



Open-loop mobility systems: driving the future of urban transportation in the Nordics and Baltics

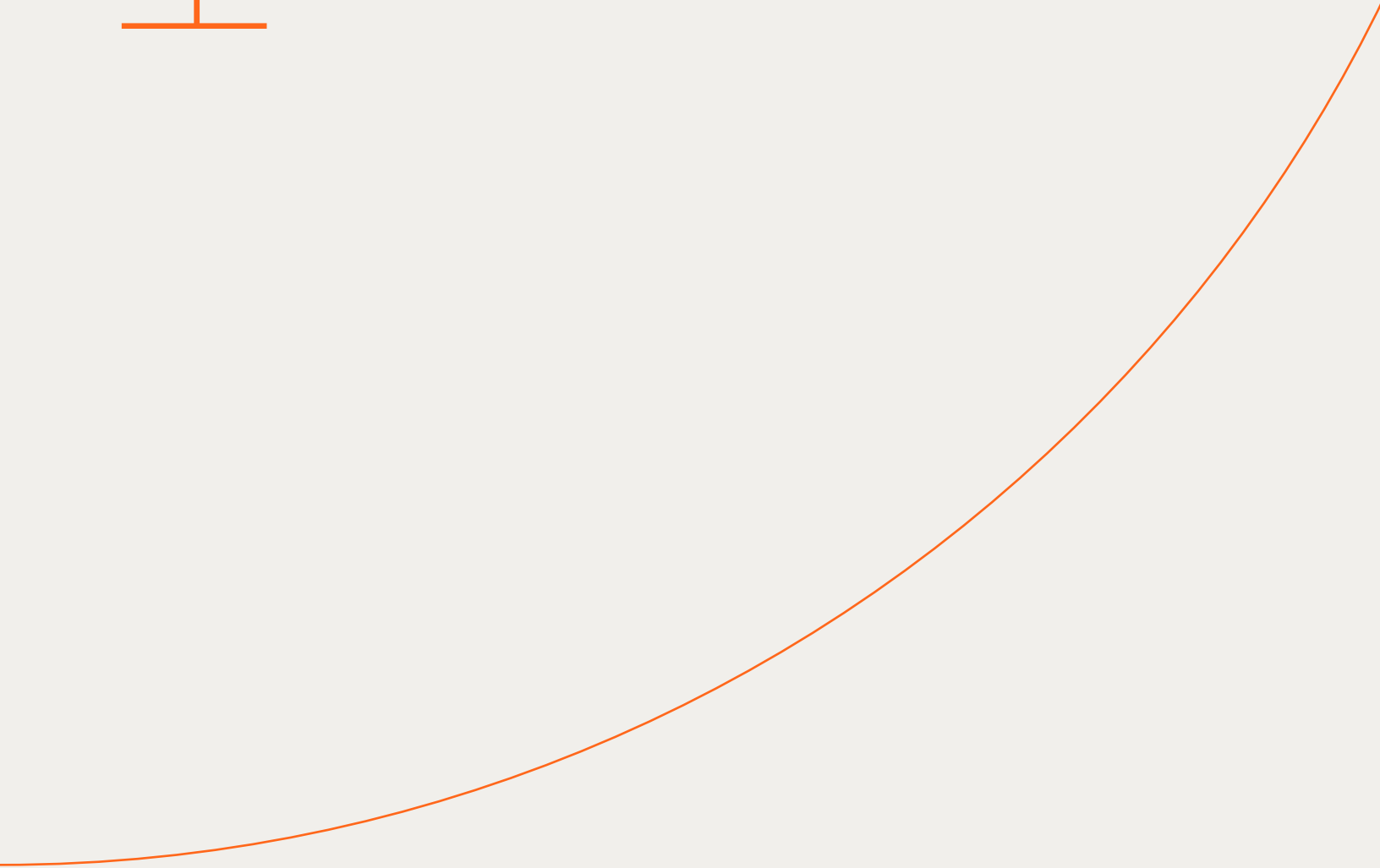
FEBRUARY 2025

Contents

1	Introduction	3
2	Open-loop systems have already begun to reshape transit ecosystems	6
3	Open-Loop mobility systems bring advantages to all parts of the ecosystem.....	10
4	Global and local case studies.....	13
	Transport for London: transition from Oyster to contactless payments.....	14
	Translink: the evolution of nation-wide public transport in the Netherlands.....	16
	SL's journey to a customer-centric transit payment solution.....	20
5	Open Loop for micromobility.....	23
6	Electric Vehicle Charging (EVC): The future of payment integration.....	27
7	Considerations when implementing open-loop systems.....	32

1

Introduction



With populations across the globe growing and urbanization expected to accelerate, more people will be living in cities than ever before.

Urban mobility is at a pivotal moment of transformation. The amount of people living in urban areas is projected to increase to around two-thirds of the global population by 2050.

With populations across the globe growing and urbanization expected to accelerate, more people will be living in cities than ever before. As cities expand, so do the complexities of moving people efficiently through them.

Public, shared and sustainable modes of transportation will be needed to accommodate the city of the future's transportation needs in an efficient manner. Congestion and pollution are already major challenges in the world's current metropolises such as New York City, Jakarta and Mexico City.

The uptake in micromobility and electric vehicle purchases suggests that we are well on the way to future-proofing our travel needs, but customer journeys across these modes of transportation is not yet frictionless:

- The traveler in some cities is required to buy an upfront ticket or closed loop card for public transport, introducing additional complexity, effort and sometimes cost.
- The traveler looking to complement his/her public transport journey with a shared bike or electric scooter ride needs to download an app and register before continuing their journey.
- An electric vehicle owner typically has multiple (closed-loop) charging cards¹ or RFID tags, or apps.

These complexities create barriers, reducing the appeal of shared and sustainable transportation options due to the effort required to use them. Additionally, this fragmented experience discourages occasional or spontaneous use, limiting revenue opportunities across mobility segments.

From a Public Transport Operator perspective, relying solely on closed-loop solutions can mean missed revenue from travelers without easy access to proprietary apps or cards, particularly tourists, occasional riders, or electric vehicle users who aren't regular customers. While most travelers carry a payment card, not everyone has access to app-based or closed-loop systems – resulting in missed opportunities for operators who lack open-loop options.

1. [ev-charging-payments.pdf](#)

INTRODUCTION

Moreover, closed-loop payment systems place additional burdens on both users and transit operators in terms of resources and operational efficiency. For users, these systems often mean extra steps, such as purchasing a physical ticket or card, maintaining a monetary balance on a transit-specific app, or waiting at ticketing machines, steps that not only consume time but also detract from a seamless travel experience. For operators, the production, distribution and management of physical tickets and cards involve ongoing costs and logistics, including maintenance of ticketing machines, waste generated from expired or discarded cards, and associated environmental impacts.

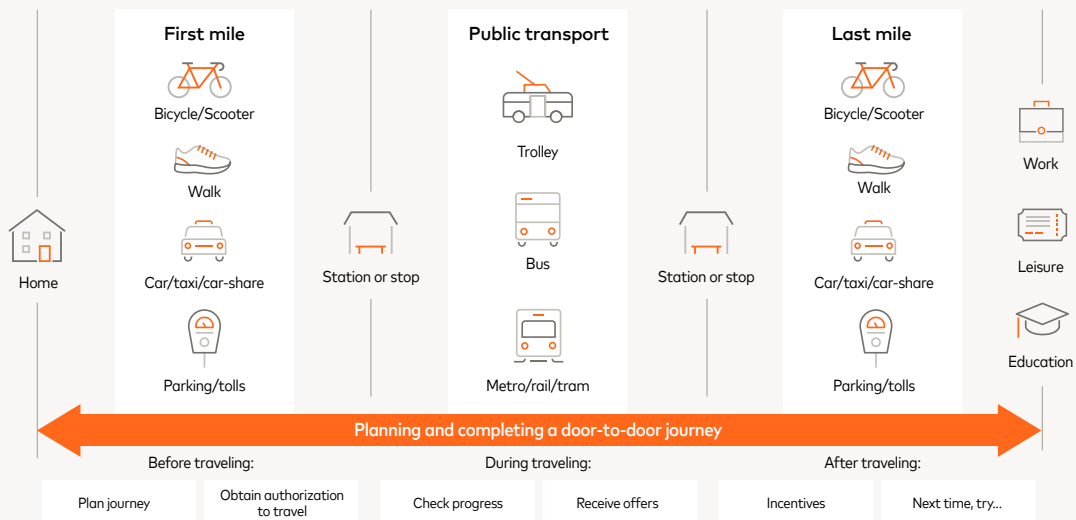
Open-loop systems address these barriers by allowing travelers to use their everyday payment methods (such as debit and credit cards) across various transport modes. Rather than improving just a single step in the journey, open-loop payment solutions streamline the entire transportation system, offering a cohesive urban mobility experience that fosters interconnected, accessible ecosystems.

