ACHIEVING SUSTAINABLE MICRO-MOBILITY

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RAMBØLL

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ACHIEVING SUSTAINABLE MICRO-MOBILITY

Description

This paper was born from program recommendations to the City of Hoboken as part of their six-month micro-mobility pilot program evaluation. It also aims to identify strategic goals of a sustainable micro-mobility program shared amongst all cities and propose practical key performance indicators (KPI) that can be used to assess its strengths and weaknesses.

Ramboll is very grateful for the incredible support of a large number of participants and contributors to this report. It was prepared in partnership with the City of Hoboken, New Jersey, and collaboration with Lime, Voi, Populus Mobility Manager, RideReport, Involved, and with special input from NACTO and POLIS, as well as community-specific contributions from city and public transit agency officials in the following cities:

- Aarhus, Denmark
- Auckland, New Zealand
- Baltimore, USA
- Chicago, USA
- Coral Gables, USA
- Hamburg, Germany
- Helsinki, Finland
- Hoboken, USA
- Oakland, USA
- Oslo, Norway
- Pesaro, Italy
- Stockholm, Sweden
- Tampere, Finland
- Vancouver, Canada
- Yokosuka, Japan

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EXECUTIVE SUMMARY

Is micro-mobility helping or hurting our cities? In the past few years, micro-mobility services have been arriving at unprecedented speed and scale to cities that are often ill-prepared to manage them. In these early years of micro-mobility, the metrics used to describe the programs are limited to general statistics. Detailed data is often gathered in a manner that makes it hard to assess how it is aligned with a city's goals. The lack of standardization can also pose a challenge as it is hard to identify best practices and compare micro-mobility schemes.

This report aims to push the discussion away from general statistics about micro-mobility and towards the identification of tangible key performance indicators (KPI) that can be measured by any city to better understand how successful they are in providing new mobility options to their communities, and where they can improve.

We begin with the identification of a set of common strategic goals that we believe any city or operator would want to achieve. These goals have been shared and discussed with a wide range of members from the micro-mobility community, including 15 cities. We then use a simple methodology to propose some potential KPIs that can be used by cities to gauge the sustainability of their micro-mobility programs, as well as compare themselves to other cities around the world.

We hope this report encourages a broader discussion in the micro-mobility community about suitable KPIs that can hopefully be adopted as the standard set of comparable metrics.

In Hoboken, a dense city with very good levels of walkability, bicycle infrastructure, and public transit ridership, micro-mobility has been developing as a critical element in the city's strategy to diversify mobility options and promote innovation. The city has recently completed a six-month pilot program that is now under review. As in other cities, the use of micro-mobility is not only seen as one way to reduce congestion and parking challenges, it is also expected to contribute to reductions in the City's sustainability goals. Of course, the City also desires that micro-mobility is generally accepted by the community and is considered safe and convenient. Finally, Hoboken would like micro-mobility to contribute to economic development if possible and aims to minimize its management role and the cost of the programs to taxpayers. We expect that most cities will find they have the above goals in common with Hoboken, even if the individual priorities differ from community to community.

This report identifies a clear need across all cities to more-precisely quantify micro-mobility. Furthermore, cities are eager to transition from the generic data learned during early phases of a pilot or other program launches to more meaningful metrics that are mapped to strategic goals of individual programs. The classic example is that of micro-mobility crashes and injuries data. If available at all, these are currently provided in a vacuum, which leads to concerns that there are suddenly many new crashes and injuries with this new mode. If these crash data were reported in better context, such as the percentage of overall motor vehicle crashes, the public and even critics might not find the numbers so alarming. In this way, communities can be better informed and have a stronger understanding of the strengths and weaknesses of micro-mobility.

Indeed, many cities hear the loud voices of opposition more than the oftentimes larger group of advocates, and struggle to react in a constructive way using data as an objective basis of discussion. For this reason, we strongly recommend cities to consider establishing strategic goals (or share those from this report) and mapping suitable Key Performance Indicators that can be measured, reported, and evaluated by decision-makers as well as the public.

With our main partner, the City of Hoboken, New Jersey, we present an approach that allows micro-mobility stakeholders in any city to better measure the success of their programs. Furthermore, we propose the establishment of standard metrics within a generally defined set of common goals to make it easier for all micro-mobility stakeholders to benchmark their programs with cities around the world.

GLOSSARY

Disadvantaged communities or communities of concern: Refers to areas or neighborhoods which most suffer from a combination of economic, health, and environmental burdens. These burdens may include poverty, high unemployment, air and water pollution, presence of hazardous wastes as well as high incidence of asthma and heart diseases.

Dockless, stationless or floating micro-mobility service: Micro-mobility vehicles that do not have to be rented from or parked at designated docking stations but are distributed across their service area. An individual can activate one vehicle (using an app or other method) and ride it to their desired destination and leave the vehicle nearby for the next individual to use.

E-scooter, motorized scooter or powered scooter: A stand-up kick scooter that commonly uses a small electric motor for propulsion.

First/last mile: In terms of mobility, the first or last mile is the leg of a journey between public transit and the journey origin or destination, respectively.

Geofencing: The use of satellite positioning or other suitable technology to create a virtual geographic boundary that can be used to mark a whole operation area for micro mobility services or smaller areas to manage recommended parking, speed-controls, or restricted use.

KPI, Key Performance Indicator: A measurable value that demonstrates how effectively set goals or objectives are achieved.

Micro-mobility: A transport mode category that consists of very light vehicles such as e-scooters, bicycles or electric assisted bicycles. Vehicles are typically shared and intended to carry a single person for short and first/last-mile trips.

Ride-hailing: A mobility service that is initiated by requesting a ride either physically (traditional taxi) or virtually (Bolt, Grab, Lyft, Ola, Uber).

Ridership: A metric that is used with micro-mobility to show how active a service is. Typically, it is presented as the (average) number of rides per vehicle per day.

Shared micro-mobility program/service: A service provided to the general public to access one or more types of micro-mobility vehicles for a fee, typically using a smartphone app.

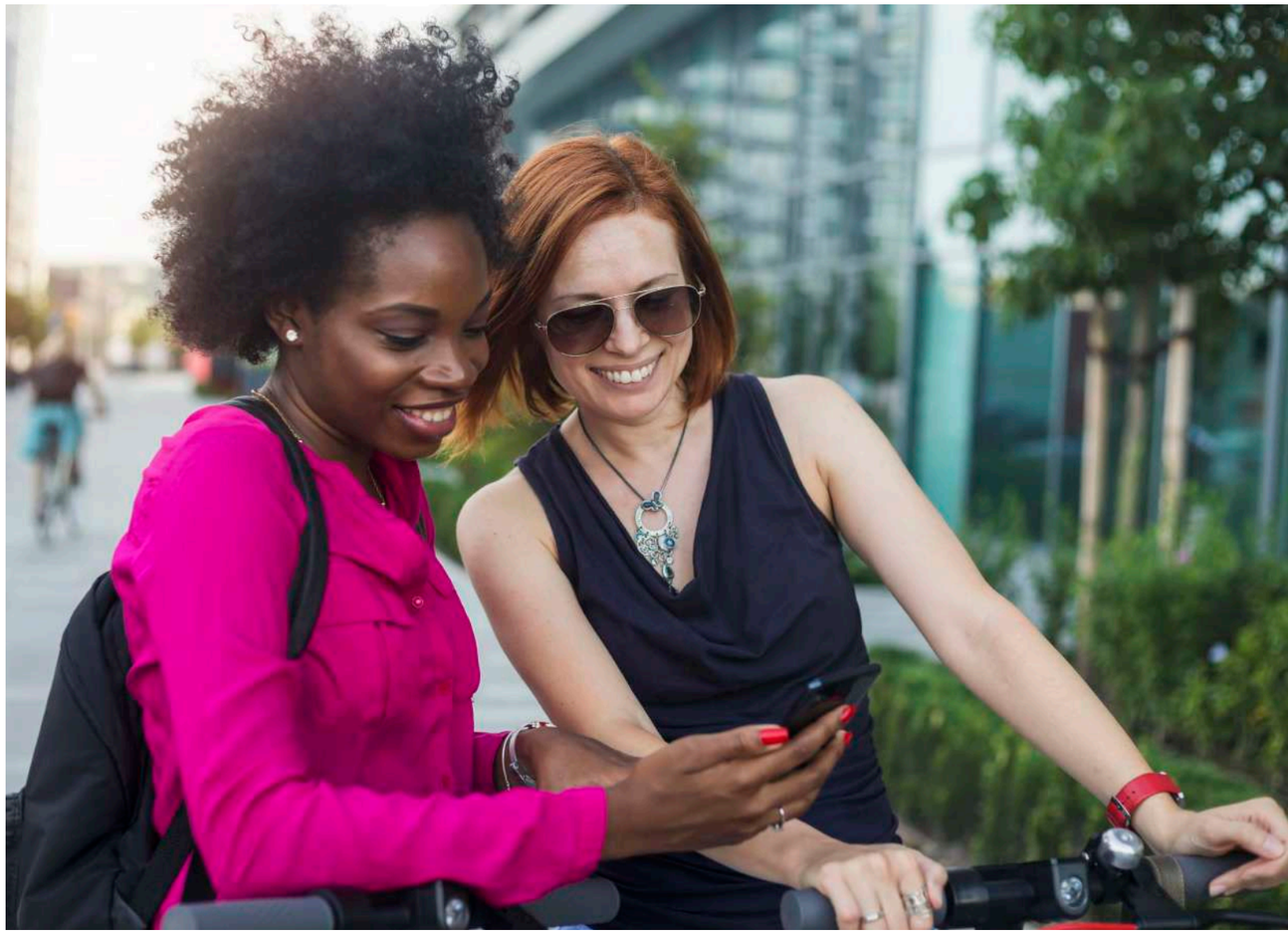
Station-based micro-mobility service: Micro-mobility vehicles that can be borrowed and returned to physical stations (only) that are installed across the service area. The station can be virtual, in which case the stations are defined as coordinates and the coordinates of the vehicle must match the station coordinates upon returning the vehicle.

1 INTRODUCTION

Is micro-mobility helping or hurting our cities? Are the benefits to users of this new niche of transportation services greater than the frustrations experienced by those in our communities who don't use them? Does improved connectivity outweigh new injuries and, in some cases, fatalities documented since their introduction? Does micro-mobility encourage a shift away from single occupancy car trips more than vehicles such as e-scooters eat into walking, bicycling, and public transport trips? To what extent can we justify the reduction of some longer-distance walking trips as an improvement to equity? Will the vehicles we are planning for today even be here tomorrow?

These are some of the questions on the top of minds in communities all around the world. Presently, we have a basic profile of micro-mobility through statistics such as vehicle and trip counts, but it is clear from our conversations with many cities, operators, and other stakeholders, that we all seek better ways to measure how well these programs are working in our communities. While every city is unique, and while micro-mobility is arriving at different times and in varying scales to cities, we submit it is still possible to identify common themes that span the globe from which we can measure success.

In the past few years, micro-mobility services have been arriving at unprecedented speed and scale to cities that are oftentimes ill-prepared to manage them. Typically, these services are introduced by private operators and are deployed as a "floating" system, meaning that only the vehicles themselves are physically present in public spaces. Legislation does not clearly define these new vehicles, and new business models do not fit neatly into existing methods of managing private businesses in public spaces. The transportation community has responded by producing several helpful publications on the topic of micro-mobility, bringing more clarity and understanding to this phenomenon, documenting the growth and expansion of programs in cities, and providing guidance on good practice. Nonetheless, cities and operators still find it difficult to know if their micro-mobility programs are serving the community well, and how well the elements of their programs compare to other cities around the world. We submit that what is still needed is an easier way to measure what it means to have a successful program.



