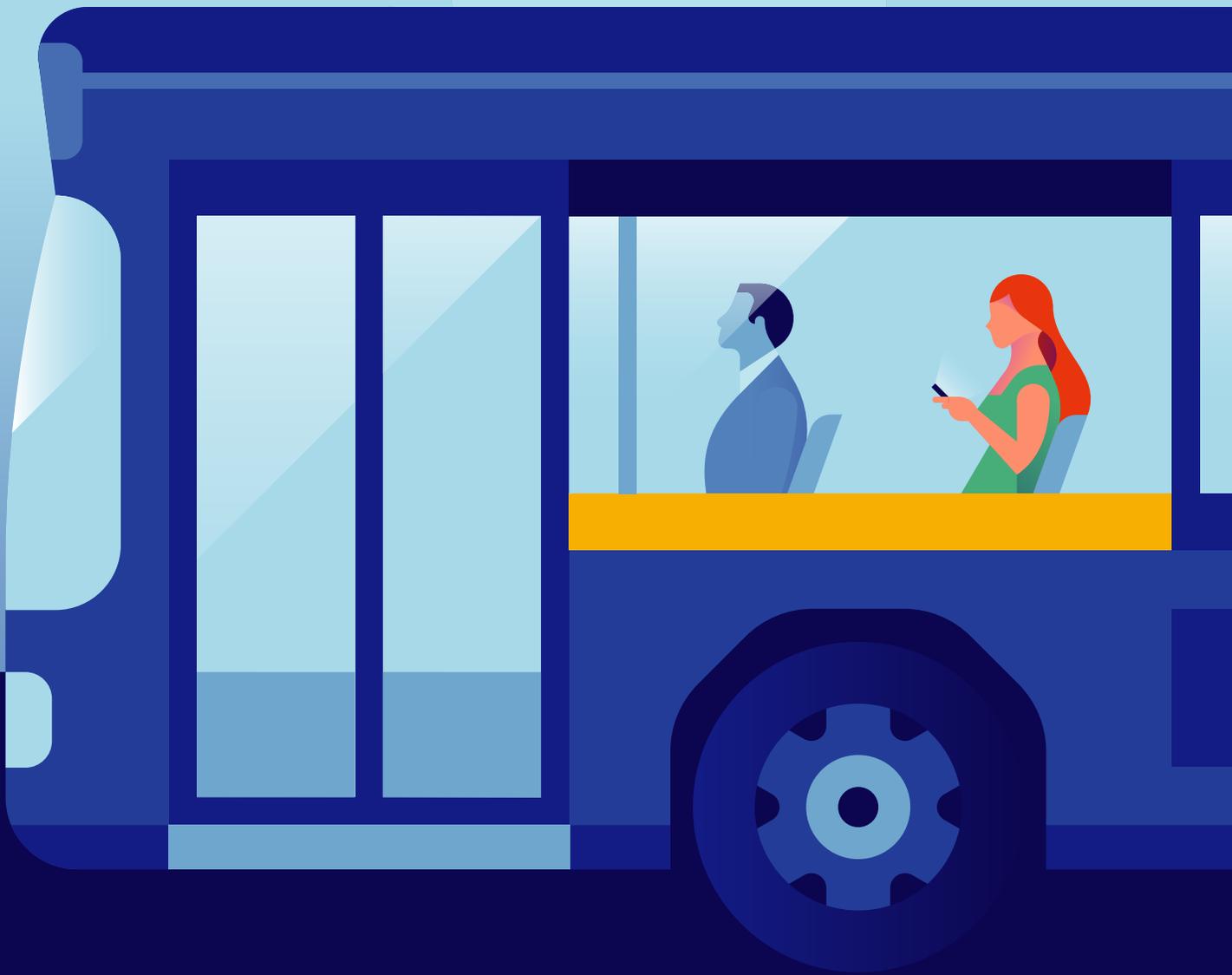


Digital Payments for Urban Mobility: Helping Cities Become Greener and More Connected



In cities around the world, administrators and urban planners are trying new approaches to make transportation systems more environmentally sustainable and logistically efficient. Greenhouse gas emissions from transport are on track to double by 2050, and already passenger vehicles account for 70% of those emissions and 50% of urban air pollution.¹ Increasing multi-modal mobility, especially public transit and micro-mobility options, is key to bringing these numbers down. Instituting highly efficient systems of fare payment and collection is one of the best ways to encourage ridership and boost mobility systems' economic sustainability.