Closed-loop solutions view each transport mode as a separate experience, while open-loop takes a holistic, integrated approach to urban mobility. This paradigm shift in transit systems, supported by Mastercard, has been transformative worldwide – not only enhancing the consumer journey but also offering operational, financial, sustainability and inclusivity benefits.

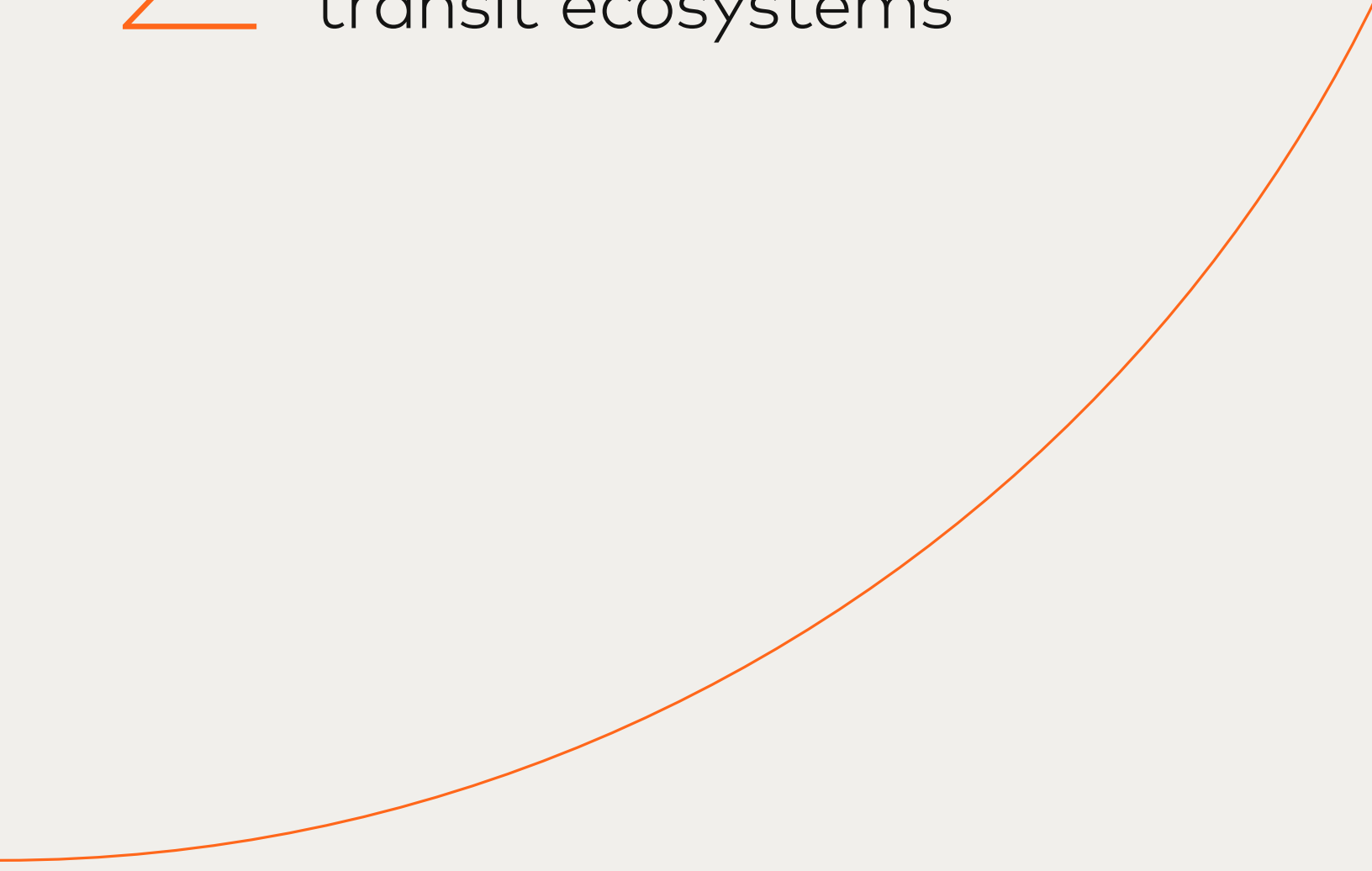
This white paper will showcase examples from public transport, electric vehicle charging and micromobility, highlighting the key results and lessons learned in the transition to open-loop systems.

Figure 1

A better way: Connected, door-to-door journeys



2 Open-loop systems have
already begun to reshape
transit ecosystems



Open loop in public transport organizations

The adoption of open-loop systems is already well underway in several major cities and countries around the world.

In London, the Transport for London (TfL) system has revolutionized the way passengers interact with public transport by allowing the use of contactless payments like credit and debit cards. This innovation has made transport more accessible and increased user satisfaction by significantly reducing friction in the payment process.

Similarly, in the Netherlands, the OVpay initiative has enabled a nationwide open-loop system, streamlining transit across all modes of public transport. This system has made it easier for travelers to use different types of public transportation without the need for multiple tickets or cards.

Several Public Transport Operators (PTOs) across the globe are also implementing open-loop systems. For instance, in Singapore, the Land Transport Authority (LTA) has introduced SimplyGo, a system that allows commuters to use their contactless bank cards or mobile wallets to pay for their rides on public buses and trains. In New York City, the Metropolitan Transportation Authority (MTA) has launched the OMNY system, which stands for One Metro New York, to provide a similar level of convenience.

Other notable implementations include the transportation systems in Sydney, Australia, and Milan, Italy, where open-loop payments have been integrated.





Electric vehicle charging

Open-loop payment systems are gaining momentum in the EV charging sector, supported by recent European regulatory developments aimed at simplifying and standardizing payment options.

The European Regulation (AFIR, 2024) mandates that all publicly accessible recharging points must offer ad hoc payment options, allowing EV drivers to pay without specialized apps or memberships. Specifically, new fast-charging points must include widely accessible payment methods, such as payment card readers or contactless card functionality.

For slower chargers – those with a power output below 50 kW – the regulation provides flexibility. These chargers can comply by offering ad hoc payments through open-loop card readers or via QR codes leading to online checkout. While QR codes fulfill the regulatory requirement, they may pose accessibility or security challenges if the QR is physical and not dynamic (digital) from an operator's perspective. This payment option requires users to have a smartphone with internet access and the skills to complete an online transaction. This could exclude low-income groups, elderly individuals, or others less comfortable with digital payments, potentially limiting EV access for these populations.

Given that slower chargers currently represent most of the charging infrastructure in Europe, prioritizing user-friendly, inclusive payment options at all levels of charging will be essential. As the market shifts toward open-loop solutions, broadening payment accessibility can further support a cohesive, user-centered EV charging network across Europe.

Micromobility

In the micromobility sector, open-loop payment solutions are being introduced to make shared transportation modes, such as e-scooters and bicycles, more accessible and convenient for all users.

\$90 billion

The global micromobility market is projected to reach \$90 billion by the end of 2026, indicating strong demand for these solutions.

The global micromobility market is projected to reach \$90 billion by the end of 2024, indicating strong demand for these solutions.² Leading micromobility providers such as Freebike and Donkey Republic are pioneering open-loop “tap-and-go” systems in cities like Helsinki and Copenhagen, allowing riders to access bikes with a simple tap of their bank card. This approach lowers barriers for tourists and casual riders, broadening the customer base and supporting urban initiatives to decrease traffic congestion and carbon emissions.

