in most Dutch municipalities it is possible to request public charging points for free. Other supportive actions are e.g., the development of a guide (2022) with steps for companies to take when they want to place charging points at their venue, providing knowledge that helps companies to electrify their fleet. The guide includes tips on how to identify the number of charging points needed and an overview of costs and subsidies, amongst other information.

Next to these policy measures, the government and industry acknowledge the importance of shifting to emission-free logistics and the associated requirements. For example, the national agenda for charging infrastructure (NAL) is an organisation where governments, knowledge institutes and industry collaborate on developing the required charging infrastructure. The regional governments aim to support municipalities in ensuring sufficient charging infrastructure, including for logistics.

Program	Typeofincentive	Eligiblecases	Range
MIA\Vamil	Investment tax deduction	Environmentally friendly investments (means or techniques that are included in the *environment list*) by businesses, non-profits, or governments	Investment tax deduction of up to 45% (MIA) or 75% (Vamil)
KIA	Investment tax deduction	Business investments of between €2.401 and €332.994	Up to 28% deduction of investments costs for charging points

Table 2 : Dutch policies for charging point installation

In summary, the Dutch government offers a range of financial incentives for companies purchasing electric vehicles and developing charging infrastructure on national and municipal levels. As a leading country in the electrification of transport with a dense charging network, the Netherlands continues via public-private partnerships to develop the infrastructure needed to keep up with the growing use of electric vehicles.

French policies for purchasing electric vehicles

In a bid to encourage the adoption of electric vehicles in France, the government has introduced several incentives aimed at increasing their accessibility to the masses. The Ecological Bonus is one such initiative that has been in place since 1 June 2020 and is available until 31 December 2023. Under this program, those looking to purchase a car or van that emits 20g of CO2/km or less will be eligible for a purchase grant of up to 27% of the acquisition cost, including tax. For vehicles that fall within the price range of €45,000 to €60,000, a flat rate of €3,000 is available.
To further support the transition to EVs, the Conversion Bonus scheme was introduced in August 2020. The scheme provides a subsidy for those who wish to purchase a second-hand or new battery-electric or plug-in hybrid vehicle and scrap their old diesel or gasoline car. Depending on the individual's income, the grant can range from €2,500 to €5,000, with a maximum combined amount of €9,500 to €12,000 from the conversion bonus and ecological bonus.
For those who live or work in low emission zones, the Low Emission Zone Bonus provides an additional €1,000 subsidy for the purchase of an EV, on top of the incentives offered by the local authority. In terms of tax benefits, fully electric vehicles and plug-in hybrids are eligible for either a 50% discount or full exemption from paying the license plate registration (carte grise) in Metropolitan France, depending on the region. Furthermore, EVs that emit less than 60g of CO2/km are exempt from the Company Car Tax.
Additionally, local subsidies may be in place for specific regions in France.

Program	Typeofincentive	Eligiblecases	Range
Conversion Bonus	Subsidy	Cars and vans that fall under BEVs, FCEVs, and PHEVs	For BEVs and FCEVs €5.000, for PHEVs €2.000
TVS exemption	Tax exemption	Company vehicles emitting less than 60g CO_2 per kilometer (excl. diesel vehicles), concerning BEVs and FCEVs	Exemption of 100% from CO_2-based tax component

Table 3 : French policies for electric vehicles purchases

French policies for developing charging infrastructure

It is expected that the amount of electric vehicles used on French roads will grow from 470.000 in 2020 to around 8.5 million in 2030, of which 1.1 million will likely be light commercial vehicles. This growth requires around 350.000 public charging points, an increase of at least ten times the amount that currently exist. Combining both public and private, up to 6 million charging points will be needed in total to assist the expected growth for 2030. The establishment of charging infrastructure for

electric cars (EVs) in France is supported by the ADVENIR program. The initiative provides grants to businesses, apartments, and public institutions to offset the cost of installing charging stations.