This paper aims to push the discussion away from general statistics about micro-mobility and towards the identification of tangible key performance indicators (KPI) that can be measured by any city to better understand how successful they are in providing new mobility options to their communities, and where they can improve. We begin with the identification of a set of common strategic goals that we believe any city or operator would want to achieve. This paper considers the perspectives, anecdotes, experiences, and factual data from a range of stakeholders and participants in the micro-mobility community, including: cities, public transit agencies, micro-mobility operators, surveys of the general public, micro-mobility-focused data management services, as well as regional expert organizations. We then use a simple methodology to propose some potential KPIs that can be adopted by cities to gauge the sustainability of their micro-mobility programs, as well as compare themselves to other cities around the world.

The authors acknowledge that micro-mobility is a broad and poorly defined category, containing many types of vehicles and services. However, in terms of volume and relevance to cities in the late 2010s and 2020s, the two primary elements are clearly bike share and e-scooters. Even among these two, while the management of bike share services has reached an equilibrium in many cities, e-scooters are still largely misunderstood and much more difficult to manage. The number of micro-mobility trips has more than doubled since 2017 and most of the growth has come from an e-scooter market that was non-existent in 2017. Companies such as Lime and Spin that used to operate tens of thousands of shared, dockless bicycles in United States have mostly replaced their fleet with shared e-scooters (NACTO 2018). For these reasons, the reader will notice an intentional emphasis on e-scooters in this paper. Nonetheless, the effort and the outcomes herein are intended to apply to micro-mobility as a whole.

PROFILES OF CONTRIBUTORS

For this study, we invited a broad range of contributors and cities with different geography, population, implementation state of micro-mobility, availability of public transportation services, and many other characteristics to participate and share their experiences and knowledge with us.

Several of the participants represent the most intensively used programs in the world or their regions, including Hoboken's and Helsinki's ridership rates for e-scooters and bike share, respectively. In total, 15 cities are included, 6 cities in North America, 7 cities in Europe, and 2 cities in Asia-Pacific. We believe the outcome is a strong representation of the successes and challenges that cities of all sizes are experiencing, from unique legislative hurdles facing each location to the universal needs that every city shares as critical to delivering successful micro-mobility services in their communities. In addition to data from other studies and sources, we refer to the inputs gathered during municipal interviews from contributing cities in this report as "Ramboll Municipal Interviews 2019".

More details about the contributors can be found at the back of the report.

2.1 Aarhus, Denmark

336 000 inhabitants

voi.

Bycykler (city-owned), Donkey republic (private, geofenced)

Aarhus is the second largest city in Denmark. With more than 50 000 students Aarhus has the highest concentration of students compared to the number of inhabitants and is demographically the youngest city in Denmark. Aarhus was the first city in Denmark to introduce light rail in 2017. The cycling modal share is 20 %. There is a city-owned shared bike system (Bycykler) since 2004, the bikes are unlocked with a coin deposit (20 DKK). Donkey republic is a private bike-share scheme with a mobile application. Voi started e-scooter operation in Aarhus in June 2019.

2.2 Auckland, New Zealand

1 600 000 inhabitants

beam JUMP neuron Flamingo

Onzo (private and dockless), Nextbike (private, station-based)

Auckland is the largest city in New Zealand. It is positioned between two large harbors and regional parks. The city relies heavily on private cars for most trips, although there has been a more recent emphasis on transit-oriented development (TOD). The bus network was recently modernized to improve frequency and four local rail lines are in operation. The city also operates two bike-share programs and multiple e-scooter operators are present; however, in December 2019 several operators were not re-issued licenses.

2.3 Baltimore, Maryland, USA

621 000 inhabitants

JUMP Lime SPIN BOLT

Baltimore Bike Share (defunct as of 2018, city-owned)

Baltimore is a large seaport city situated close to Washington DC. The city's historic downtown includes many walkable neighborhoods and its Inner Harbor was rebuilt to better support commercial activities as well as tourism. Baltimore has an extensive bus network, light rail, and a subway. The city no longer operates a bike share program, but has an annual permit system for micro-mobility operators that was uniquely developed with community input.

https://transportation.baltimorecity.gov/bike-baltimore/dockless-vehicles

2.4 Chicago, Illinois, USA

2 700 000 inhabitants

Lime BIRD BOLT gbfs lyft JUMP S SPIN VeoRide WHEELS

Divvy (city-operated, station-based)

Chicago is the third most populous city in the United States. The city covers a very large area with a downtown core of higher density along the shoreline of Lake Michigan and sprawling, lower-density blocks emanating outwards. A strong public transit system offers alternatives to driving, and the city has experienced the common growth of residential occupancy in the downtown area over the past decade. In addition to its robust bike share service operated by the City and more than 322 km (200 miles) of on-street protected, buffered and shared bike lanes, a pilot program for e-scooters has been underway in 2019 in specific zones. This program leverages an "Emerging Business Program" to establish controls with the participating operators.

http://chicago.gov/scooters

2.5 Coral Gables, Florida, USA

50 800 inhabitants

Dockless bikes by private (above mentioned) operators

Coral Gables is located in the Miami metropolitan area of Southern Florida, not far from downtown Miami. It is comprised of historical residential blocks of mostly single-family homes, as well as an extremely walkable downtown. Several major urban arterials of the greater Miami-Dade County roadway network run through the community. Coral Gables is operating an e-scooter pilot under its Dockless Mobility Program that bundles bicycle and e-scooter services together. As of June 2019, a critical change in Florida State law allows the use of e-scooters on streets and, more importantly, within painted bike lanes.

https://www.coralgables.com/docklessmobility

2.6 Hamburg, Germany

1 800 000 inhabitants

StadtRAD, city-owned and station-based system

Hamburg is the second-largest city in Germany. It is a major port city situated along the Elbe River near the North Sea. The north shore of the Elbe is a dense, active urban center while the south shore is heavily industrial with many port-related activities and canals. Hamburg has a strong mix of public transportation options, as well as a city bike sharing program and several private e-scooter operators.

2.7 Helsinki, Finland

643 000 inhabitants

Station-based bike share system operated jointly by regional metropolitan cities

Helsinki, the capital city of Finland, is situated on the country's south coast. The densest part of the city center is built on a peninsula and on surrounding islands. Helsinki enjoys well-balanced travel metrics between walking/bicycling, public transportation, and private cars. The city has a successful shared bike system even by global metrics: 9 trips are made with each bike daily on average and 14–16 trips on peak days. While the regional transport authority organized a station-based e-scooter pilot, all other e-scooter services are operating privately.

2.8 Hoboken, New Jersey, USA

54 400 inhabitants

Hoboken is one of the most densely populated cities in the United States and enjoys perhaps the most robust mix of modal choices of any small city. Its proximity across the Hudson River from Manhattan makes it a bustling bedroom community for commuters working in New York City, but it also enjoys its own strong share of commercial and retail activity, particularly along the Hudson River waterfront and its main business corridor, Washington Street. Hoboken has one of the most complete bicycle lane networks in the United States, a mature bike share program that is integrated with several neighboring municipalities (although notably not with New York City), and has been operating a pilot program for e-scooters for six months in 2019. Hoboken's e-scooter program experienced the world's highest ridership rates per vehicle

2.9 Oakland, California, USA

420 000 inhabitants

Lime lyft BIRD gray

Bay Wheels, a Station-based and dockless bike share system operated by Lyft

Oakland is a large city located on the east coast of the San Francisco Bay and is well-integrated with the regional public transportation system. The downtown neighborhoods of Oakland are densely populated with many walkable streets. The city bike system in Oakland is a part of a system that covers all of the San Francisco Bay Area. The city has a permit program for e-scooters.

https://www.oaklandca.gov/topics/e-scooters

2.10 Oslo, Norway

673 000 inhabitants

Lime voi.

Oslo Bysykkel station-based city bike system is operated in collaboration by the city and Clear Channel

Oslo is the capital city of Norway, located on the end of Oslo Fjord inlet. The city has been on the headlines due to their plans to remove private cars from city center to encourage active transport and public transport use and in order to increase livability and attractiveness of the city. Micro-mobility also plays a role to support its car-free schemes. The city operates a bike share program and two e-scooter services operate with limited controls imposed by the city.

2.11 Pesaro, Italy

643 000 inhabitants

voi.

Mobike (private, dockless)

Pesaro is a city located on the Adriatic coast of Italy. The city is a mix of industrial areas inland and the more traditional, dense city neighborhoods with many narrow streets along the coast. Due to an extensive network of bicycle paths and continuous cycling promotion, Pesaro was dubbed a “Cycling city” by Italian environmentalist association Legambiente.

http://www.comune.pesaro.pu.it/viabilitaemobilita/micromobilita/

2.12 Stockholm, Sweden

965 000 inhabitants

voi. Lime TIER circ BIRD

The Stockholm City Bikes station-based system operated in collaboration with Clear Channel is currenlty halted due to legal proceedings.

Stockholm, the capital city of Sweden, is situated on fourteen islands within an archipelago along the Baltic Sea. It was one of the first cities to implement congestion pricing on cars and enjoys a robust public transport and bicycle network. The City is aiming beyond the goals of minimizing deaths and injuries in traffic - the so-called “Vision Zero” program created in Sweden over 20 years ago – by measuring infrastructure performance in terms of community health benefits, encouraging more people to walk and cycle. The city operates a bike share program and several e-scooter services operate with limited controls imposed by the city.

2.13 Tampere, Finland

232 000 inhabitants

TIER voi.

There is a limited private dockless bike share system (Easybike), the city is planning for a proper bike share system.

Tampere is the second largest urban area in Finland outside the capital metropolitan area. Its city center is squeezed on an isthmus between two large lakes. There is no full-scale city bike system yet. The first phase of light rail system is expected to be finished in 2021. City has guidelines for e-scooter operators but otherwise the e-scooter operators are free to run business in the city.

2.14 Vancouver, Canada

631 000 inhabitants (city)

Provincial regulations do not permit the use of e-scooters on public roads.

Vancouver has a bikeshare system povided by Mobi.

Vancouver is the eighth most populous (third largest metropolitan area) and most densely populated city in Canada. It is a seaport city situated along the eastern shore of the Strait of Georgia, tightly connected to the over twenty other municipalities of the metropolitan region. The city enjoys an exceptional public transportation network with very high ridership, including the continent's second-largest trolleybus fleet. The region's public transportation agency, TransLink, has been developing recommendations for a regional micro-mobility program and participated in our study via telephone interview.

2.15 Yokosuka, Japan

410 000 inhabitants

None

None

Yokosuka is medium-sized Japanese city and is part of Greater Tokyo Area, situated on a peninsula to the south of Kawasaki and Yokohama. The city is spread across a large, hilly area with pockets of denser neighborhoods connected by roads and several rail lines, as well as a dense bus network. Walking and bicycle ridership in Yokosuka is high and the city offers many cycling routes; however, the city has not initiated a micro-mobility program and use of electric bicycles and scooters are heavily restricted by state and local laws.