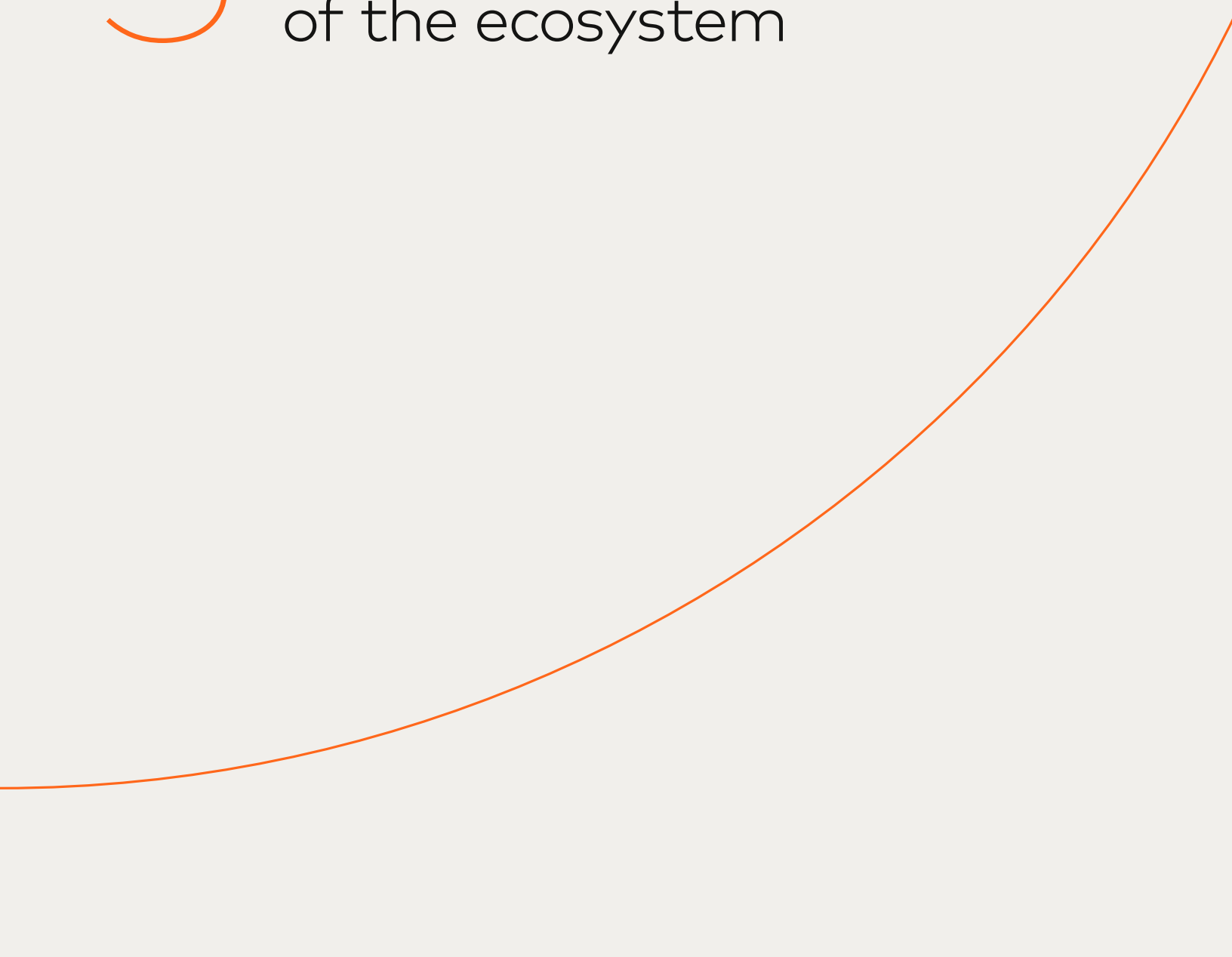
These developments underscore a growing trend toward frictionless, accessible transportation experiences that integrate seamlessly with open-loop payments, positioning micromobility as an essential element in modern urban mobility ecosystems. A consistent payment experience where travelers can use the same contactless card or digital wallet across all public and private transport modes within a city enables true interoperability, allowing travelers to seamlessly combine multiple modes of transit into a single journey. Furthermore, it opens the potential for fare capping across daily journeys, providing an efficient and cost-effective end-to-end travel solution.

2. blog.emb.global/micromobility-trends-in-2024



3

Open-loop mobility systems
bring advantages to all parts
of the ecosystem



User experience improvement

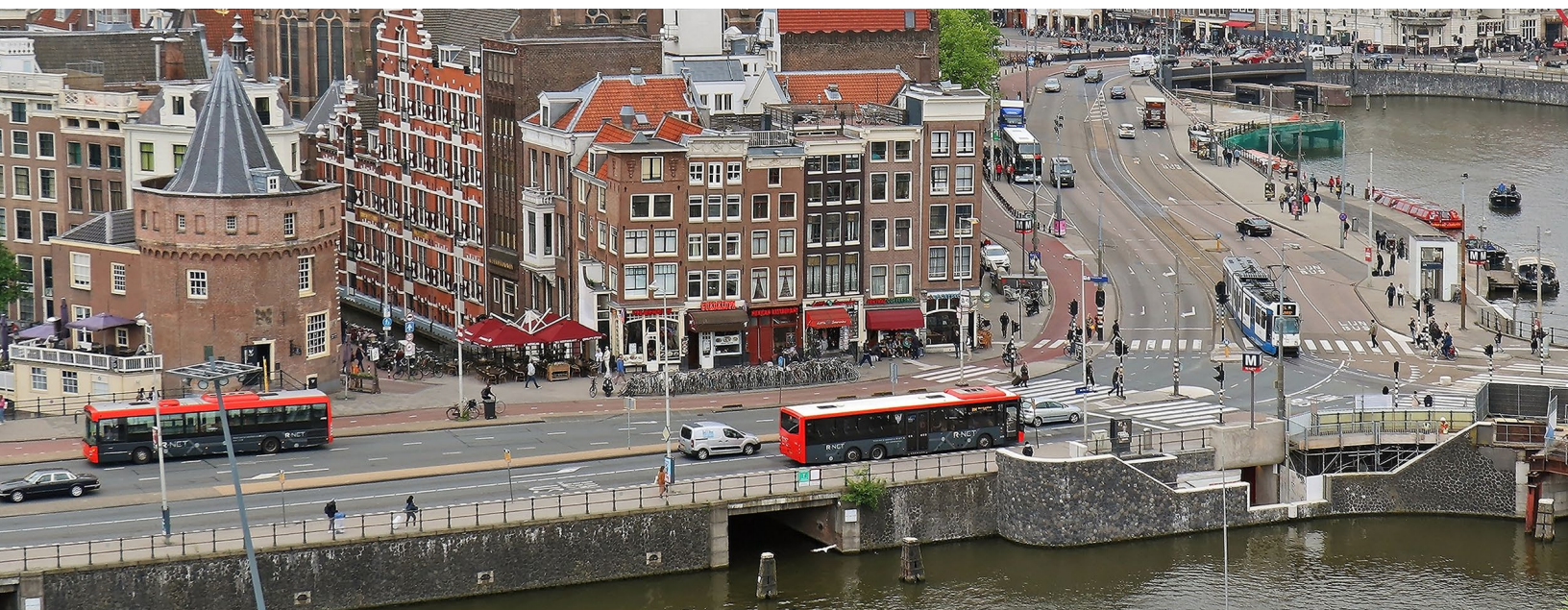
Imagine a traveler's day in an open-loop city:

Starting with a tap of their contactless card on the city bus, they reach a central station where they transfer easily to a shared bike without needing to download a separate app. Later, they seamlessly hop on a tram using the same card, bypassing the need for a paper ticket or fare top-up. Throughout the day, each journey is smooth, with just one payment method needed across buses, bikes and trams.

This simplicity reduces the complexity of managing multiple payment methods, apps, or tickets, enhancing convenience and saving time for both frequent commuters and tourists. Open-loop systems allow travelers to move effortlessly from one mode of transport to another, creating a truly multi-modal experience where mobility feels frictionless and user-centric.

Transport providers efficiency gains

For transport operators, open-loop systems offer several layers of efficiency. By simplifying fare collection and backend processing, operators can reduce the complexities of handling multiple payment methods and dedicated ticketing systems. Depending on the operator, open-loop systems can lower fare collection costs. Along with procurement efficiency, operators avoid vendor lock-in, providing greater flexibility to innovate and adjust their systems as needed.