Program	Typeofincentive	Eligiblecases	Range
ADVENIR	Subsidy	Building	Up to 40% of purchase and installation costs
ADVENIR	Subsidy	Companies	Up to 50% of purchase and installation costs
ADVENIR	Subsidy	Cities	Up to €2.160 per charging point

Table 4 : French policies on electric vehicles purchases

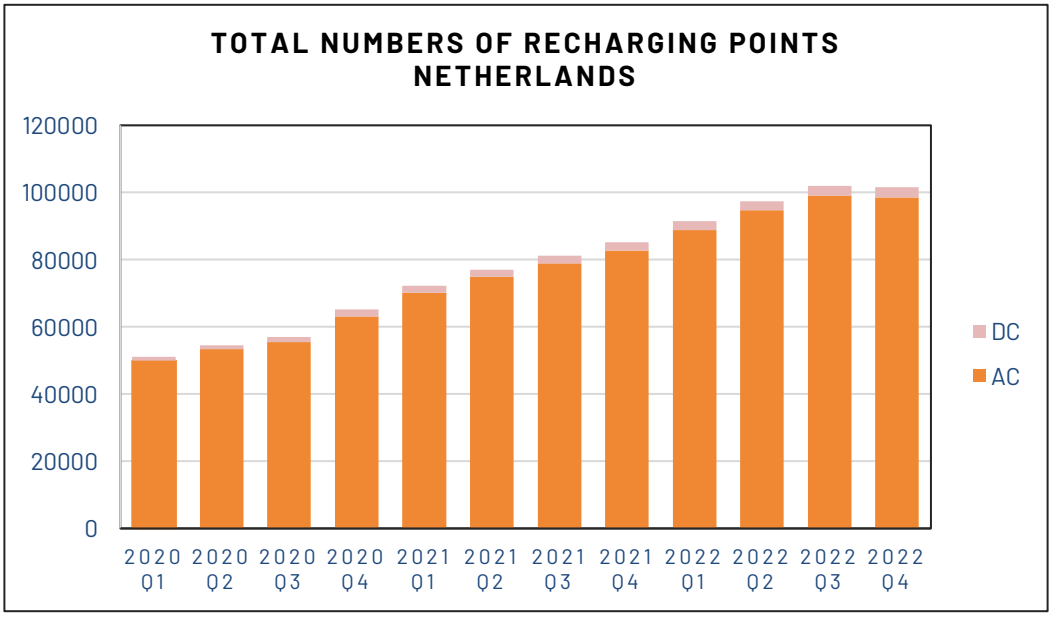
The French government has extended the ADVENIR program to promote the installation of EV charging infrastructure throughout the country. This program covers the costs of acquisition and installation of charging points for companies and residential collectives. For companies, subsidies of up to 40% of the purchase and installation costs are available. For apartments, subsidies of up to 50% of the purchase and installation costs were offered with the goal of having charging points installed at 3,000 buildings by 2022. In Paris, local subsidies are also available for EV charging in residential buildings, car parks, and taxis, with subsidies covering 50% of the cost up to a limit of €500 per charging point for condos and €4,000 for car parks. The ADVENIR program also offers incentives for municipalities to support the development of public charging stations, with subsidies of up to €2,160 per charging point installed at the request of EV users within 500 meters of their place of residence or work.

In conclusion, the French government is implementing a wide range of financial incentives to encourage the use of electric vehicles. These incentives, which include grants for purchases and tax breaks, are designed to increase commecial and public access to EVs. The country is also attempting to create a strong charging infrastructure to accommodate the rise in EV usage, and the ADVENIR program offers funds to companies and housing cooperatives to install charging stations. Municipalities and the government are working together to stimulate the growth of public charging stations, while also creating incentives to help with their installation. In the coming years, it is anticipated that these initiatives will significantly increase the use of EVs on French roads.

Both France and the Netherlands have taken decisive steps towards electrifying transportation. The Netherlands boasts one of Europe's highest public charging networks and provides financial incentives for companies and charging infrastructure development through public-private partnerships. Meanwhile, France focuses on making EVs more accessible to the masses, offering purchase grants and subsidies, tax benefits, and exemptions for license plate registration. The

distinct policies of these countries highlight the diversity of strategies that can be employed to reduce emissions from the transportation sector.
It remains to be seen which approach will prove more effective in achieving emission-free mobility. The Netherlands' proactive stance towards electrification, demonstrated by its high charging network and support for businesses' fleet electrification, contrasts with France's emphasis on consumer adoption, especially in low emission zones. Ultimately, both nations serve as valuable examples of different pathways towards a greener future and illustrate how different strategies can lead to a range of outcomes in the pursuit of sustainable transportation.