2.16 Lime

Lime is a transportation company based in the United States. The company runs e-scooter, e-bike, pedal bike and car sharing systems in more than 120 cities across more than 30 countries. Lime has operated e-scooter services in several American and European cities including in Hoboken, New Jersey during the six-month pilot in 2019 that was evaluated in this report.

2.17 Voi

Voi is the first European e-scooter company based in Sweden. The company operates e-scooters in about 40 cities in 10 European countries. Voi is operating e-scooter services in several European cities interviewed in this report and contributed to our evaluation of the private operator's perspective

2.18 NACTO

The National Association of City Transportation Officials (NACTO) ís an association of 81 major North American cities and transit agencies formed to exchange transportation ideas, insights, and practices and cooperatively approach national transportation issues. NACTO has recently produced several critical publications related to micro-mobility in recent years and contributed to our research via telephone interview

2.19 POLIS

Polis is the leading network of European cities and regions working together to develop innovative technologies and policies for local transport. POLIS has also produced several critical publications related to micro-mobility in recent years and contributed to our research via telephone interview.

2.20 Ride Report

Ride Report works with cities at every stage of their micromobility program, from policy definition and pre-permitting to operator insights to pilot to permanent rollout. Ride Report operates at the intersection of cities and operators to help cities overcome differences in priorities, processes, and terminology and forge collaborative relationships based on shared facts. With a single source of truth for managing micromobility, cities can anticipate challenges and get out of reactive mode to better serve their constituents

2.21 Populus

Populus helps cities securely and effectively access mobility operator data to monitor mobility pilots and make informed planning and policy choices. Populus' advanced analytics software integrates live data feeds from multiple operators in a user-friendly platform to help cities monitor shared mobility services, including bikes, scooters, and vehicles

2.22 Involved

Involved is a survey tool that integrates with existing contact databases and social media to support government officials in engaging more constituents. Our single-click surveys simplify participation while verifying voters, categorizing comments and providing a heat map of respondents by demographic data. Founded in 2017 by Boston University alumni, Involved aims to help voices be heard by improving how we communicate

UNIVERSAL STRATEGIC GOALS

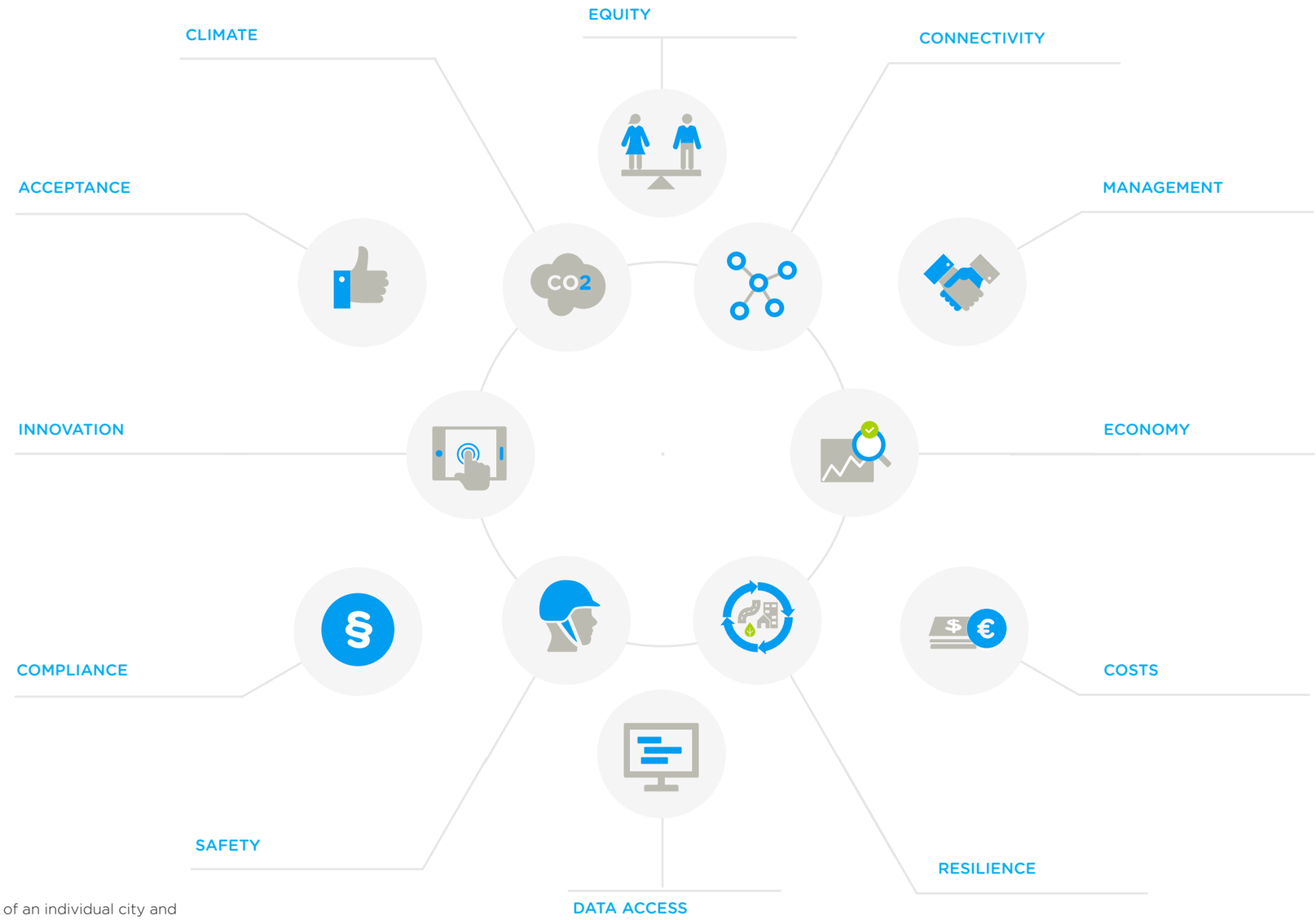
Every city is unique. The people, the cultures, the urban form, the institutional organization, topography and even the weather impact the way in which transportation services function. While every conversation about micro-mobility is shaped by the influences of the local context, our team has approached this project with the premise that we could nonetheless identify common themes that weigh on the minds of the people in any city. These themes are essentially the elements that contribute to providing local communities the best possible, successful micro-mobility program; or, to use a term that allows us to understand success with respect to the environment, economy, and social well-being, sustainable.

Building upon the idea of common themes for a sustainable micro-mobility program, we argue that it is possible to derive a set of strategic goals that tend to be universally applicable. In other words, regardless of the local context, there are a set of universal strategic goals that every city can agree are important to realize a sustainable micro-mobility program.

In our collaboration with cities and operators experiencing micro-mobility first-hand, as well as other authorities and stakeholders closely connected to the management of micro-mobility programs, we have derived the following twelve universal strategic goals, shown on the opposing page. The goals were established to allow our discussions to focus on specific metrics that would be useful in better gauging the success of local micro-mobility programs.

In this section, we aim to build upon the universal strategic goals previously identified by extracting the characteristics in our surveyed cities that support each goal and, hopefully, providing initial suggestions for suitable key performance indicators (KPIs) that can be used to gauge the progress of an individual city and to allow a basis for comparisons across cities.

Benchmarking is an extremely important next step to improving the success of micro-mobility programs in cities. In the recently published “Guidelines for Regulating Shared Micro-mobility”, NACTO states that “Cities can also gain additional insights by coordinating their survey questions with those asked in other cities to benchmark their results and generate a clearer picture of shared micro-mobility use.” If we can not only coordinate the collection of data between cities, but identify the most useful data points to collect, all stakeholders will benefit from getting the best understanding of how well these programs are performing.



3.1

CONNECTIVITY

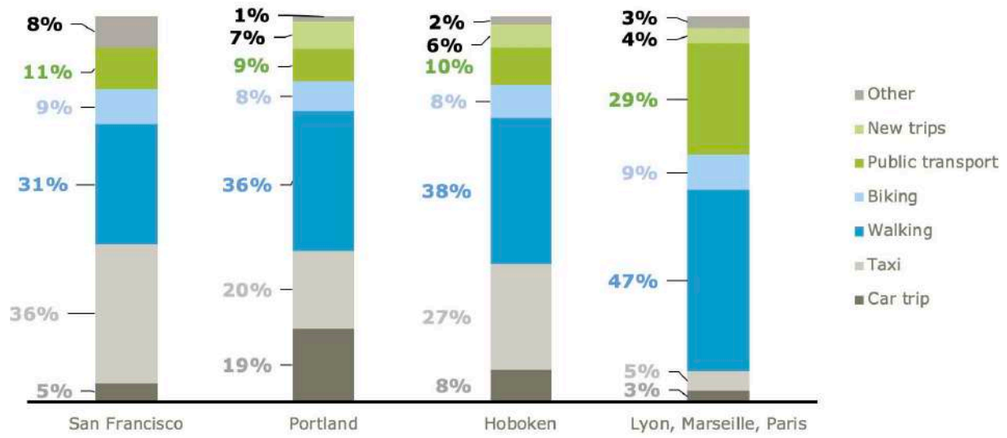
Cities want to reduce the negative effects of congestion. At the same time, there is a strong desire to make it easier to get from one place to another as conveniently as possible. Micro-mobility should make it easier for people to move around town on short trips, ideally reducing vehicle congestion and parking demand.

Surveys from North America - where car use is significantly higher compared to other places, as can be seen by the survey results from French cities - show that 5–19 % of e-scooter trips would have been private car trips and 20–36 % ride-hail car trips. According to Lime, the share of trips that would have been car trips if e-scooters were not available varies greatly from 10 % in Paris to 50 % in Santa Monica (Lime 2019). In general, e-scooters seem to have some potential to reduce short car trips in city centres; however, the congestion reduction effect is more noticeable in places where car ownership is higher, and ride-hailing is more common.

Of greater concern to cities viewing these data is that 31–47% of e-scooter trips would have been walking trips. This can be viewed as a negative effect when it comes to health impacts, but it could also be viewed positively in terms of connectivity and equity, depending on factors such as the distance of these trips. Perhaps what's missing is a clarification on whether the trips replaced are short distance trips (e.g. less than 0.6 miles or 1 kilometre) or longer distance trips that would otherwise increase travel time and discourage connectivity to public transportation.

Proposed KPIs to measure connectivity:

- Share of micro-mobility trips that would otherwise be a car trip
- Share of micro-mobility trips greater than 1 km that would otherwise be a walking trip.
- Share of micro-mobility trips combined with public transport
- Share of users who say that micro-mobility "makes it easier to get around town".