Sustainability contributions

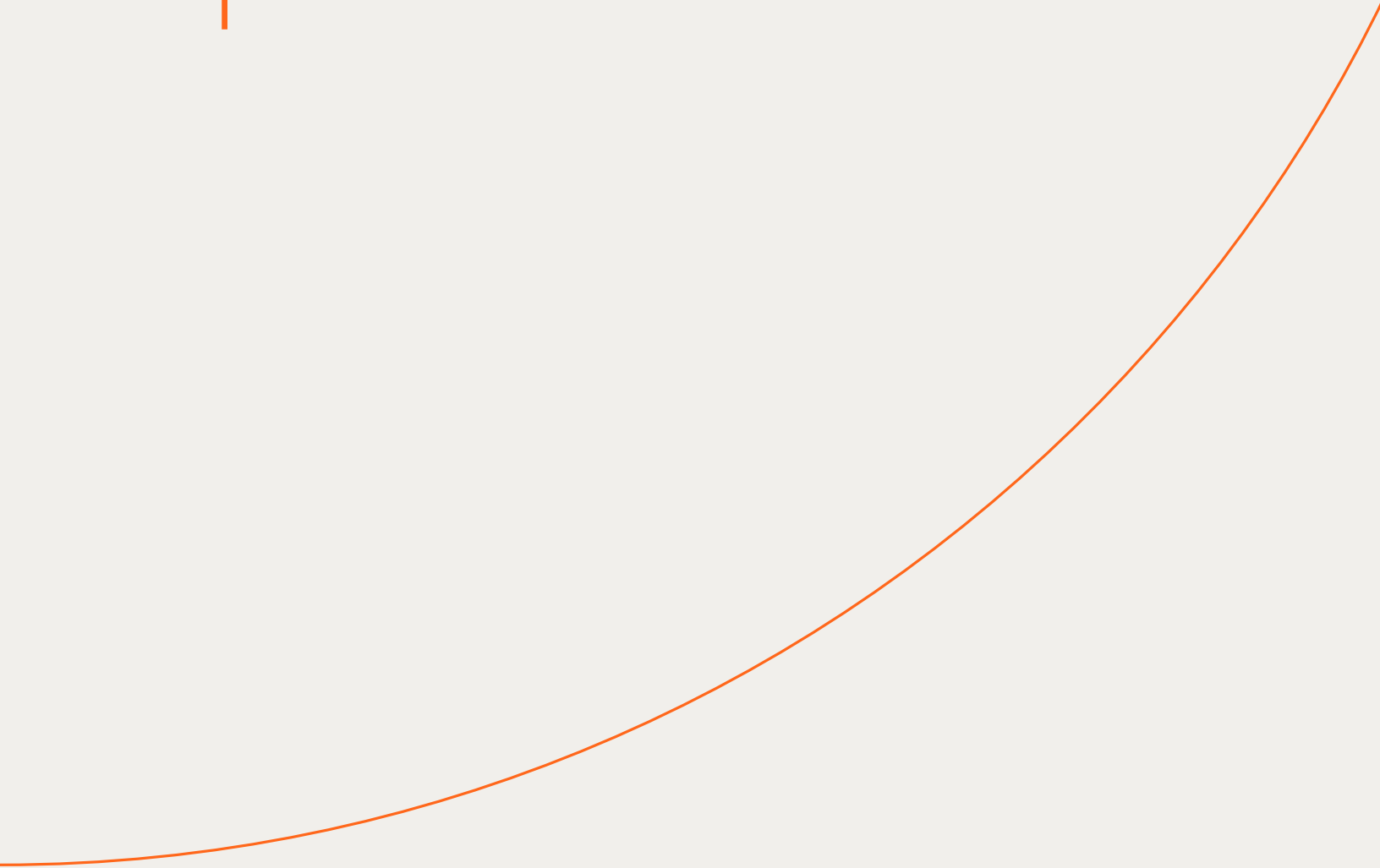
Open-loop systems enhance sustainable urban mobility by enabling an integrated, holistic and multi-modal transit network. Rather than operating in separate silos, different transport modes are integrated into a cohesive and interconnected experience. The elimination of paper tickets and specialized top-up cards further minimizes waste and the resource intensity of transit systems. Encouraging multi-modal journeys that include micromobility options also contribute to lowering pollution caused by traffic congestion.

Inclusion enhancement

Open-loop systems increase accessibility by offering convenient options for tourists, occasional travelers and those who may not have the technical literacy to navigate app-based solutions. The ability to use a regular bank card for transit removes the need for complex registration or ticketing processes, accommodating a broad spectrum of users. This can make public transport more convenient and accessible for earlier mentioned segments.

A stylized orange number '4' composed of three lines: a diagonal line from the top-left to the middle-right, a horizontal line from the middle-left to the middle-right, and a vertical line from the middle-right to the bottom-right.

Global and local case studies





Transport for London: transition from Oyster to contactless payments

With 3.25 billion passenger journeys annually, Transport for London (TfL) operates the public transport network for one of the world's busiest cities, ensuring the smooth functioning of buses, trains, the Tube and ferry services.³

For over a decade, TfL used the Oyster card, a closed-loop smart card for ticketless payments on various services. However, evolving technology and demand for a more accessible system prompted an upgrade.

London became the first city worldwide to implement an open-loop system, setting a global standard. The shift to open-loop payments was driven by TfL's need to reduce high costs associated with issuing, maintaining and managing the closed-loop Oyster card system. In addition to cost reduction, the transition prioritized customer convenience. With the new system, passengers no longer need to purchase a separate transit card, which simplifies access and convenience of use.

TfL's comprehensive marketing efforts before, during and after the launch educated users on the benefits of contactless payments and ensured a smooth transition to the new system. With fare capping⁴ included, the system guaranteed passengers the best available fare, further encouraging adoption. By 2023, contactless payments accounted for approximately 30 million journeys per week, demonstrating the system's widespread popularity and acceptance.

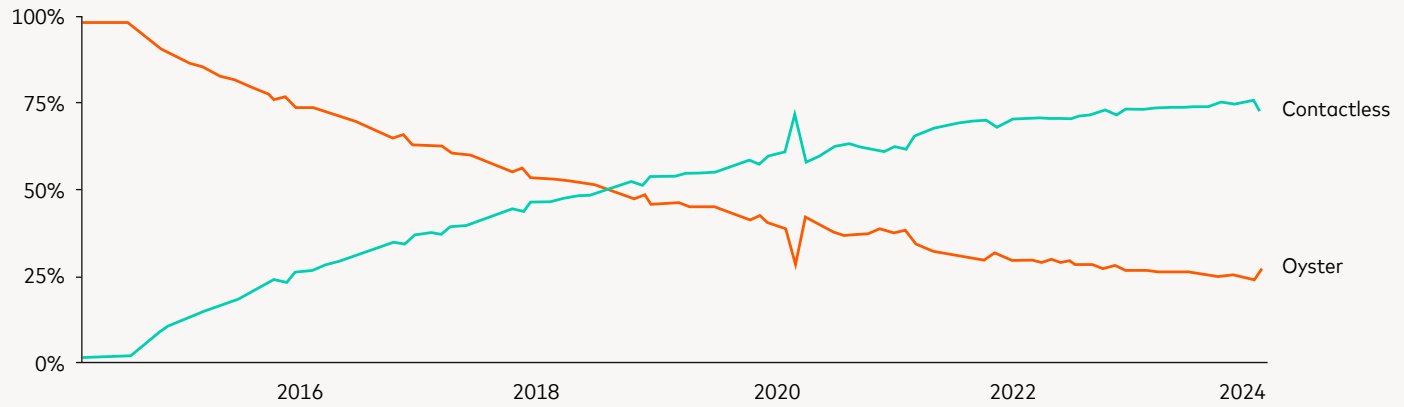
3. [Transport for London quarterly performance report – Quarter 4 2022/23](#).

4. Fare capping is a pricing strategy that limits the amount a public transportation passenger pays for a set period of time or distance.



Figure 2

Monthly journeys on TfL over time (per payments method, as % of total)



SOURCES: [Transport for London — Contactless report](#), [Transport for London — Oyster card report](#).

Key results

TfL was the first Public Transport Operator to recognize and address the consumer’s need for a payment solution that required no top-ups or tickets and was just as fast and cost-effective as the existing Oyster system. The open-loop payment model not only improved the user experience but also delivered substantial efficiency gains. The streamlined system reduced fare collection costs, enabling TfL to reallocate resources to enhance services across the network. Notably, the cost of fare collection as a percentage of revenue fell from 14% to approximately 7%,⁵ underscoring the significant financial efficiency achieved through the adoption of contactless payments.

Considerations for successful transition

Mastercard’s collaboration with TfL and the U.K. Payment Card Council included innovative solutions like deferred authorization and fare capping, both integral to the smooth functioning of London’s open-loop system. With deferred authorization, passengers can tap and enter gates instantly without waiting for payment approval, a feature that helps maintain flow during busy periods. Fare capping, on the other hand, calculates the optimal fare automatically by setting daily or weekly limits, so riders benefit from the best rates based on their usage without needing to pre-select fare types. Together, these enhancements streamlined the transit experience, establishing a new standard for efficiency and ease in public transport.

5. [Cost of fare revenue collection — May 2021 \(Transport for London\)](#).



OVpay: the evolution of nation-wide public transport in the Netherlands

The Netherlands is globally celebrated for its efficient public transportation network, which seamlessly integrates trams, ferries, metros and trains.

"Our vision has always been around the customer. [...] At its core, public transport [in the Netherlands] is a public service, subsidized by the government. It is therefore our duty to prioritize the customer's journey above all."

Peter van Dijk,
CEO of Translink Netherlands

For several years, the OV-chipkaart, a closed-loop, single-purpose transit card, was central to this system, standardizing ticketing across trams, metros and ferries. However, as travel patterns evolved and technology advanced, the need for a more modern and user-centric solution became clear.

The move to OVpay was not just about replacing old technology but about putting customer convenience at the forefront. As Peter van Dijk, CEO of Translink Netherlands, explains: *"Our vision has always been around the customer. [...] At its core, public transport [in the Netherlands] is a public service, subsidized by the government. It is therefore our duty to prioritize the customer's journey above all."* With this goal in mind, Translink collaborated with all Dutch transit companies to map the customer journey in detail, identifying pain points and setting guiding principles to address them.