The case of the Netherlands: a data collection



The Netherlands has been a true trailblazer in the transition towards electric transportation. The country's effective policies and investments in charging infrastructure have led to a substantial growth in both AC and DC charging points (slow charging and fast-charging, respectively), as seen in the data above.

In the early days of electric vehicles, the Netherlands was quick to recognize the importance of charging infrastructure in promoting the adoption of EVs. This foresight has paid off, as the Netherlands now boasts one of the largest and most advanced charging networks in Europe.
The success of the Dutch charging network has been driven by several factors. Urban logistics and fleet managers have been quick to adopt EVs as they now have access to a reliable network of charging stations. This, in turn, has reduced carbon emissions and improved air quality in cities. Additionally, regulations promoting the installation of charging stations in densely populated areas have made it easier for city dwellers and logistics operators to switch to electric vehicles.

In the past year, the number of charging points has continued to grow at an impressive pace. The data shows a steady increase in both AC and DC charging stations, with fast-charging stations growing at an even faster rate. This is a clear indication of the strong demand for sustainable and clean transportation options in the country.

However, the Netherlands' journey towards electrification is far from over. Despite its impressive progress, there is still a long way to go before the country can claim to be fully electrified. Nevertheless, the Netherlands has set an excellent example for other countries to follow, demonstrating what can be achieved with the right policies and investments in charging infrastructure.

The case of France: A data collection

As the demand for sustainable and clean transportation options increased, the French government implemented policies to support the development of charging infrastructure for electric vehicles. These policies have had a significant impact on the growth of recharging points throughout the country. The data from the past year shows a steady increase in both AC and DC charging stations, signaling a shift towards a more electrified future for France.
Urban logistics and fleet managers have benefited from this transition as well. With more charging options available, fleet managers have been able to add more electric vehicles to their fleets, leading to a reduction in carbon emissions and an improvement in urban air quality. Additionally, urban

access regulations have also supported the growth of charging infrastructure by incentivising the installation of charging stations in densely populated areas, where the usage of ICE vehicles is restricted. This has made it easier for city dwellers and logistics operators to switch to electric vehicles, knowing that they will have access to reliable and convenient charging options when they do.
While the progress in France is commendable, it still has a way to go to catch up with countries such as the Netherlands which is leading the way in electrification of transport. However, the policies and investments made by the French government, along with the efforts made by both public and private sectors, have put France on the right track towards a more sustainable and cleaner future.

In conclusion, France and the Netherlands have both taken significant steps towards electrifying their transportation systems. While France has made commendable progress, the Netherlands has set an example for others to follow, with its effective policies and investments in charging infrastructure leading to a substantial growth in charging points. Both countries have shown that a transition to electric transportation is possible and that it can bring numerous benefits, including reduced carbon emissions and improved air quality. With continued investment and support for electric vehicles, both France and the Netherlands could soon become leaders in this field.

Conclusion

We've seen how different types of data are necessary, from charging infrastructure to the location of charging stations, from vehicle characteristics to driver behavior, and more. Obtaining and utilising this data can be a daunting task, requiring collaboration across sectors and public-private partnerships. But, as we have seen in the cases of the Netherlands and France, it is possible to overcome these challenges and reap the rewards of electrification.

It's not just about data, though. Incentives and policy frameworks also play a critical role in accelerating the adoption of EVs. While data helps inform decision-making, incentives can sway it in a certain direction, making it more financially and environmentally viable to switch to electric. The Netherlands example showed us how a combination of incentives and policy framework helped boost the adoption of EVs, creating a virtuous circle of benefits for all involved.

As we move forward, a more comprehensive approach is needed to smoothen and enhance the availability and use of data, as well as the process of electrifying urban logistics. This involves developing more standardised data formats and protocols, encouraging information sharing and cooperation, and creating open data platforms. At the same time, it requires policies and regulations that support and incentivise the transition to electric logistics, ensuring that it benefits all involved, from logistics operators to the environment and society at large.

Lastly, the transition towards electric urban logistics is a complex and multi-faceted process, with data playing a crucial role in enabling and guiding this transformation. However, data alone is not enough, and a comprehensive approach is needed, involving incentives, policies, and regulations that support electrification and facilitate the use of data. By working together and taking a holistic approach, we can make the transition to electric logistics a reality, creating a greener, more sustainable, and prosperous future for all.