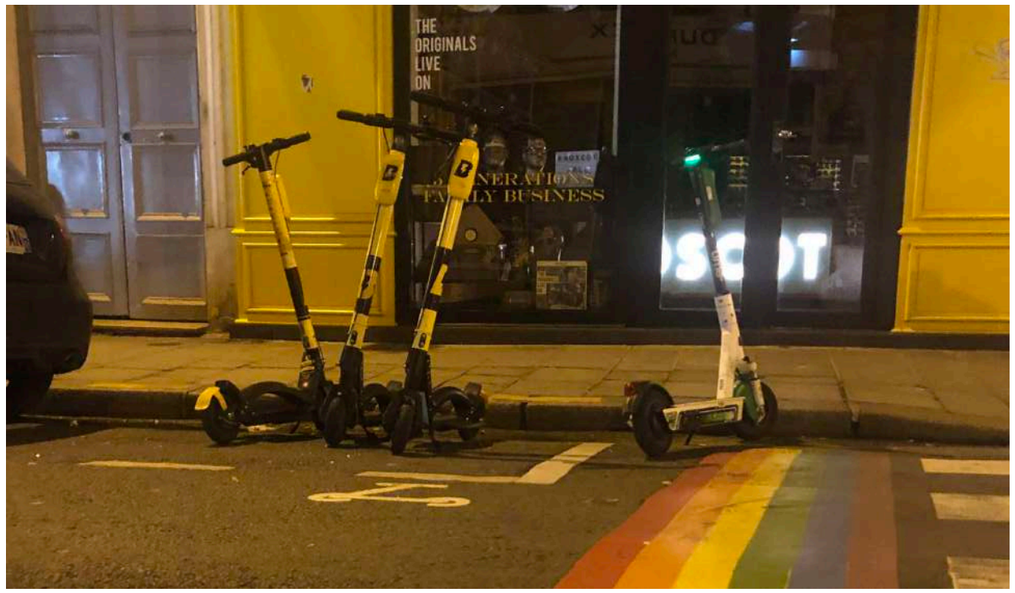


2. Modal shift from different transport modes to e-scooters in nome North American and French cities (SFMTA 2019, PBOT 2019, Hoboken survey 2019, Agora 2019). In San Francisco "Other" mode includes new trips.

> **"The scooters have made my commute far easier and more convenient. It cuts a trip to the path that normally required a 30-minute walk or an Uber ride to a quick, convenient, 5-minute scoot."**
>
> **- Respondent to Hoboken e-scooter survey**

> **Being in charge of urban space is the major city tool they can use.**
>
> **Karen Vancluysen, POLIS**

The balanced use of public space in the city is a major concern raised by many of the municipalities during our interviews. Fewer cars driving in the city centre also means reduced parking demand, specifically, reduced demand for street and curb space. Rather than crowding already stressed sidewalk areas with bicycle and e-scooter parking, reclaimed curb side space anticipated due to reduced car parking demand should continue to be used for vehicle-to-walking transitionary activities, such as parking of micro-mobility vehicles. When done in an organized manner this can also support other goals.



Block Corners May Solve Many Micro-Mobility Concerns

In conversations with many cities, a primary concern with micro-mobility is riding and parking on sidewalks. Karen Vancluysen, Secretary General of the POLIS Network, argues that this concern can be viewed more abstractly as management of public space. Micro-mobility vehicles, after all, are vehicles that require travel lanes and parking. Since micro-mobility vehicles are shown to reduce private car and taxi trips, reallocation of existing street space for these purposes is a justifiable policy.

One new concept being tested in European and North American cities, such as Baltimore, is to leverage block corners as micro-mobility hubs. The idea is to make the last parking space or - depending on the language of local laws - the curb side “no parking” area in front of crosswalks and stop signs as the transition between riding and walking. This simultaneously clarifies a city’s policy on and removes riding and parking of micro-mobility vehicles from sidewalks, and it better integrates walking shorter distances with the use of micro-mobility vehicles. These locations could also be combined with e-mobility charging infrastructure (micro-mobility charging adjacent to EV charging) to reduce the carbon footprint of program management.

> **Our goal is to reduce the number of cars in the city […]. There is not enough room for everyone to circulate at the moment.**
>
> **Pekka Stenman, City of Tampere**

3.2

CLIMATE

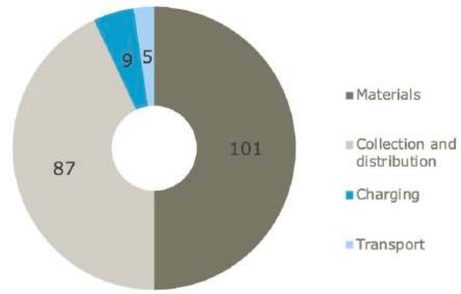
Micro-mobility should support the city's efforts to reduce transport's impacts on climate change, both in terms of minimizing the use of fossil fuels and reducing the lifecycle carbon footprint of the individual vehicles.

All cities interviewed put a focus on reducing the number of cars in the city and lowering CO2 emissions as well as fine particulate emissions. At the same time, cities such as Vancouver mentioned during interviews that shifting from walking short distances to using micro-mobility is undesirable.

It is generally assumed that the carbon footprint of micro-mobility vehicles is lower than that of larger, motorized vehicle, and significantly so for those powered by fossil-fuels. In other words, the average motorized vehicle trip is assumed to generate more CO2 than a micro-mobility one. However, in the case of e-scooters, this basic assumption becomes more complicated when we consider the life-cycle emissions of current fleets, and there is currently not enough data to thoroughly evaluate the carbon footprint of a micro-mobility vehicle. To clarify this process and allow for benchmarking, a standardized methodology of calculating this should be established and universally adopted.

Proposed KPIs to measure climate:

- Share of micro-mobility trips that would otherwise be a fossil fuel car trip
- Share of micro-mobility trips less than 1 km (.6 miles) that would otherwise be a walking trip
- Lifecycle carbon footprint of micro-mobility vehicle
- Share of users who say micro-mobility "facilitated access to public transport" versus "replaced a public transport trip".
- Trip purpose of "new" micro-mobility trips



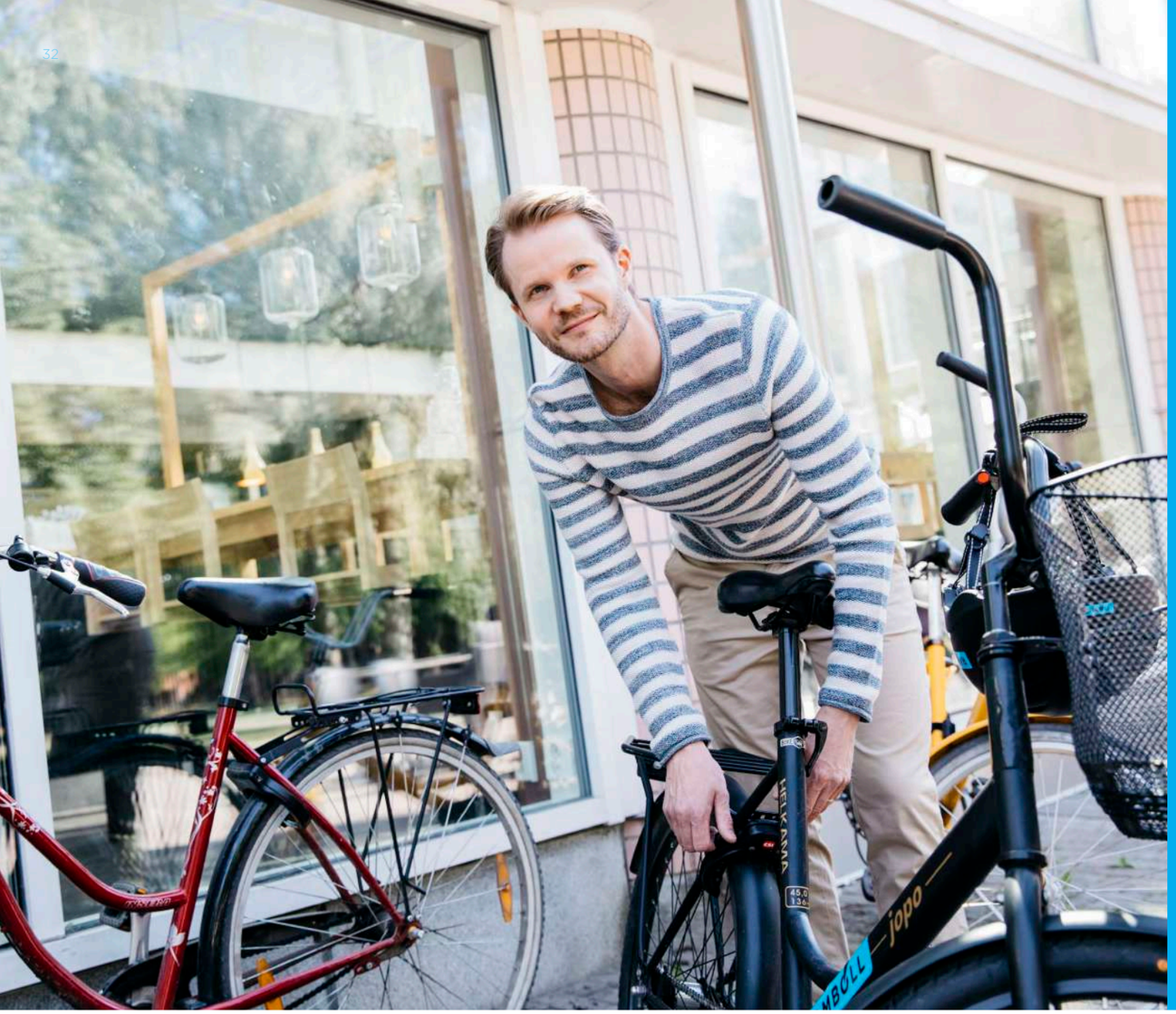
3. E-scooter environmental impact by passenger mile. Numbers are grams of CO_2 (Hollingswoth 2019)

The picture of micro-mobility competing with walking and public transport is also unclear. Better monitoring of short distance trips replaced by micro-mobility is needed. A study recently conducted in San Francisco (SFMTA 2019) suggests that while e-scooters may replace some public transport trips, they are also used to get to public transport stations and therefore encourage more people to use public transport. In that study, e-scooters induced more public transport trips than they replaced. It is therefore suggested that cities collect data that allows for a clearer comparison of replaced versus connected public transport trips.

Finally, some concerns were raised about entirely new trips, especially those that have no connectivity benefit or economic impact (e.g. recreational rides). If "new" trips result in more time outdoors or better connect residents and visitors to local businesses, the benefits to society may outweigh the costs; however, this remains to be seen thorough better measurement.

According to our interviews, most cities have few if any sustainability requirements for operators. Operators have only agreed to general guidelines to be responsible and sustainable.

> **E-scooter retrieval, rebalancing and maintenance by diesel vehicles can account about 43 % of e-scooter life cycle emissions.**
>
> **Hollingsworth 2019**



2 cities only asked for sustainability information from operators

3 cities required suppliers to comply with sustainability guidelines

1 city has specific requirements for waste disposal (e.g. batteries)

1 city requires R&D on batteries life-cycle and recycling

1 city requires strategic distribution of vehicles to maximise utilization

4 cities do not take any specific sustainability actions

4. What measures is your city taking with respect to sustainability? (source: Ramboll Municipal Interviews 2019)

If a city is able to cooperate or regulate micro-mobility companies, it can request or require data on vehicle life cycle and push for improvements to sustainability-connected operations and life-cycle characteristics.

Tracking the extent to which micro-mobility vehicles are considered "disposable" is also a critical metric related to climate impacts. Reportedly, more than 1700 e-scooters went missing and nearly 400 e-scooters were damaged beyond repair in half a year in San Francisco. More proactive cities are already pushing for improved lifecycle features of vehicles, improving the ability to protect, repair, and upgrade existing fleet hardware. While major changes to vehicle design are not quickly achievable, many quick-fixes are possible. The number of missing scooters declines with "lock-to" policies (SFMTA 2019) and can be done as a retrofit. In Istanbul, a small, bolt-on cable lock and alarm is integrated with trip-end procedures in the app, including a photo showing the vehicle locked.