A critical guiding principle was "mobile first, not mobile only," driven by our ever-digitizing world. "Nowadays, almost everyone carries a bank card, often in the wallet of his/her phone and should not need another plastic card for travel." Offering customers the ability to use mobile wallets like Apple Pay or Google Pay is easily done through the EMV system, which was one of the key considerations in the decision for Translink to go open loop.



Key results

The transition from OV-chipkaart to OVpay began with a pilot in 2021 and achieved nationwide rollout by June 2023, making the Netherlands the first country to implement open-loop payments across its entire public transport network. OVpay's introduction modernized the payment landscape, offering travelers the ability to use their bank cards or mobile phones for seamless nationwide travel.

Adoption of OVpay has been rapid and widespread. Within six months of the nationwide launch, contactless transactions exceeded 22 million. One year later, 15% of all trips – equivalent to roughly 150 million annually – were made using debit or credit cards, with non-subscription users accounting for 36%⁶ of these journeys.

For travelers, OVpay has transformed public transport. Tourists and occasional users in particular, have benefited from the elimination of upfront ticket purchases or card top-ups. OVpay also offers convenience for regular users as a backup when they don't have an OV-chipkaart available.

6. translink.nl/c/nieuws-6624

Figure 3

Traveler's associations with OVpay

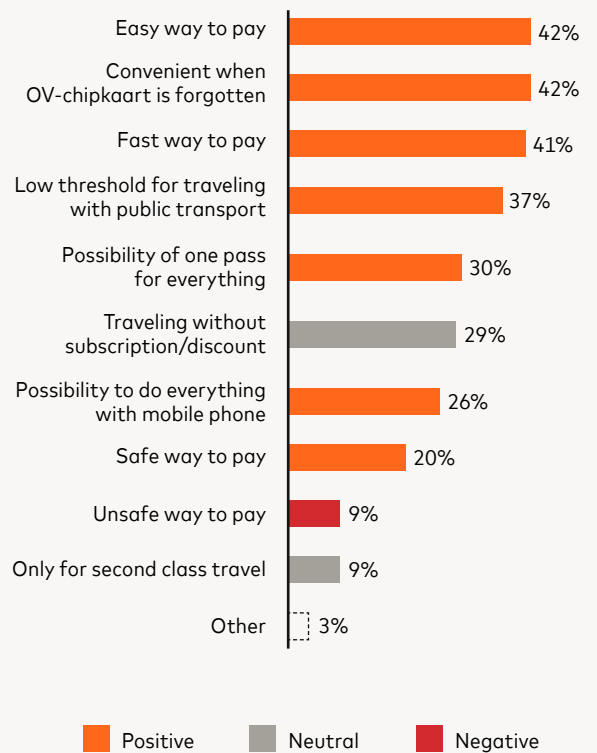
Share of respondents indicating association (multiple allowed):

Question: When you think of OVpay, which allows you to check in and out with a debit card/credit card/mobile phone, among other things, which of the following associations do you have?

Base: familiar with OVpay, n=644

Source: Ipsos research, MCA Analysis (2024).

Mastercard conducted research together with Translink to understand what people associate with the open-loop system (right). It was clear that most associations with the open-loop system are positive and are about convenience. One of the most important associations is that open loop is associated with a "low threshold for travelling with public transport" – a clear indication that open loop indeed lowers the threshold for travelers to choose public transport over other modes of transport.



"Going from a card-based system to an account-based system allows us to save a lot of money on hardware that was originally CAPEX, but also OPEX in terms of maintenance costs."

Peter van Dijk,
CEO of Translink Netherlands

For Translink, the shift from a card-based to an account-based system significantly improved efficiency. Payment costs, which accounted for about 15% of turnover under the OV-chipkaart system, are expected to drop below 10% with OVpay.⁷ Hardware and maintenance cost savings have further contributed to the business case for open-loop systems. Peter van Dijk explains the business case: *"Going from a card-based system to an account-based system, allows us to save a lot of money on hardware that was originally CAPEX, but also OPEX in terms of maintenance costs."*

By enabling contactless payments, OVpay reduces dependency on millions⁸ of additional plastic cards. This change not only minimizes environmental impact but also encourages sustainable travel choices by lowering barriers for tourists and incidental users to opt for public transport over private vehicles.

Considerations for a successful transition

The nationwide rollout of OVpay demanded extensive planning, investment and collaboration to ensure its success. More than 60,000 validators (front end equipment) were installed or updated across the Netherlands, requiring seamless coordination between transport operators and technology providers.⁹

At the launch of OVpay in 2023, subscriptions and discount profiles were not supported. Nowadays, transit companies are starting to offer discount products connected to debit/credit cards. Additionally, the possibility of travelling with age-related discounts was introduced to OVpay¹⁰ in July 2024. Users simply add their card to the OVpay app and request the appropriate age discount based on their personal details.

To address data privacy and security, Mastercard's expertise ensures compliance with stringent PCI DSS standards, implementing secure, tokenized transactions, which safeguards user data and builds public trust. Additionally, Translink launched comprehensive educational campaigns to familiarize users with OVpay's functionality and benefits. These proactive efforts smoothed the transition from the OV-chipkaart, fostering widespread adoption and confidence in the new system.

7. connectivepayments.com/emv-in-transit-the-dutch-ovpay-case

8. parool.nl/nederland/eind-dit-jaar-is-ov-chipkaart-niet-meer-nodig-inchecken-kan-dan-ook-met-bankpas-en-mobiel-bee45132/

9. mastercard.com/news/europe/en/newsroom/press-releases/en/2023/netherlands-contactless-transit-payments-system/

10. ovpay.nl/leeftijdskorting

Looking ahead

In 2025 the OV-pas will be introduced. This closed loop card is based on EMV technology and will replace the OV-chipkaart. With this latest development in 2026 the transitioning entirely to the OVpay system will take place. The three methods of payment will be:

- tap in and tap out through debit/credit card
- tap in and tap out with an OV-pas, with a pre-paid and a post paid payment method
- travel in public transport by using e-tickets

The future vision includes expanding the platform to incorporate additional services, such as bike-sharing and parking, under the OVpay brand. These enhancements aim to create an integrated mobility solution that supports seamless, multi-modal travel.

Mastercard continues to play a pivotal role in these developments, ensuring that, as new services are added, the system remains secure and user-friendly. This ongoing collaboration aims to make public transport in the Netherlands even more accessible, convenient and sustainable, setting the standard for other countries looking to modernize their transit systems.





"We didn't want to act as a bank for our customers. We wanted them to have a quick, hassle-free way to pay without any preparation."

Charlotte Modig,
Senior Business Development
Manager for Cards and
Payments at SL

SL's journey to a customer-centric transit payment solution

A new era for SL: Embracing contactless payments for seamless travel

In an interview with Charlotte Modig, Senior Business Development Manager for Cards and Payments at SL, insights emerged about the Stockholm-based public transport operator's transition to contactless payments. Inspired by Transport for London's (TfL) success in London, SL adopted the "tap-and-go" model to simplify travel and enhance customer convenience.

SL's decision to implement contactless payments stemmed from both financial and operational considerations. Previously, SL's travel credit system allowed for automatic top-ups, which provided convenience for customers but came at a high cost. Modig noted, *"We didn't want to act as a bank for our customers. We wanted them to have a quick, hassle-free way to pay without any preparation."* The contactless system allows travelers to confidently board any bus or train, knowing they can simply tap their bank card without needing a dedicated travel card.





Key results

While initially intended to serve tourists and occasional travelers, the contactless payment system has also proven popular among regular commuters. Since the pandemic, single-ticket usage has increased significantly. According to Modig, many travelers appreciate paying only for what they use. "Even if, over a month, it might cost a little more than a monthly pass, people feel they're getting exactly what they pay for," she explained. In fact, the convenience and flexibility of the system have made it a favored option among Stockholm residents and occasional users alike.

For SL's customers, contactless payments bring control and convenience. Modig elaborated, "Imagine trying to catch a bus in unfamiliar surroundings, unsure about how to pay." With contactless, travelers can board without the need to check for payment methods or read through complex instructions. They can simply tap and go, which reduces stress and allows for spontaneous travel choices.

SL also benefits from a unique single-zone fare structure: a single tap is valid for 75 minutes across all modes of transport, including ferries, buses, trains, and the metro. Modig highlighted the simplicity and convenience that SL customers now enjoy with this structure.

"Our goal is to use data to improve service without compromising privacy."