The Visa Global Urban Mobility team is enabling cities to charge and collect fares by delivering a seamless way to pay for travel that is fast, easy, and secure. Riders can plan and pay for travel on an app and can tap to pay on all modes of transport using a contactless card. This system not only attracts riders and makes fare-collection more efficient, but it also provides innovative ways to generate additional value, such as data insights, rewards programs, and promotional support from industry.

Tap to pay is already working well in cities around the world. In one example, five years after London transit system adopted contactless tap to pay as part of their fare collection, using a contactless card or device is now the most common way to pay-as-you-go around the city. This development has fundamentally changed how customers experience urban mobility, and greatly reduced the printing of paper tickets and transit travel cards. Visa brings scale and efficiency to the equation for urban mobility operators and cities, which can then direct more time, attention, and resources to the complex transit concerns—routes, schedules, safety, cleanliness, maintenance—that must be addressed to create a great experience for riders.

In collaboration with cities, national governments, and 100+ other partners—including public and private

urban mobility providers—Visa is helping transportation networks function more efficiently, creating a better door-to-door journey for customers. Visa's secure payment experience works across multiple modes of transportation—without unnecessary friction and with maximum convenience to the passenger. Customers save valuable time by avoiding the need to pre-purchase a ticket, manage a standalone transit card, or stand in line to reload their fare card—reducing ticketing costs, vehicle dwell time, and carbon emissions. And transit operators, city planners, and administrators reduce the need to issue plastic cards and paper tickets, and can more easily manage the machines, processes, and workers who maintain these systems' bespoke infrastructure.

Such user- and operator-friendly systems boost ridership and rider satisfaction, positively impacting cities' economies and reducing their carbon emissions.

Decarbonization: an urgent call to all

Scientists are ringing the alarm bell on climate change with increasing urgency, warning that we have only about a dozen years to turn things around to avoid devastating effects.²

“We urgently need to move towards a pollution free planet, to tackle climate change and to drive sustainable development. We can only do that with decisive action in this sector. Technologically and commercially viable solutions exist, but we need stronger policies and partnerships to scale them up more rapidly.”

Erik Solheim, Executive Director, United Nations Environment Programme⁷

The United Nations Framework Convention on Climate Change (UNFCCC) aims to halt total temperature rise at 2°C above pre-industrial levels, if not 1.5°C³, a goal that can only be reached by bringing greenhouse gas (GHG) emissions to net-zero by year 2080.⁴ Current rates of GHG emissions are on track to lead to unacceptable temperature rises of 2.9°-3.4°C above pre-industrial levels by 2100.⁵ Such a scenario would lead to what the UN calls “catastrophic” changes and occurrences around the world.⁶

Bold action across both public and private sectors is needed to bring emissions of these atmosphere-altering gases down precipitously and to help countries work to adapt to climate change impacts that are now unstoppable. Cities are “top-responders” in the face of this crisis, working diligently to transform their urban infrastructure in ways that will benefit both local residents as well as the global community.

Cities: top climate responders

As major population centers, cities are disproportionately responsible for climate change. While they are currently home to 55 percent of the world’s population, cities consume 78 percent of the world’s energy and produce 60-75 percent⁸ of the world’s greenhouse gas emissions.⁹ And these numbers are likely to swell—the globe’s urban population is rising fast. City-dwellers are likely to make up 68 percent of the world population by 2050,¹⁰ by which time the world will have 50 megacities with more than 10 million inhabitants each.¹¹

While cities are major contributors to climate change, they can also be a powerful and proactive solution to it.¹² Small-scale changes to infrastructure and urban planning can have big impacts on reducing carbon emissions, especially as cities grow.

Cities know this and are already answering the call. The world’s leading cities have formed a network called C40, which has pledged to take action to address emissions and reduce climate impacts. At the UN Climate Action Summit in New York in September 2019, participating cities made commitments to prioritize addressing climate risk in their planning and investment decisions, embracing the goal of creating at least 1,000 bankable, climate-smart urban projects by 2030.¹³ Also at the Summit, 100 organizations formed Action towards Climate-friendly Transport (ACT),

pledging to work toward decreasing carbon emissions in transport. This is the largest global coalition to push transport as part of the solution for sustainable development aligned with the Paris Agreement.¹⁴

Visa is committed to providing those cities that are pushing urban mobility in new directions with comprehensive, technically advanced payment solutions designed specifically for transit operators' needs.