Operational travel emissions (by diesel vans and trucks), which account for about 43 % of e-scooter life cycle emissions, can be reduced noticeably by encouraging swappable batteries and performing maintenance runs on small electric vehicles like cargo bikes (Agora 2019). For example, Lime in Paris states that they have a fleet of cargo bikes for field maintenance and retrieval to reduce emissions. Lime is also experimenting with local shop owners who are paid a small fee to collect and charge nearby e-scooters overnight.

These actions can be clearly communicated to the community when cities track the life-cycle carbon footprint of vehicles.

7%

of users in Portland said they would not have made their last trip if the service was not available.

3.3

MANAGEMENT

Public administration is about regulating public life and, critically, space and making sure that both are being used for the benefit of the citizens. In terms of micro-mobility, this means that programs should be effectively managed with a suitable business model that enables public agencies and private operators to efficiently share the responsibilities of providing high-quality services to the community.

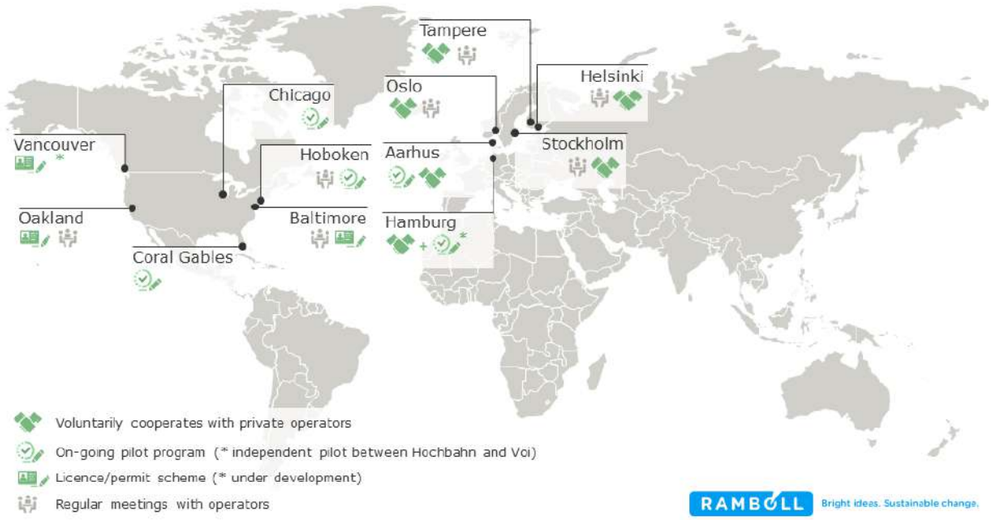
According to NACTO, half of the 84 million micro-mobility trips in United States in 2018 were made with e-scooters while the other half was made with station-based share bicycles. At the same time, dockless bicycles have all but disappeared. Remarkably in 2017 the e-scooter share of micro-mobility trips was practically zero (NACTO 2019). Preparing for this kind of strong disruptions in mobility is a major challenge for city management and requires operational models that are not vehicle-specific.

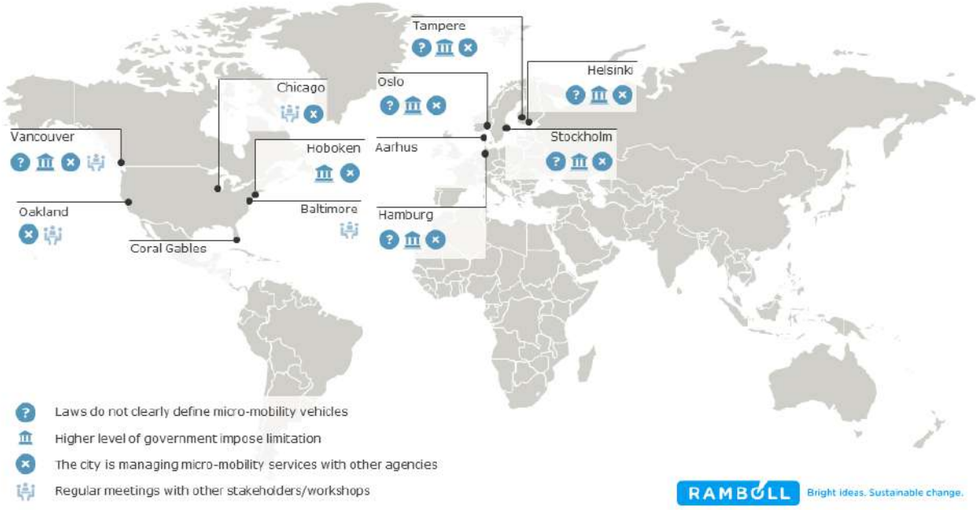
Two distinct management approaches stood out from municipal interviews.

Nordic cities, including Helsinki, Oslo, Stockholm, and Tampere, have embraced e-scooter companies on a basis of voluntary coop-

Proposed KPIs to measure management:

- Which model is used to manage micro-mobility (voluntary cooperation, pilot program, permitting/licensing scheme)?
- Effectiveness of the mechanisms used to manage micro-mobility
- Number of city staff assigned to the micro-mobility program per ride





1 or less

Full time employee engaged in managing micro-mobility in most of the municipalities we interviewed

eration in which an unlimited number of companies are engaged in regular dialogue to respect general guidelines. State and local laws limiting city controls necessitate this softer approach. One exception to this is Aarhus, Denmark, which has managed to establish stronger regulatory controls.

In North America, various pilot programs and permitting or licencing schemes are the norm, with stricter, more specific requirements for e-scooter companies and revenue-sharing schemes in place. Each model has its pros and cons; however, we submit that the importance of open dialogue and a shared understanding between communities, cities, and micro-mobility companies dramatically improves the overall service, regardless of geography. While the amount of regulation is clearly a function of the age and scale of micro-mobility operations in a particular city, the earlier engagement occurs, the better the outcome.

Pilots appear to be a useful way to experiment with program elements, but they should be agile, and adaptive. In San Francisco regulation and permit system clearly decreased the number of e-scooter related complaints.

Cooperation and further management require staff. Cities should ensure there is adequate staff managing micro-mobility.

- Requirement of equitable distribution or maximum density of vehicles
- Limit to the number of companies or vehicles operating
- Restrictions on placement or parking of vehicles
- Restrictions on access or speeds

- Revenue-sharing scheme to offset the costs of management
- Escrow terms to cover costs born by city for non-compliance
- Fine to providers
- Termination of operation or removal of vehicles

- Workshops and discussions

6. Examples of management mechanisms used in cities we have interviewed (Ramboll Municipal Interviews 2019)

3.4

COSTS

Micro-mobility should be made available to the community in such a way that all costs are understood and transparent to the public, and that these costs are fairly shared between the public and private stakeholders.

Most of the interviewed cities do not track the exact costs of micro-mobility, except for some cities that have budgeted micro-mobility programs.

Typically, micro-mobility related costs are paid from transport authority or infrastructure budgets. When they are calculated, costs could include parameters listed below.

To cover their costs, some municipalities require suppliers to pay fees per ride, or per vehicles. In Portland for instance, e-scooter companies must get operating permits. The permit required the companies to share data and cooperate with the city.

Companies also had to pay permit fees and per-ride surcharges ($ 0.25). The fees and surcharges were used to partly cover program design, administration and evaluation and to provide educational material for citizens.

The Portland pilot cost about $ 287 300 while the collected fees were about $ 212 100. The remaining balance was $ -75 200. Considering that there were 700 000 trips, each e-scooter trip ended up costing the city about $ 0.11. (PBOT 2019)

A well-planned permit system can be a good mechanism to manage the e-scooters in the city. Permit fees can be used to cover some costs the e-scooters bring about. However, too high fees might limit the number of potential operators and increase ride costs to customers, decreasing equity.

Hoboken announced a per-ride fee as part of its efforts to recoup management, enforcement, and infrastructure costs. Baltimore calculated its anticipated costs and applied a combined fee that included an annual payment as well as per-ride charges.

Proposed KPIs to measure costs:

- Elements that are considered in the overall program costs to the city
- Cost of the program to the city per ride
- Cost per ride for operators
- Pricing structure

Infrastructure
Riding & parking
Striping & signage

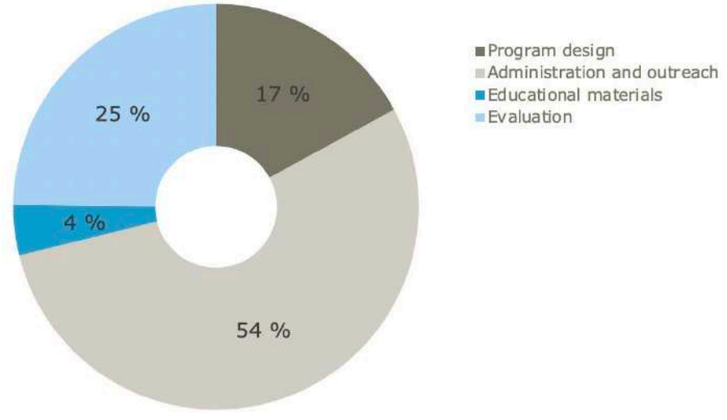
Management staff time
Public works staff time
Police enforcement cost

Communication
Training and education
Workshops

7. Most recurrent elements included in cost calculations (Ramboll Municipal Interviews 2019)

6 out of 11

municipalities we interviewed haven't calculated the cost of the program for their municipality



8. Example of Estimated Micro-mobility Pilot Program Municipality Expenses (PBOT 2019)

3.5

ACCEPTANCE

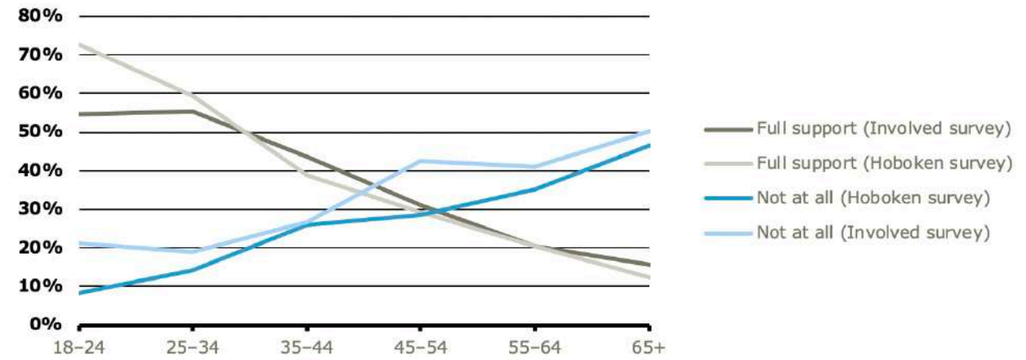
Micro-mobility should be generally accepted by the community at large as a beneficial service, even amongst members of the community who don't use or directly benefit from the system.

Listening to all - not just the loudest voices - is critical to evaluating overall acceptance. Acceptance should not be confused with first impressions. As with the introduction of just about any new concept, there will always be objections and concerns for doing things different; the challenge to communities is to differentiate between initial reactions and understanding whether there is a longer-term benefit of a new idea to the community.