Charlotte Modig,
Senior Business Development
Manager for Cards and
Payments at SL

Considerations for a successful transition

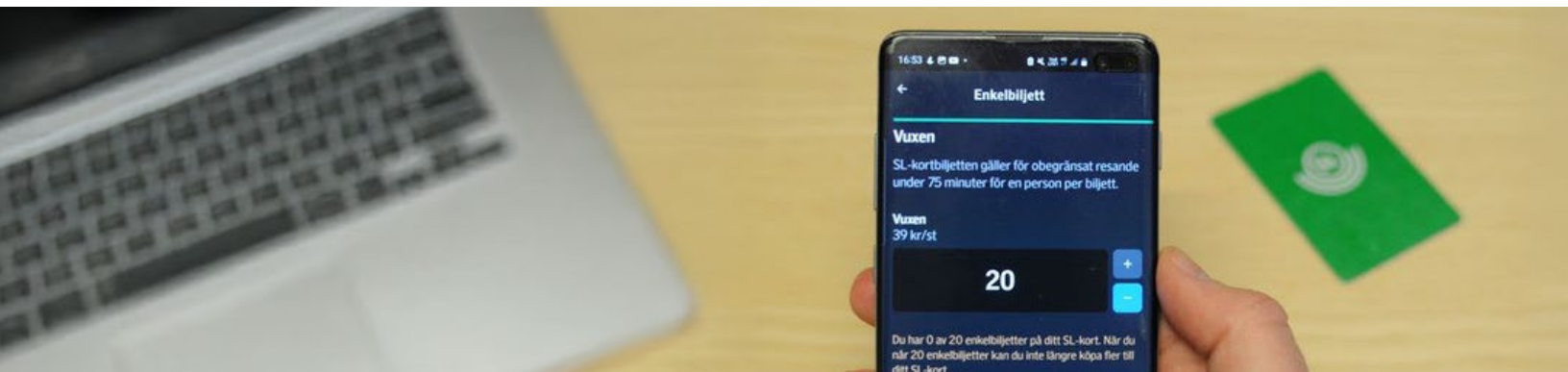
SL has encountered specific challenges, particularly in implementing discounts and ensuring tourists understand the system. Senior passengers and students benefit from a reduced fare card but must register in advance — an additional step SL would like to simplify. For tourists, understanding that one fare applies across multiple transport modes has involved a learning curve. The challenge is how to reach the traveler with the explanation of how the solution works. SL has been addressing this through public campaigns and educational efforts, but the most effective way to convey the message is by word of mouth from ambassadors who have successfully tried the service and share the experience with others.

Looking ahead

Data analysis plays a significant role in SL's operations. By analyzing travel patterns and traffic data, SL can plan services more effectively and respond to customer needs. However, SL has chosen not to collect customer-specific data, which limits certain insights. Unlike some other public transport organizations that connect ticketing data with individual travel behavior, SL prioritizes data privacy, focusing instead on understanding broader travel patterns. SL is exploring ways to enhance this approach, as Modig noted, "Our goal is to use data to improve service without compromising privacy."

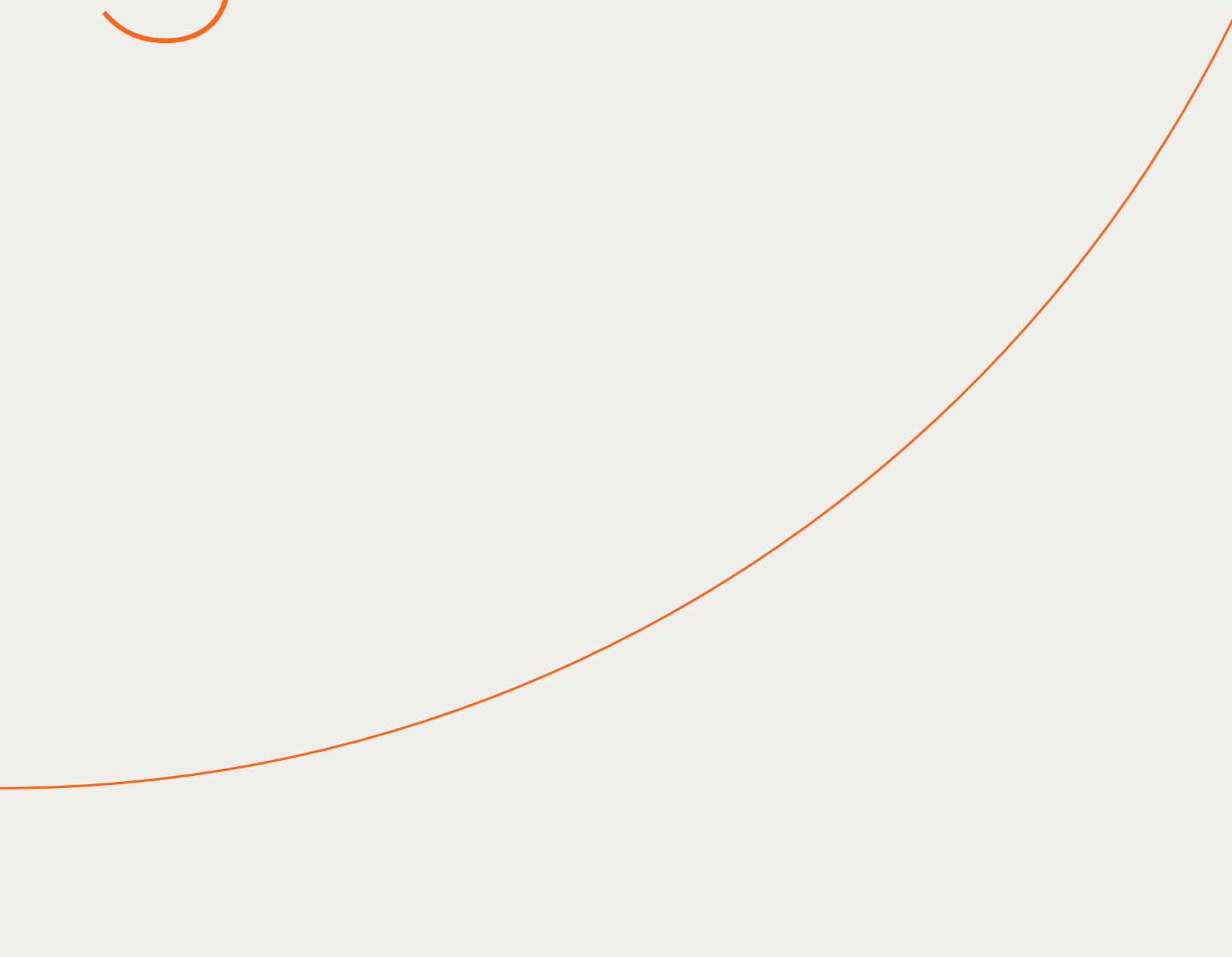
A model for the future

As the largest public transport operator in the Nordics and Baltics, SL's approach reflects a strong commitment to innovation and customer centricity. By balancing customer needs with operational efficiency, SL has made public transit in Stockholm more accessible, reliable and stress-free. With this thoughtful integration of contactless payments, SL has shown how a simple shift in payment systems can resonate strongly with both residents and visitors. As numerous SL travelers have commented, "***This is the best thing SL has ever done.***"



5

Open loop for micromobility



70%

With around 70% of all journeys in the EU under 8 km, micromobility services are well-suited to meet the demand for shorter urban trips.

Open loop for micromobility

Micromobility has become a vital component of urban transportation, providing flexible, short-distance travel options such as shared bicycles and e-scooters that connect seamlessly with public transit.

By facilitating “first-mile” and “last-mile” solutions, micromobility helps reduce car dependency and promotes sustainable choices, aligning with city goals to lower congestion and emissions. With around 70% of all journeys in the EU under 8 km, these services are well-suited to meet the demand for shorter urban trips. However, traditional reliance on proprietary apps and closed-loop systems has created barriers for users, limiting accessibility and profitability for operators. Open-loop solutions are thus emerging as a way to streamline access, expand reach and enhance the overall user experience.

Fragmented payment landscape: Challenges and the open-loop solution

The fragmented payment landscape in micromobility often forces users to download apps or use specific systems, creating friction that discourages use. This lack of integration makes it harder for operators to capture the incidental users that drive revenue. In comparison, open-loop systems offer users the flexibility to simply tap a payment card, removing barriers and increasing accessibility.

This “tap-and-go” model is not only convenient but can coexist with app-based systems, offering choice while maintaining a streamlined user experience.





Success in tap-and-go solutions

Freebike's implementation of open-loop, tap-and-go technology has demonstrated significant success in making micromobility more accessible and appealing. In Lahti, Finland, this approach has led to increased ridership by simplifying access for users, especially tourists and occasional riders, who can unlock bikes with a simple tap of their payment card — no app download or registration required. In Lahti, a tap-and-go deployment of 500 e-bikes equipped with contactless payment functionality has seen a notable rise in usage and attracted new riders, further underscoring the effectiveness of open-loop systems in supporting urban mobility.