“Dear friends, I want to tell you clearly—we can win this race,” said UN Secretary-General António Guterres in closing remarks at the Summit.¹⁵

Urban mobility: key to cities' climate action

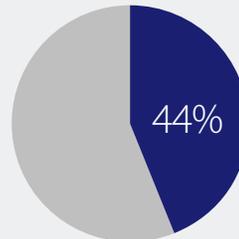
Effective urban mobility systems are essential to cities' economic success and sustainability.¹⁶ Those who live in cities want a dynamic transportation system that reliably moves them around the urban landscape with as little hassle as possible. Faster, easier, safer, cleaner, and greener transportation encourages more users, which boosts population density, drives cities' economic success, and reduces the carbon footprint of transportation networks.

Transport is among the largest contributors to carbon in cities.¹⁷ In 2017, road transport was responsible for almost 72 percent of total greenhouse gas emissions from transport. Of these emissions, 44 percent were from passenger cars.¹⁸ Therefore boosting transportation's efficiency is an essential tool for reducing cities' GHG emissions. Studies show that adapting transit routes and schedules based on rider demand can reduce the number of transit vehicles and increase rider density on the vehicles that remain on their routes, thus reducing emissions of pollutants by about 13 percent.

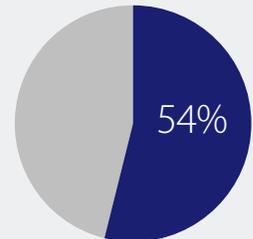
Urban Mobility Usage

How urban residents in major cities around the world use public transit¹⁸

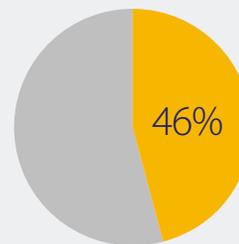
Work/School Commute



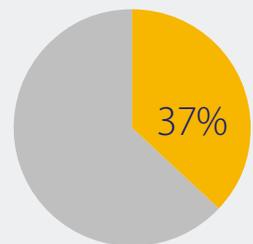
Personal Travel



Commute Times



46% of consumers in major cities around the world have had commute times increase over the past five years.



37% of consumers in major cities around the world expect their commute time to get longer over the next five years.¹⁹



27% of consumers in major cities around the world state that they would use more public transport if it was easier to pay.



50% of consumers surveyed would use more public transport if they could plan and pay for trips on a single app.²⁰

Using digital payments can also encourage commuters to incorporate micro-mobility solutions like bike- and scooter-sharing into their multi-modal journeys, which can help reduce traffic congestion and GHG emissions. While it can be difficult to measure how many micro-mobility users would be driving in the absence of these programs, there are potential benefits. A Deloitte analysis found that if non-bike commuters traveled by bicycle 96 days a year, carbon emissions could be reduced in major metropolitan areas in the U.S. by a total of 5 million metric tons annually,²² the same amount emitted by almost 600,000 homes' annual energy use, which would require 82.7 million tree saplings over a decade of growth to sequester.²³

Cities have long played an important role in using changes in transport policy and structure to reduce GHG emissions and contribute to a climate solution. As early as 2003, London instituted congestion charges to reduce the number of cars in the city and added 300 buses to city routes as part of the change.²⁴ And California—home to two of the most populous U.S. cities—continues to lead the country on green policies, including in transportation policy. The state has robust programs targeting emissions in transportation, designed to contribute toward the statutory GHG emission goal of reducing statewide emissions to 40 percent below 1990 levels by 2030.²⁵ If cities prove they can set and reach such audacious targets, they can serve as models for corporations and other cities to take action too.

Part of the reason that transport can be an important catalyst for helping cities meet their goals is that there is already impetus to reform transportation. These existing efforts can be leveraged to transition systems to greener operations. Around the world, transportation systems face great pressure, with city-dwellers struggling with traffic congestion, overcrowding on transit, and problems with reliability.²⁶ These are tough problems that take unique form in each city in response to a wide variety of impacts and pressures.