As is often the case, perception is different from reality. In many cities (and for many subjects), negative feedback from a small group drowns out the generally positive opinions of residents who see the value of micro-mobility. False signals can be verified with general acceptance metrics collected from the general public, both users and non-users.

Acceptance of micro-mobility is strongly associated with demographic differences. A survey in San Francisco confirms that e-scooters are more typically ridden by young adults (see equity section). According to a survey conducted by Involved in Hoboken for a sub-set of the community, young people also tend to support e-scooters more than old people. This suggests that cities should work especially hard to understand and address the concerns of elderly residents as well as other demographic subsets that can be distilled from survey data, and target improvements that can alleviate fears and hesitations.

Age is inversely related to e-scooter support in Hoboken

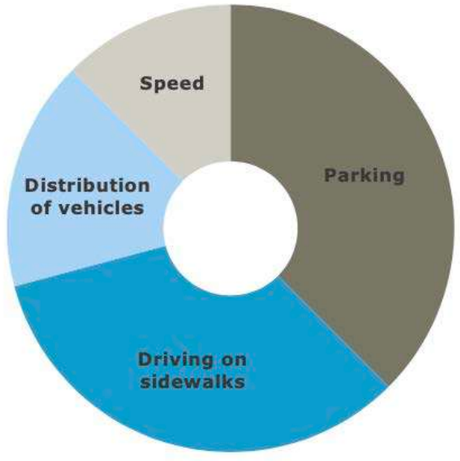


9. Age vs. e-scooter support in Hoboken (reproduced from surveys by the City of Hoboken and Involved)

Proposed KPIs to measure acceptance:

- Value of the system to the community
- Importance of specific infrastructure elements or policies to improve acceptance
- Clarifications between users and non-users

> **"It's a question of people getting used to new vehicles operating in the city.**
>
> **Pekka Stenman, City of Tampere**



10. Greatest Concerns about micro-mobility vehicles Heard by Municipalities (Ramboll Municipal Interviews 2019)

Municipal interviews revealed major concerns expressed from the general public are about e-scooter parking and riding on sidewalks. The same concerns were raised in reports from Portland and San Francisco (PBOT 2019, SFMTA 2019).

Other mentioned concerns were uneven or inequitable distribution of vehicles and too fast speed of vehicles.

Knowledge of key concerns by asking the right questions empowers cities to make corrections. In Coral Gables, the city strengthened acceptance by ensuring vehicles were placed in areas where they would get the most use.

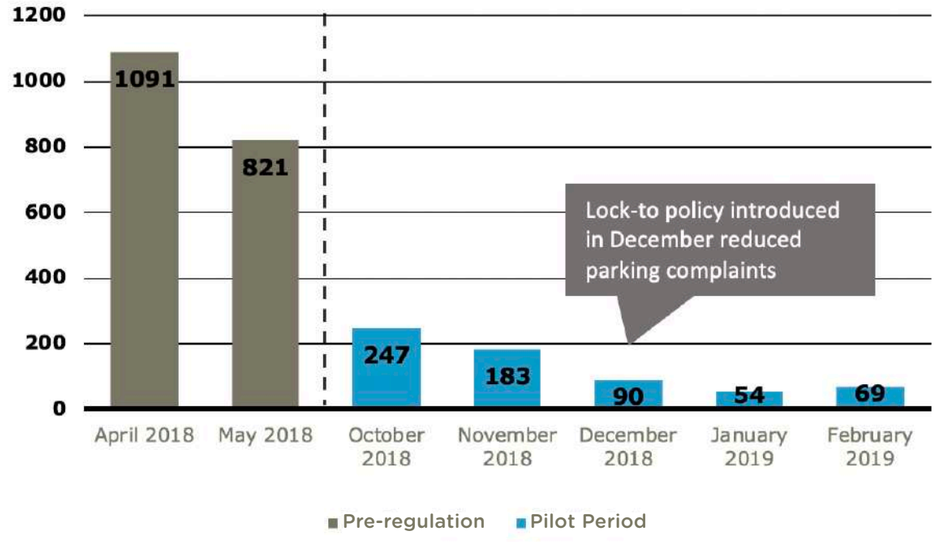
Interestingly, all cities except for Aarhus stated that driving e-scooters on sidewalks is a concern. Indeed, the municipality received just a couple of complaints in the program's first six months.

In Danish cities, where people are more accustomed to cycling and suitable infrastructure already exists, fewer conflicts occur.

Aarhus was also an outlier what comes to parking issues. Only Aarhus and Chicago required e-scooter operators to collect all scooters from the streets each night and redistribute them each morning. This not only helps to keep e-scooter parking in order but reportedly also decreases drunk driving.

Cities like Oakland and Baltimore have adopted inclusive, proactive start-up approaches by organizing public meetings before establishing the permit rules for future operators. These cities have experienced higher levels of acceptance and positive feedback from the community.

> **Parking of scooters has a major impact on people's acceptance.**
>
> **Pekka Stenman, City of Tampere**



11. Complaints about e-scooters before/after addressing main concerns (reproduced from SFMTA 2019)

5 out of 12

Cities received a general feedback rather positive. Negative voices are usually louder

> **The city has to take the opinions of both users and non-users into account.**
>
> **Rune Gjøs, City of Oslo**

3.6

SAFETY

Micro-mobility should contribute to the city's overall safety goals by reducing the overall number of motor-vehicle injuries and fatalities.

Due to the lower speeds and overall mass of micro-mobility vehicles, shifts from cars and taxis to these smaller vehicles can be expected to reduce the severity of crashes and hence, improve overall safety statistics.

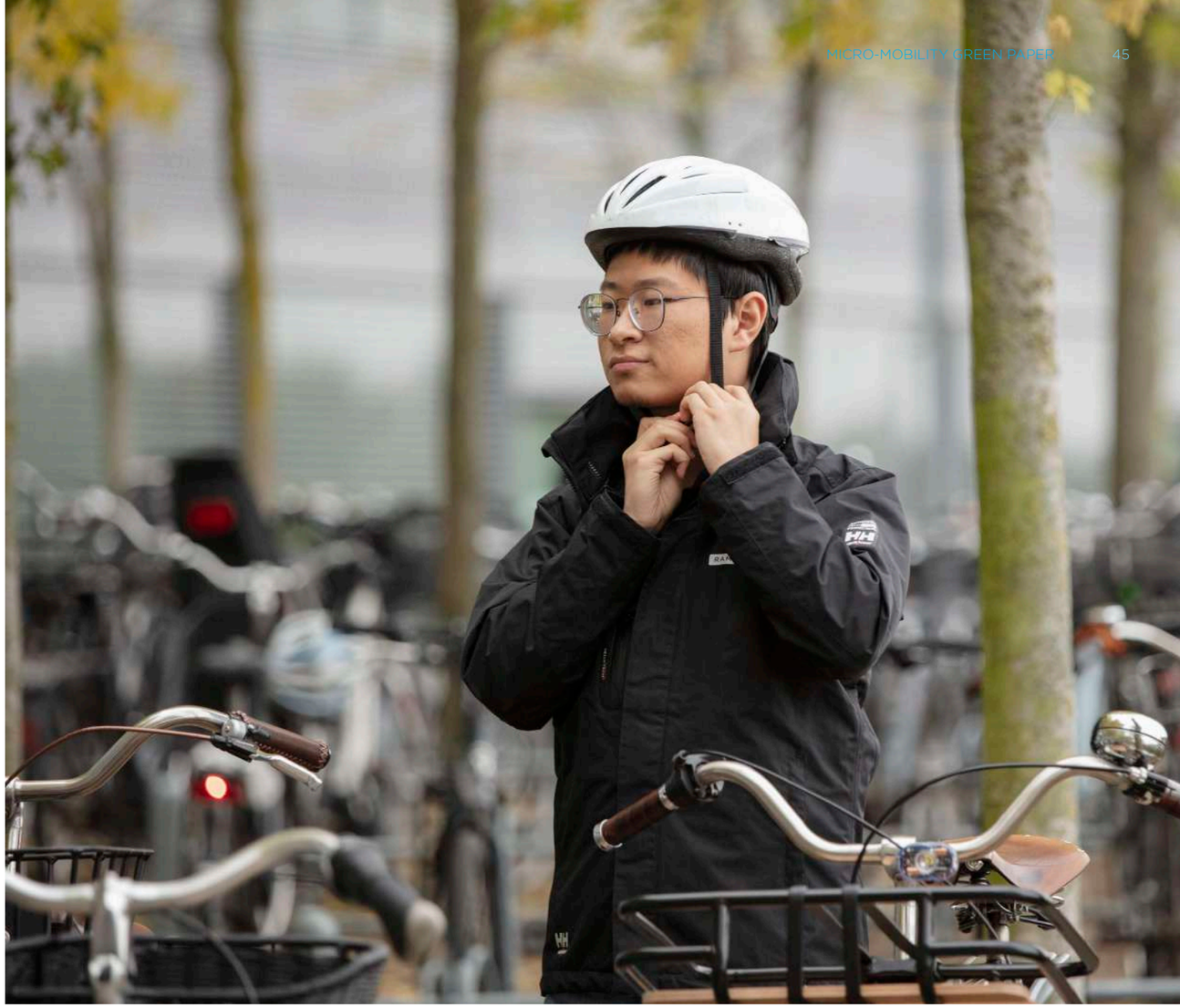
A report from Portland reasons that since e-scooters have reduced the total distances travelled by cars, there could be a decrease in serious injuries and fatalities (PBOT 2019). E-scooters are seen to have the potential to contribute to safer streets: if they reduce car trips, there are fewer car crashes which tend to be more serious than e-scooter accidents.

However, categorical increases in micro-mobility trips will result inescapably result in alarming increases in crashes and injuries when the data is viewed in a vacuum. For this reason, cities should aim to compare micro-mobility crash data to overall motor vehicle crashes (e.g. as a percent of total crashes/injuries) to provide the public with a more complete perspective on what is happening.

Establishing riding profiles makes it possible to identify causes of the highest injuries and collisions. For example, most of the accidents reported in Stockholm occurred late at night and with younger riders. Similar data are seen in many other cities, suggesting that tracking of these variables in safety data is critical to getting a good understanding of what elements result in the most dangerous uses of micro-mobility vehicles.

According to data from the Los Angeles area and Portland, the majority of e-scooter related injuries were due to falling off or colliding with a static object. About 10 % of the accidents involved another vehicle and less than 10 % involved a pedestrian (PBOT 2019, Trivedi 2019). Improved transport infrastructure that follows the principles of Vision Zero could help to prevent such accidents; however, according to municipal interviews, cities are concentrating mostly on soft methods like rider training and outreach as well as fine-tuning laws and rules. Implementation of harder methods such as investing in better infrastructure is still lacking.