Freebike has also introduced a model where designated parking zones are displayed on bike handles, helping users return bikes in a manner that doesn't disrupt pedestrians. For cities, this model promotes a "free float" system that balances availability with regulation

In Copenhagen, on November 15, 2024, **Donkey Republic** has announced a new open-loop payment initiative in partnership with Mastercard. This move towards open-loop payments reflects Donkey Republic's commitment to align with public transport innovations and support of urban goals of reducing congestion and emissions. A Donkey Republic spokesperson highlighted that this initiative is driven by a focus on accessibility, sustainability, and the importance of forming long-term partnerships with cities to foster integrated and seamless mobility solutions.

Profitability for operators

For operators, open-loop payments directly support profitability by broadening the user base, especially for tourists and one-time riders who may hesitate to download an app for occasional use. Data from Freebike suggests that by implementing open-loop systems, operators see a significant increase in ridership — more than 50% in some cases. With many users already carrying credit or debit cards, operators can tap into established demand without needing additional user acquisition strategies.

Key points for government stakeholders

Governments, meanwhile, are focused on using micromobility to increase accessibility, reduce congestion and manage parking demand effectively. On the other hand, micromobility can contribute to sustainability by encouraging the use of eco-friendly transport modes. Open-loop payments not only simplify access for residents and visitors alike but also support government efforts to create orderly, accessible micromobility systems.

Simultaneously, micromobility plays a crucial role in promoting sustainability by encouraging the adoption of eco-friendly transport options. For instance, a bike-sharing system with 5,000 e-bikes can help reduce approximately 200 tons of carbon emissions annually, supporting cities in achieving their net-zero or broader sustainability goals.¹¹

Considerations for a successful transition

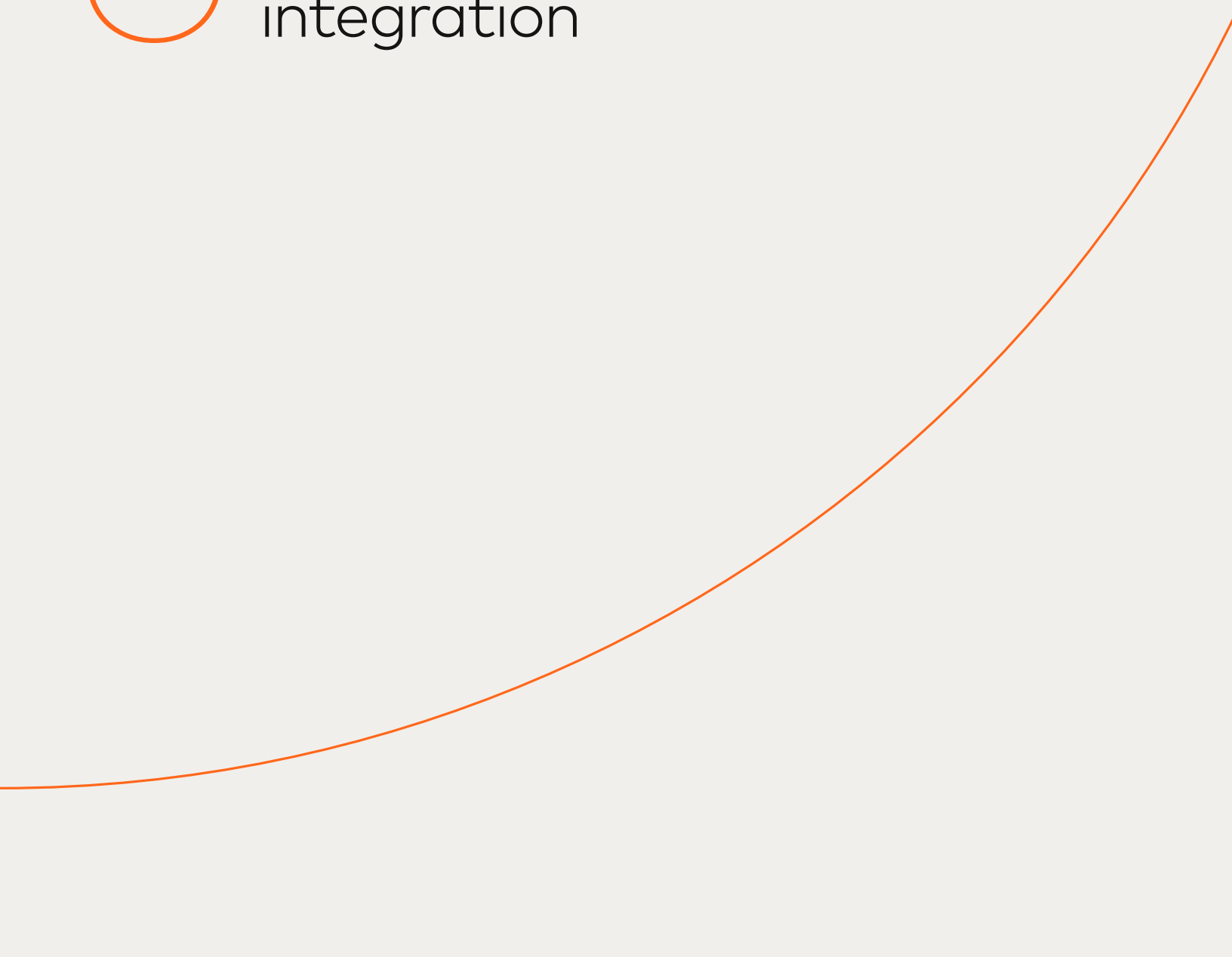
While the transition to open loop in micromobility is promising, it requires careful planning to ensure compliance with security standards like Payment Card Industry Data Security Standard (PCI DSS) and address potential issues such as real-time payment processing and device compatibility. Ultimately, implementing open-loop solutions can make micromobility a profitable, accessible and integral component of urban mobility.

11. [sciencedirect.com/science/article/pii/S0966692323001692#:~:text=Rose%2C%202013\).-,Mcqueen%20et%20al.,et%20al.%2C%202018](https://www.sciencedirect.com/science/article/pii/S0966692323001692#:~:text=Rose%2C%202013).-,Mcqueen%20et%20al.,et%20al.%2C%202018)





Electric Vehicle Charging (EVC): The future of payment integration

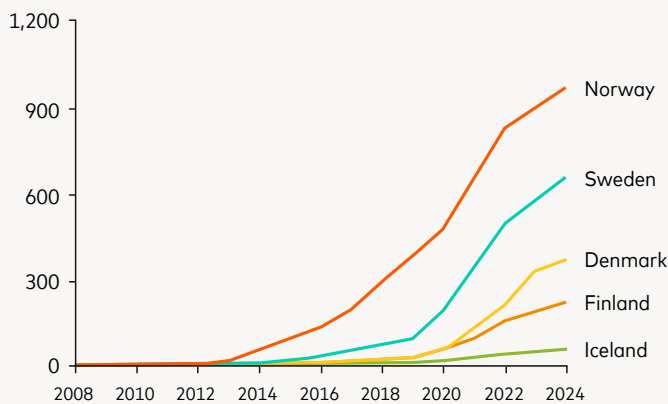


As electric vehicles (EVs) grow in popularity (see figures below), so does the need for a reliable and accessible charging infrastructure.

Early EV adopters suffered from “range anxiety,” as EV ranges were low (the average EV range in 2010 was less than 40% of what it is today¹²) and public charging infrastructure was minimal. Since then, these challenges have largely been improved, EV drivers are more and more likely to find a charger in time as the infrastructure has matured. However, the EV charging payment infrastructure did not naturally evolve in a similar manner, which created a fragmented landscape of closed-loop apps and RFID tags. In other words, the anxiety nowadays is not to find a charger, but to be able to pay for the charging in a convenient way.

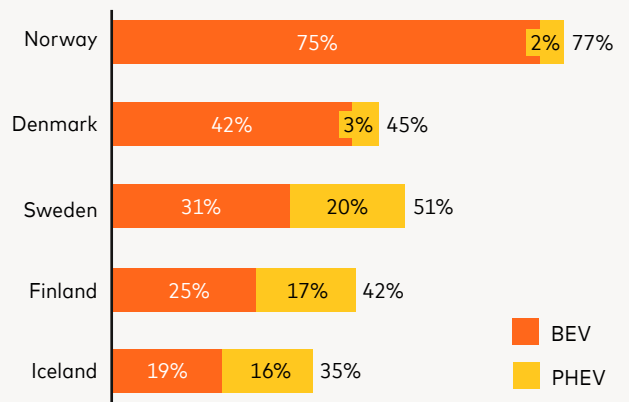
12. IEA (2022), Evolution of average range of electric vehicles by powertrain, 2010-2021, IEA, Paris. [iea.org/data-and-statistics/charts/evolution-of-average-range-of-electric-vehicles-by-powertrain-2010-2021](https://www.iea.org/data-and-statistics/charts/evolution-of-average-range-of-electric-vehicles-by-powertrain-2010-2021)

Figure 4
Total (cumulative) electronic passenger vehicle registrations
 per year, in 000s



Source: [European Alternative Fuels Observatory](https://www.eafo.eu/).