One problem that can be solved systematically and uniformly across cities is the difficulty riders have with paying for public transit. Riders are turned off by complex payment methods that are often involved in using transportation systems. Surveys show that almost half of commuters surveyed in 19 countries say that it is inconvenient to need different tickets for different modes

of travel, 44 percent say they struggle to know how much to pay, and 41 percent say they are annoyed by cash-only requirements on transit. Ridership on public transit globally would increase by 27 percent if transit journeys were easier to pay for.²⁷

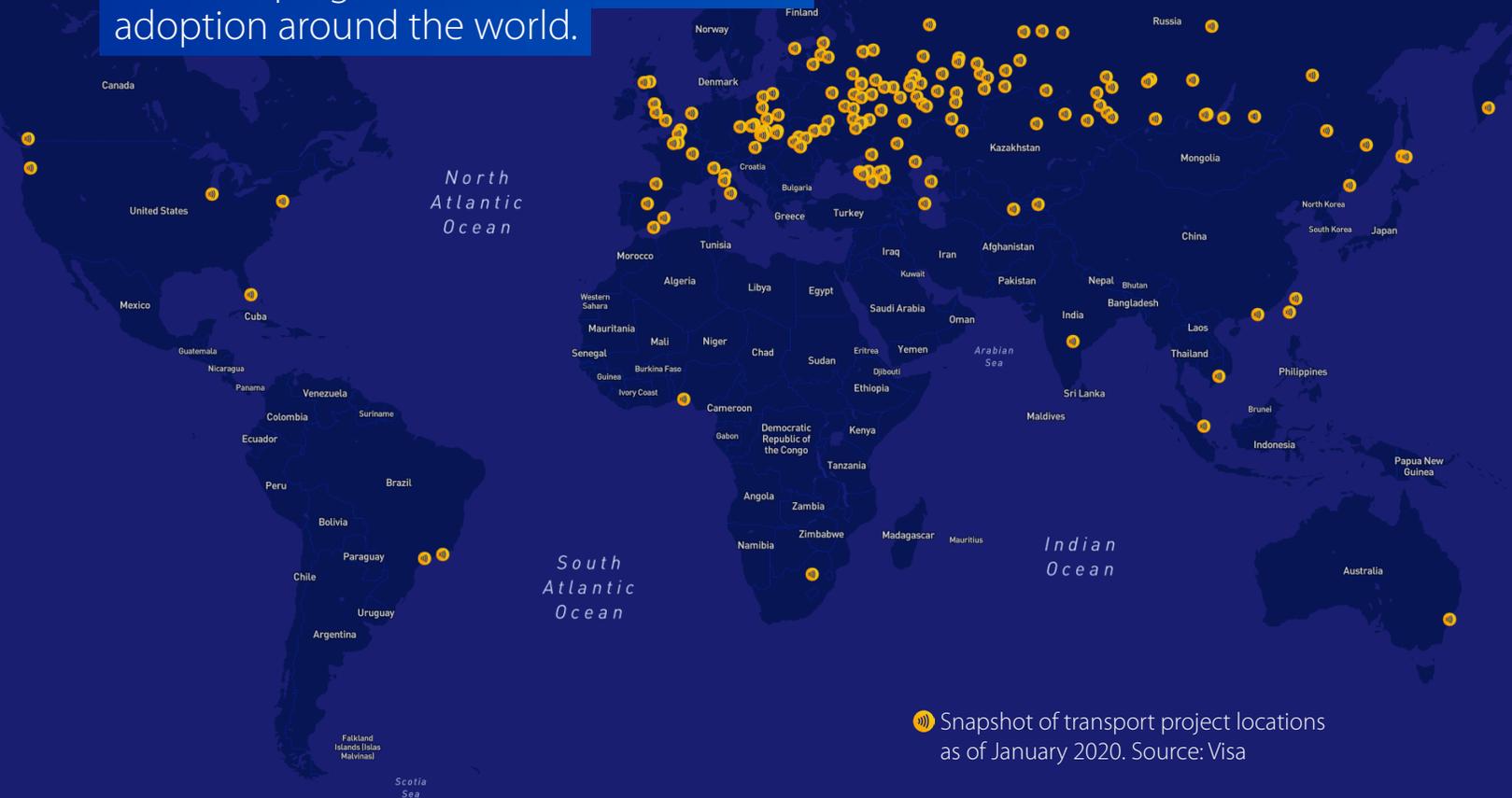
Another pain point for many riders is how long it takes to board and pay—known as “dwell time”—leading to a slow ride with long pauses.²⁸ Traditional ticketing systems keep transit's carbon footprint high—the busiest bus routes with the most passengers boarding have been shown to have the highest emissions due to the large amount of dwell time.²⁹ Similarly, commuters who drive on toll roads are often frustrated by long waits for toll processing. Studies of the effects of E-ZPass automatic toll transponders found that implementation of the technology on the New Jersey Turnpike reduced toll plaza delays by about 85 percent, saving passenger cars 1.8 million hours per year and reducing fuel consumption on the turnpike by 1.2 million gallons per year.³⁰

By implementing Visa payment standards and solutions, cities can free up resources to direct toward problems that are harder to address but essential for increasing transit usage.