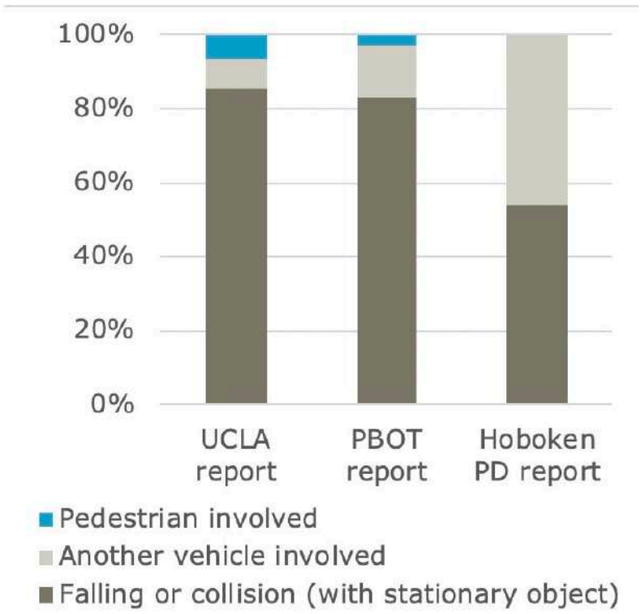
Karen Vancluysen from POLIS takes this argument one step further. She suggests that the safety issue is closely related to how public space – including streets - is managed between different modes. When priority in busy downtown areas is given to larger, faster vehicles, the outcomes should not be a surprise.



Proposed KPIs to measure safety:

- What safety training is advertised/offered?
- Reported injuries per total rides per year
- Micro-mobility crashes as a percent of all motor-vehicle crashes
- Riding profiles/safety elements that led to crashes/injuries

> **Improving safety implies reallocating space.**
>
> **Karen Vancluysen, Secretary General, POLIS Network**



12. Most e-scooter crashes occur without another party (PBOT 2019, Hoboken PD 2019, Trivedi 2019)

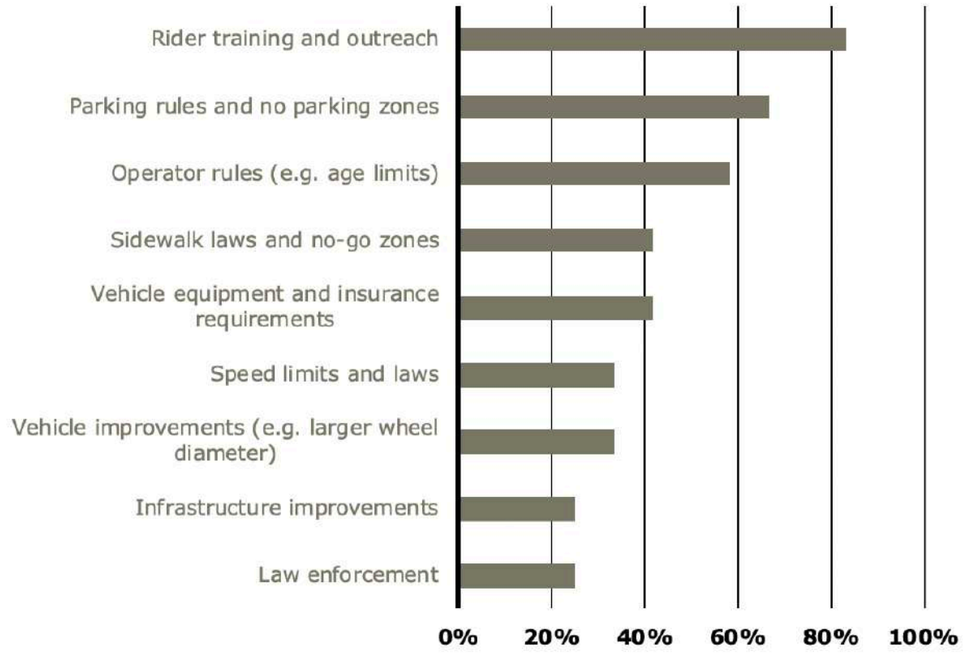
Policies for balanced use of public spaces are easily supported with safety arguments, especially when supported by data. In Oslo, the municipality intends to reduce the traffic speed limit to 20 mph (30 km/h) in the whole city center. This measure aims first at improving pedestrian safety; however, micro-mobility users will also benefit from the changes.

E-scooter crash data is understandably not easy to collect. To get a consistent picture of e-scooter safety, hospitals and police should be asked to report e-scooter crashes/injuries as their own transport mode, separate from bicycle and pedestrian data. To get comparable numbers, cities also need to collect data on travelled distance for each transport mode, and work with operators to solicit crash reports from customers. Some cities we interviewed meet with operators to discuss safety issues and potential improvements on a regular basis.

E-scooter safety is also a function of the vehicle characteristics. People usually practice the skill of riding a bicycle in areas without traffic before riding in traffic. But when it comes to e-scooters, people immediately use a 15 mph (20 km/h) vehicle without any training.

In Denmark, riders are required to signal with their hands (left, right and stop) as on a bicycle, but doing that is not easy on a scooter with very small wheels, a very different center of balance than a bicycle, and quick acceleration.

There is a need to discuss whether changes in policies and infrastructure are needed to provide safe conditions for e-scooter riders as well as other users. To address the lack of familiarity with e-scooters, Hoboken created two safety videos targeting rider safety and rules which are linked to social media and available on the City's micro-mobility web page.



13. Percent of interviewed cities (N=12) where safety elements or policies are in place (Ramboll Municipal Interview 2019)

3.7

COMPLIANCE

Micro-mobility users and operators should comply with local laws and avoid becoming a nuisance to the general public. Improving compliance reduces the potential for collisions and injuries and serves as a proactive measure for increasing overall public acceptance.

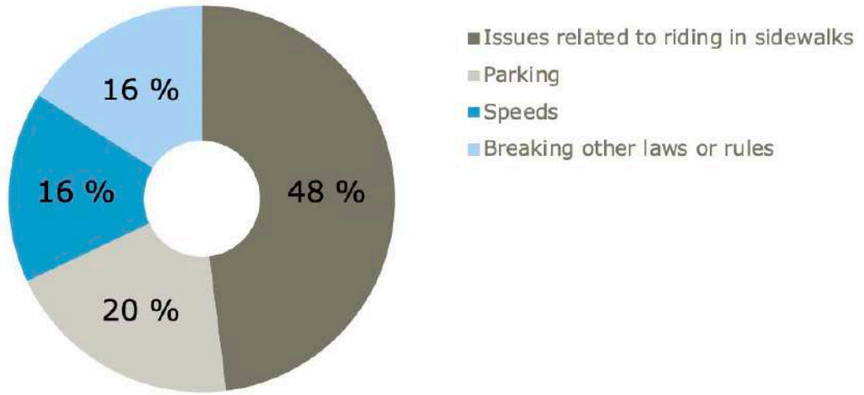
When municipalities were asked which concerns were most often raised by communities regarding e-scooters, the most frequent response was related to riding and parking on sidewalks, e.g. proximity to pedestrians. Excessive e-scooter speeds and improper parking were also noted. Other things that were seen unfavourable were underage driving, drunk driving and general disregard of traffic rules.

Community feedback about compliance is also important. With basic information about which elements of micro-mobility are of greatest concern, cities and operators can more effectively address the biggest offenders. Hoboken's public survey revealed the usual suspects for compliance concerns. "Spot Checks" can also be solicited using "one-click" questions to communities more regularly and scouring the open comments for key words, as done by Involved for a sub-set of Hoboken residents. Cities have varying measures to improve compliance. Softer measures include training programs and community outreach events. Most cities require operators to inform customers about rules through their apps.

Proposed KPIs to measure compliance:

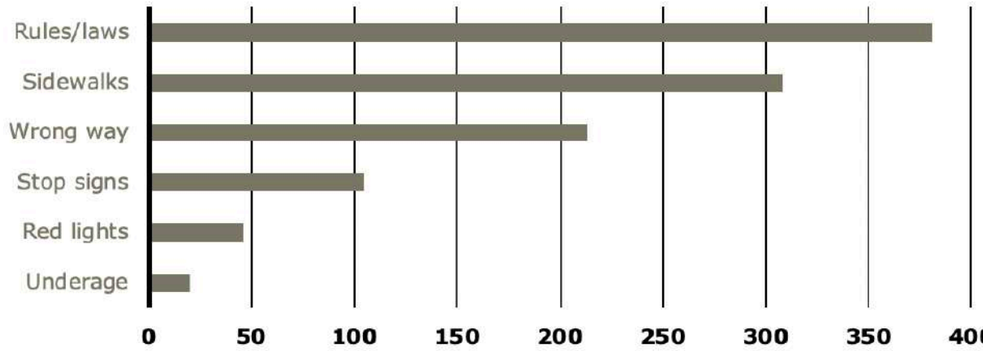
- Degree of rider compliance with local regulation
- Citations issued to users for non-compliance/total rides
- Types of compliance concerns noted by the public
- Initiatives to improve compliance
- Policies and fines used to improve compliance

Primary concerns regarding non-compliance raised by communities in 11 cities



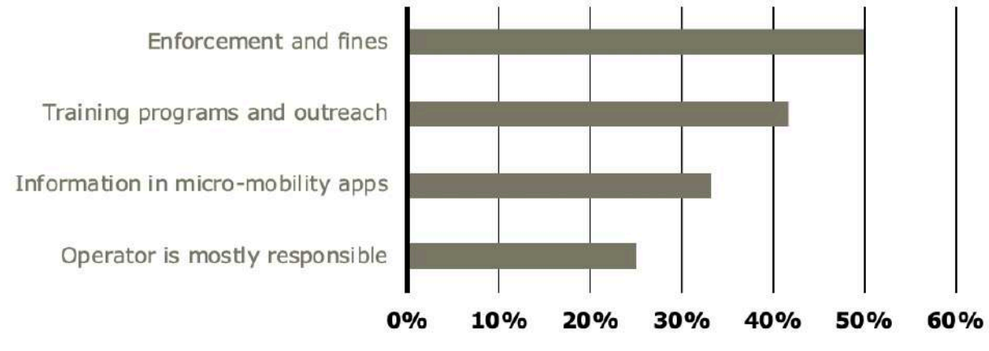
14. Non-compliance issues raised in communities in different cities (Ramboll Municipal Interview 2019)

Most common compliance concerns raised by the public



15. Number of comments mentioning different types of rule violations (Involved 2019)

How cities improve compliance



16. Compliance-improving measures in different cities (Ramboll Municipal Interview 2019)

Some municipalities are running information and education campaigns on their own, through their website and social media. Hoboken offers videos and pamphlets. TransLink in Vancouver has developed parking guidance materials.

In the cities where the operators cooperate voluntarily with the city (as opposed to licence or permit requirements), public perception forces companies to look after rider compliance: if riders do not behave, the general public sees e-scooters in a m ore negative way and the company might lose customers in the city.

According to municipal interviews, about half of the cities are cooperating with law enforcement to improve compliance and some have a fine system for users in place. In Helsinki, a special bicycle-based police group was established to enforce rules on bicycles and e-scooters. Hoboken has deployed two Code Enforcement Officers specifically for micro-mobility concerns.

While not strictly improving rider compliance, some Nordic and Northern American cities have staff who remove and impound improperly parked vehicles. In Stockholm, the municipality charges the operator with a fine for each vehicle that is removed using city resources.

Parking compliance concerns can be dealt with using several systems. San Francisco's "lock-to" requirements have dramatically improved parking concerns. In Aarhus, e-scooters are collected nightly and redistributed in the morning. This ensures the e-scooters don't clutter the sidewalks overnight. During the day, users are encouraged to park the vehicles in geofenced hubs, spread around the city. Users still have the possibility to park outside of the hubs, in which case they will be charged with an extra fee.

San Francisco has a requirement to get an operating permit and operators have to have a lock or tethering mechanism installed on their fleet so that scooters can be locked to a fixed object when not in use. This seems to be a very practical way to reduce inappropriate parking and blocking pedestrian paths. (SFMTA 2019)

3.8

DATA ACCESS

Micro-mobility activity data should be publicly available so that entities responsible for safe, efficient mobility can effectively gauge and manage the impacts of these services to the overall transportation network.