Figure 5
Electronic passenger vehicle new registrations
 as of % of total registrations (cars and vans)



The problem is most critical when taking longer trips beyond standard routes, and in particular when visiting other countries where different providers are present compared to one's home market. Imagine driving an EV to central Europe and being stuck at a German, French or Spanish charging site where you need to download an app in a foreign language. What if there is no internet connection or a bad UX in the local app?

Not only is there a rising demand for uniformity in the payment infrastructure, but there is also a regulatory need for it: as part of the EU's 'fit for 55' package, the European Commission has agreed on legislation involving Europe's alternative fuel infrastructure: [AFIR](#) (Alternative Fuel Infrastructure Regulation). One of the three key objectives of the regulation is "to ensure comprehensive user information and adequate payment options at alternative fuel infrastructures."¹³ Part of that objective has now been fulfilled with the regulatory requirement for new fast-charging stations to accept card payments on a terminal, with a retrofit requirement by 2027. This ensures that drivers can easily access fast chargers on the go, using a standard payment method.

However, in the Nordics, 82% of all charging points are slow chargers,¹⁴ with the regulation allowing for QR or online checkout (available without pre-registration or membership) as of April 2024 as an alternative to card payments. Furthermore, charging point operators still push for their lock-in/apps, creating inconsistencies in the overall EV charging experience. So, many charging stations still rely on closed-loop payment systems, where drivers are pushed to use specific apps or membership-based systems to access charging services.

13. transport.ec.europa.eu/transport-themes/clean-transport/alternative-fuels-sustainable-mobility-europe/alternative-fuels-infrastructure_en

14. [EU27 + UK, Norway, Iceland, Switzerland, Turkey, Liechtenstein | European Alternative Fuels Observatory](#).





Studies have shown that these systems create a fragmented experience that frustrates drivers. A **Mastercard & PaymentGenes report**¹⁵ highlighted how the lack of interoperability between different charging networks forced users to juggle multiple cards or apps, with **36% of EV drivers** in some regions **having four or more different charging cards**. As a result, there now exist monetized closed-loop solutions that offer cards that work on most stations in Europe (e.g., ANWB Charge Card, Shell Recharge Card).

This fragmented experience is a significant barrier to user satisfaction and could slow the adoption of electric vehicles. In a Norwegian survey among EV owners, more than 90% of respondents indicated that they want a simpler payment solution that works across all charging operators.¹⁶ In a consumer survey,¹⁷ 65% of consumers indicated that card payment is their preferred method of payment for EV charging.

AFIR's key objectives are "to ensure comprehensive user information and adequate payment options at alternative fuel infrastructures." Achieving this fully will require operators of slow charging infrastructure to prioritize universally accessible solutions. These options should eliminate the need for multiple apps, closed-loop cards, tags or monetized systems, aligning with consumer expectations and fostering a seamless transition to EV ownership for all user groups.

15. [EV charging payments](#).

16. [The Electric Motorist – Norway's largest survey among electric car owners in Norway – Norwegian Electric Vehicle Association](#).

17. ccv.eu/wp-content/uploads/sites/18/2022/07/Consumer-Research-Payment-for-Electric-Vehicles.pdf

ELECTRIC VEHICLE CHARGING (EVC): THE FUTURE OF PAYMENT INTEGRATION

Open-loop payment systems offer a convenient solution to this challenge by providing a consistent, universal way to pay for charging services. The ability to tap-and-charge using a regular card terminal simplifies the process significantly for drivers. It allows them to use the same payment method as a diesel or petrol would do at the gas station.

The demand for easy payments is also recognized in the car manufacturing industry, as Mercedes,¹⁸ Skoda,¹⁹ BMW²⁰ are now equipping some of their cars with in-car payment services. This will pave the way for a seamless charging experience – similar to Tesla’s plug-and-charge model. A study conducted by the German market research company GfK on behalf of Mastercard shows that around 60 percent of 18- to 39-year-olds would prefer to pay their gas bill or electric vehicle charging directly via the car.²¹

While these initiatives address customer demand, the infrastructure at large also needs to have ad hoc payment methods to account for situations where cards are not (yet) registered in the cars. Enabling ad hoc payment methods (open-loop) will also help late adopters, who might have the highest skepticism towards EVs, have a smooth transition to driving electric.

If we truly want a transition to a more sustainable future, we should make sure that the EV charging infrastructure is not only for pioneers that are willing to suffer minor inconveniences and put in the work for a sustainable future; we should collectively ensure that it is more convenient for everyone to make the green choice than to drive with fossil fuel.

18. mercedes-benz-mobility.com/en/what-we-do/payment-services

19. skoda-storyboard.com/en/press-releases/skoda-auto-introduces-in-car-payments-with-brand-new-pay-to-fuel-service

20. bmwgroup.com/en/news/general/2024/in-car-payment.html

21. mastercard.com/news/europe/en/newsroom/press-releases/en/2023/mercedes-benz-and-mastercard-introduce-native-in-car-payments





Considerations when implementing open-loop systems

For more information download the
[Open-loop Payment in Public Transport – Implementation Roadmap Report](#)

Transitioning to an open-loop payment system offers a unique opportunity to enhance user experience, accessibility and operational efficiency.

Achieving these outcomes requires a strategic, coordinated approach, with careful attention to the readiness of technical, operational and regulatory factors.

Set strategic objectives

The foundation of a successful, open-loop transition lies in clearly defining the strategic goals that align with both organizational and customer needs. This initial phase involves outlining the project's objectives, including customer experience improvements, operational efficiency targets and financial goals. By establishing these objectives from the outset, mobility providers can ensure that the open-loop transition aligns with the organization's broader mission and delivers tangible benefits for both users and stakeholders.





Involve key ecosystem players and foster necessary partnerships

Collaboration with essential partners — such as payment providers, acquirers, transit operations, and government bodies — helps create a resilient and user-friendly system. Engaging these players early on supports system scalability and makes it more accessible for travelers.

Mastercard embarked on its mobility journey over a decade ago partnering with various public authorities, PTOs, financial institutions and regulators enabling successful implementation of open-loop solutions around the world.

Define elements of transition readiness

Ensuring readiness across technical, operational and regulatory fronts is vital to building a robust open-loop system. Technically, the fare collection system and back-office infrastructure must be optimized to support open-loop transactions, including compliance with security standards such as EMV and PCI DSS. Operational readiness includes establishing effective workflows, training staff and preparing customer support protocols, all of which contribute to seamless operations. Additionally, regulatory compliance guarantees alignment with privacy and data protection standards, which are essential for maintaining user trust.

Plan payment methods and roadmap

A well-structured transition plan for payment methods further builds user confidence. Especially for public transit systems, defining a clear roadmap that phases out any outdated payment methods and communicating timelines transparently, helps maintain user trust. For a truly convenient experience, the transition should prioritize familiar payment options, such as widely used cards and mobile wallets, reducing the need for new registrations.

Develop a targeted value proposition

A targeted value proposition is key to fostering widespread adoption. Identifying primary user groups, such as commuters, tourists and occasional riders, allows mobility providers to tailor features and benefits accordingly. Supporting each group's unique needs and providing clear guidance on using the new system promotes a positive onboarding experience. Thoughtful pricing models, including flexible fare caps and discounts for frequent riders and specific groups, enhance accessibility and user loyalty.

By aligning strategic goals, fostering cross-functional collaboration, ensuring comprehensive transition readiness, planning a clear payment method roadmap and developing a well-defined value proposition, an open-loop system can be created that is efficient, inclusive and transformative for the public transport landscape. This structured approach not only builds a seamless, scalable solution but also reinforces the value of open-loop systems in meeting today's urban mobility needs.





This document is proprietary to Mastercard and shall not be disclosed or passed on to any person or be reproduced, copied, distributed, referenced, disclosed, or published in whole or in part without the prior written consent of Mastercard. Any estimates, projections, and information contained herein have been obtained from public sources or are based upon estimates and projections and involve numerous and significant subjective determinations, and there is no assurance that such estimates and projections will be realized. No representation or warranty, express or implied, is made as to the accuracy and completeness of such information, and nothing contained herein is or shall be relied upon as a representation, whether as to the past, the present, or the future.

Mastercard and the circles design are trademarks of Mastercard International Incorporated. © 2025 Mastercard. All rights reserved.