“We came to the very simple realization that nobody wants to buy a ticket, and actually, we don't want to sell them one, either. If you could find a means of making that very simple business process work more efficiently that would be the right thing.”

– Shashi Verma, Chief Technology Officer,
Transport for London³¹

Visa is helping to drive contactless transit adoption around the world.



Digital payments: a win for transportation

As more of today's bustling cities transform into tomorrow's megacities, technology will be an important driver of efficiency in these urban landscapes.³² Specifically, connected devices will bring new ways for people to interact with the city's infrastructure, streamlining daily tasks and processes and reducing the resource waste of slow, manual systems of management.

It's clear that changes are needed to streamline payment procedures across transportation systems, which will increase ridership while bringing down emissions. One promising way to do so is to institute digital payments.

For example, when riders use contactless payment cards or digital wallets, they tap to pay at the turnstile or onboard terminal on a transport vehicle, rent a shared bike or scooter, pass through tolls, and/or use public parking facilities. Users can plan and/or pay for trips across all modes of transport

ahead of time, or simply use their card/device to pay as they go. The system can also track transportation use each day and automatically charge the customer's card at the end of the day, accounting for fare capping.

Because riding public transportation is a critical part of daily life, transit continues to be an important use case for introducing consumers to tap to pay technology. Contactless payment systems' ease-of-use is likely to encourage users to leverage transit and micro-mobility options, reducing the use of cars.

Digital payment technology creates the ability to apply discounts and payment caps to charges across the system, and allows customers to ride, bike, scoot, drive on toll roads, and park without having to think about methods and amounts of payment for each segment of their transportation journey. Riders are able to use their cards/devices within and outside the transportation systems and may be able to recoup the amount on the card in the case of its loss or theft.

Such streamlined digital fare systems will encourage usage of public transportation, as well as improve efficiency and reduce emissions of transportation networks. A study for bus boarding times in Sydney, Australia, found that passengers paying with a card inserted into a slot are able to board a bus almost twice as fast as those paying with exact change in cash, and more than three times faster than those receiving change from the driver.³³

A contactless system is even faster than using transit cards, as riders can simply tap their cards while boarding instead of pausing to put a card in the machine. Slashing the time it takes for riders to board and pay reduces dwell time and the resulting emissions. An international group of researchers investigating this question on a typical diesel bus system in Dalian, China, found that a tap to pay system on diesel buses resulted in 20 percent less emissions than a cash payment system, and concluded that “the use of contactless card payment will considerably reduce emissions.”³⁴

“We’re making public transport a more affordable option for millions of people across our city. This is vital to encourage more Londoners out of their cars – helping reduce congestion and emissions, and clean up our toxic air.”

- Sadiq Khan, Mayor of London, England, announcing a freeze on fares enabled in part by the increase in contactless payments, which now account for 64% of all journeys made on the Tube.³⁵

Contactless ticketing also reduces the resources usually expended on producing and dispensing with paper tickets: paper sourcing, printing, disposal, and administrative effort. Single-use tickets cannot be recycled due to the magnetic stripe on the back.

Not only do contactless payment systems help increase ridership, fight emissions, and reduce waste, but the data they generate also helps cities plan more efficient and effective routes by anonymously assessing riders’

movements among various parts of a city, showing peak travel times and ridership trends within and among neighborhoods. Knowledge of these types of synergies can help city administrators plan the most effective transit routes for the population’s needs, thus boosting ridership and increasing efficiency and sustainability.³⁶

On top of the other benefits, digital payments save transport operators money. A Visa study found that ticket management in a public transit system costs 14.5 cents for every physical dollar it collects in fares, compared to only 4.2 cents for every digital dollar. Security costs are also reduced, since Visa contactless cards are built on secure EMV® Chip technology that has a proven track record of reducing counterfeit fraud.³⁷

Visa: helping cities make transport more efficient

With more people moving through city centers on a daily basis, optimized urban mobility and city sustainability are of paramount importance to the future of thriving metros. Visa dove deep to understand the problems cities face on this front, and is taking the lead in creating and implementing data-based solutions that improve urban mobility’s uptake, efficiency, and impacts.

Visa is using its technological excellence and innovation to enable platforms that can drive a city’s economic success by lowering costs for cities, growing revenue, and building a more sustainable future. As the network of networks, Visa is able to build a truly “open loop” transport system and offer a secure payment experience that works across multiple modes of transport. The smoother, faster, and more cohesive logistics of digital payments move cities toward a more navigable and sustainable future.

Visa tap to pay technology is gaining widespread recognition and seeing uptake around the globe. It is commonly preferred outside the U.S., with more than 50 percent of Visa transactions occurring with a tap at checkout in retail establishments. There are now almost 50 countries where contactless payments represent at least a third of all face-to-face transactions. Tapping to pay is catching on quickly in the U.S. as well, with 8 of the top 10 issuers now offering contactless cards, and 300 million Visa contactless cards expected to be issued by the end

of 2020. Today, more than 80 of Visa’s most-transacting merchants in the U.S. offer customers the ability to tap to pay at checkout, with the result that more than 60 percent of face-to-face Visa transactions in the country now take place at a contactless-enabled merchant.³⁸

Transport systems are a key driver of that adoption. Cities around the world are using this technology to transform their transportation systems. A Visa survey revealed that 49 percent of UK commuters identified the introduction of tap to pay in London as the most significant improvement to their experience with public transit.³⁹ The New York Metropolitan Transportation Authority (MTA) has seen positive feedback, and reached 1 million taps within the first 10 weeks and 4 million taps within the first 7 months by visitors representing 93 countries.⁴⁰

As part of Visa’s work with public- and private- sector actors to help cities become environmentally sustainable and economically successful, the company’s urban mobility experts are helping transport operators transition to tap to pay systems and integrate digital payments across the entire door-to-door journey.⁴¹ Visa has helped launch more than 175 contactless transit projects—62 in 2019 alone— including in Edinburgh, Manchester, Miami, New York, Rio de Janeiro, and Singapore. Such transit projects have seen positive adoption with a 40% rise in contactless transit transactions on Visa globally. Visa’s global transit partner program, Visa Ready for Transit, includes 100 partners worldwide, providing transit agencies with access to an expanded network of technology solutions and expertise.

Singapore is home to one of the largest open-loop transit implementations using Visa technology.

30,000+

touchpoints

\$1.39b

total annual ticket revenue

In 2019, this system helped:

5.6m

residents

18.5m

visitors

Residents and visitors efficiently made use of:

5,400

buses

182

transit systems



Recommendations: making transport greener

As Visa has become increasingly involved in boosting the efficiency of transportation systems around the world with technological solutions, the company has developed a number of recommendations for municipalities looking to bring a new approach to their transportation network.⁴² Considering the strong link between greater efficiency and effectiveness of urban mobility and decarbonization of cities, the advice below can directly contribute to strong urban climate change action.

1. Create a seamless payment experience.

City governments and urban planners will need to implement innovations such as contactless payments and platform-based solutions that give customers a frictionless and predictable experience and provide operators with a faster, efficient, and more sustainable system. City planners should move their thinking from “ticketing” to “fare collection,” building experiences that are highly customer-centric.

2. Design with all members of society in mind.

When designing innovations to the transportation ecosystem, city administrators and urban planners must design with seniors, disabled riders, and the un- or underbanked in mind to ensure everyone has access. Creating an accessible system helps boost ridership and encourages the successful integration of public transportation options into urban life.

3. Require and invest in technology upgrades.

Cities should introduce legislation to require up-to-date technology in transportation systems and invest in a robust data infrastructure to ensure connected technology solutions meet consumer demand. Residents benefit from data about their transit journeys, and city administrators gain insight about levels of demand and patterns of movement.

4. Encourage connectivity and collaboration.

As commuters increasingly mix modes of transit, city planners must consider how to streamline multimodal transportation. Municipalities will benefit from encouraging stronger collaboration among multiple operators in the same area. By adopting digital payment terminals that are standard across

the globe, it will be easier for operators to integrate and administrators to run systems efficiently as people travel among cities, regions, and countries.

5. Develop strategic partnerships to drive insights.

Cities can partner with companies that can broaden insight to aid in planning, such as using artificial intelligence and big data to analyze consumption, movement, and changing trends. This will provide new ways to analyze current changes and future directions for transportation to increase its efficiency and effectiveness.

Conclusion

Improving city life by reducing pollution—while also moving people around efficiently—is one of the biggest challenges of our time. That is why Visa is working with cities around the world to promote ways to reduce carbon, drive economic sustainability, and make cities more livable with better transportation solutions. Billions of riders are already served by Visa Urban Mobility every year—from Singapore to New York.

Leveraging payment technology can help cities run more efficiently by adopting contactless and open loop transportation systems that promise to make every day travel easier, faster, and greener.

Appendix

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