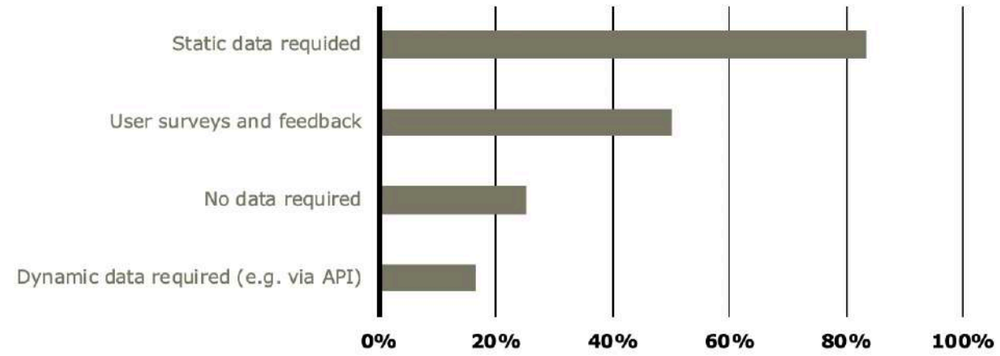
According to municipal interviews, most cities have some kind of requirement or agreements with micro-mobility companies to share data. However, cities typically only have access to static data in the form of reports provided by operators. About half of cities conduct surveys or require operators to do so. And only a handful have more advanced access to operations data. In Hoboken, for example, operators provide access to a limited set of operational data via third-party data management platforms (currently RideReport and Populus). Out of the 15 interviewed cities, only Baltimore requires dynamic, real-time access to operators' databases.

User surveys are either required from e-scooter operators or conducted by cities with or without funding support from operators. In some cities, community feedback is gathered from different channels, such as the 311 service offered by Hoboken. Other methods of engagement are via social media or from surveys performed and released by operators.

Proposed KPIs to measure data access:

- Existing data sharing agreement with operators
- Data sharing platforms used
- Types of data collected

Data collection requirements in cities



17. Data collection requirements in interviewed cities (Ramboll Municipal Interview 2019)

San Francisco, Portland, and Chicago require the operators to give limited access to their databases via a programming interface for data collection and permit evaluation. The PBOT report (2019) notes however, that it is important that the operators are required to provide standardized and unambiguously specified data, otherwise evaluation can prove difficult.

The cities we interviewed would like more data or better access to data related to safety and crashes collected by police and hospitals to better understand which safety issues to address. However, these data must be combined with other data such as modal shift.

Modal shift data is typically collected by user surveys asking users what kind of alternatives they had to an e-scooter before they were available. A much more demanding and time-consuming approach is to conduct citywide time-series surveys on transport modes, including e-scooters.

Some cities would like to have more accurate location-based data, partly to identify sidewalk riding and otherwise illegal riding (i.e. against one-way traffic). However, currently available geospatial positioning technologies might not be accurate enough to pinpoint a location so that non-compliance could be reliably and positively recognized. Also, such accurate data would raise more questions about user privacy and data protection.

Regardless, the common theme across all cities interviewed is that data access is essential to a clear understanding of the impacts of micro-mobility programs, and cities are flying blind without it.

Cities that have the regulatory authority to require data are best positioned to get what they need to measure their programs. Typically, cities who request data do so in either of the two most common specifications; namely, the General Bikeshare Feed Specification (GBFS) and the more recent Mobility Data Specification (MDS).

Access to data and the ability to communicate in two directions using these specifications is becoming more advanced, as is the resistance of operators to reveal too much. Some of this resistance is simply down to cities asking for more than they really need. Or, more succinctly, asking for too much because they haven't clearly identified what they need. To this end, we submit that cities who carry out the exercise of establishing strategic goals, useful metrics, and specific KPIs will be able to speak more openly with operators about what data is needed and why.

18. Types of data the interviewed cities need more to better manage e-scooters and integrate them to their transport system (Ramboll Municipal Interviews 2019)

> **Secure third-party data platform solutions allow cities to efficiently harness mobility data for important policy and planning decisions.**
>
> **Regia Clewlow, Populus**

3.9

EQUITY

Micro-mobility should be accessible, available, and increase mobility options for all members of the community. The program should identify groups that require improved inclusivity and attempt to establish program elements that better serve these groups.

Establishing program elements that can support the goals of equity are possible in terms of specific requirements placed on the operator, such as offering discounts to lower income groups, including alternatives to payment by credit card, or integration with public transportation payment systems.

Some cities have chosen to directly address transportation inequalities by initiating pilot programs in areas where access to public transportation is more challenging. For example, in Chicago, the ongoing pilot program was designed to be in the West Side to provide more opportunities to a community that has fewer public transit options.

In other places, such as Oslo, micro-mobility services focus their business downtown where public transport access is strongest; however, neighborhoods a few miles outside of this area are recognized as being in greatest need of improved first/last mile services but do not see these services without specific incentives or requirements put in place.

The general trend observed during our study was that North American cities tended to see equity based on economic and demographic disparities whereas European cities recognized equity concerns more spatially (e.g. downtown versus city fringes).

19. Financial equity mechanisms used in cities (Ramboll Municipal Interview 2019)

Proposed KPIs to measure equity:

- Trip starts/ends in lower income census tracts
- Ridership by age, gender, race, ethnicity, disability, and income status from surveys
- Pricing and payment options provided by operators
- Incentives of penalties applied for non-compliance

Regardless, new mobility services such as e-scooters can be surprisingly expensive. It is much cheaper to travel by bus, tram or metro, if available.

In Oslo, the equity challenge is that affluent, highly educated, young populations in the 5 city districts that make the core of Oslo are better business for private e-scooter operators, and hence the areas of the city with the best options, best infrastructure, etc. get a very uneven distribution of mobility, and especially access to green mobility.

Attempts to improve equity are also closely linked to general acceptance with the public. Failing to ensure that a wide spectrum of community members have access to micro-mobility will increase the challenges and opposition to them.

In Baltimore, a simple sticker added to bus stops asks pubic transportation riders if they would like to have e-scooters at that location to send a message to the city. This is a very clever way of soliciting valuable, actionable feedback form the community that equates strongly to improved equity as well as public acceptance.

20. Potential barriers to e-scooter access (Reproduced from Agora 2019)

“ [E-scooters] must be accepted by the general public or face being driven out by dissatisfied residents, vandalism, and lack of adoption. As a result, e-scooter companies have a clear interest in regularly seeking input from many demographic groups in the community [...].

Agora

3.10

ECONOMIC DEVELOPMENT

Micro-mobility should improve access to local businesses and make it easier to operate a business in town.

Despite many studies showing transportation infrastructure that supports local mobility, such as walking and bicycling, facilitates access to local businesses by nearby, repeat customers, most cities interviewed had not yet considered measuring a direct link between micro-mobility and economic development.

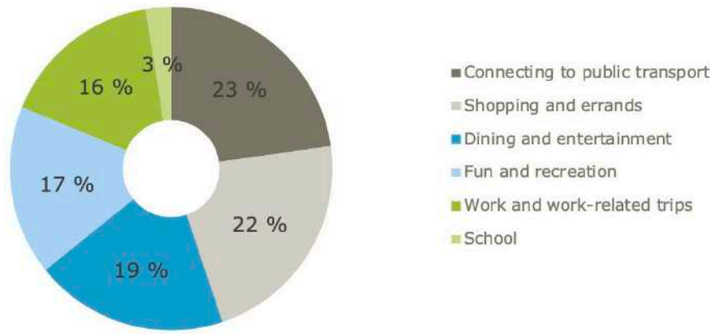
Data of Hoboken e-scooter trips provided by Lime and evaluated in the Ride Report platform (below) show that the highest trip-start and -end densities occur along the main commercial corridors of the city. This kind of information is critical to understanding the benefit of micro-mobility to local businesses.

In Portland's four-month pilot period, 71 % of users reported that they used e-scooters to get to a destination rather than riding for fun (PBOT 2019). A Bird survey in Paris reported 70 % of trips were to commute or run errands. And, according to NACTO (2019), e-scooters are reportedly used more for social, shopping and recreational use. Lime reports that their operation in Paris has resulted in 380 net new jobs, including technicians and mechanics (Lime 2019)

Proposed KPIs to measure economic development:

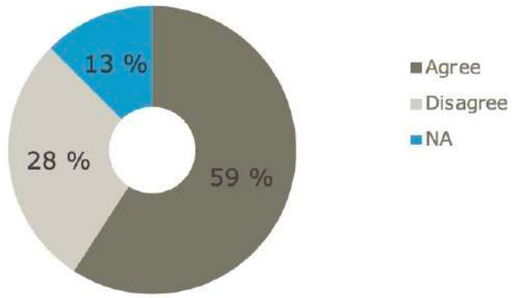
- Number of trips ending along main street / total trips
- Trip volumes along commercial corridors
- User trip purpose
- Number of local business customers arriving by e-scooter/micro-mobility

Types of trips the answerees did at least weekly in Hoboken



21. Types of trips done by e-scooters by trip type (Hoboken survey 2019)

E-scooters make it easier for employees or customers to access business in Hoboken (n=120)



22. Majority of business owners think that e-scooters help their customers and employees to get around (Hoboken survey 2019)

23. Trip start densities are highest along every segment of commercial corridors (via Ride Report, October 2019)

According to a study commissioned by Agora Verkehrsvende and German cities, e-scooters have the potential to support the tourism industry since they are a fun and easy mode to use for exploring a destination, especially if scooters by a familiar company are available in the destination for users.

All in all, there are signs that e-scooters can support local economic activity, but more research on e-scooter usage patterns is needed.

In surveys, users should be asked to what types of businesses they make trips with e-scooters or other transport modes.

Local businesses should also include these questions to find out what kind of transport modes customers are using. Businesses themselves typically overestimate the number of people arriving by cars and underestimate the other modes.

> **“[The scooters] also enables all sorts of fast trips to stores and cafes that I would have normally done in a car.**
>
> **Respondent to survey in Hoboken by Involved**

3.11

INNOVATION

Micro-mobility should support the city's goals for innovation in transportation – both in terms of technological and social improvements.

Transportation is changing at a fast pace and requires cities to be more agile, less interested in static policy structures, and able to anticipate changes. Consequently, cities are more open to innovation, and more often than not, include innovation as part of their strategic planning. Innovation also allows cities to position themselves as an attractive, interesting place to live and work.

To support innovation at the municipal level, it is important to experiment with and test ideas in an inclusive way with the community. Outreach about the activities and collecting feedback from the community are part of the innovation process. Generally speaking, working on micro-mobility meets many of the criteria to support innovation, and opens up the door for other experimentation.

For example, in Tampere, e-scooter companies are attempting their first Finnish winter. Questions about street condition, wheel diameters, and treatment methods are all areas where innovation can occur. Typically, walking and bicycle paths in Finland are treated with crushed gravel rather than salt. This material may prove to be incompatible with the tire sizes and hub construction of e-scooters.

Hoboken's experimentation with data collection, outreach methods, geofencing and spatial restrictions (e.g. the waterfront walkway), and public input are all examples of laudable innovations. In Baltimore, the orientation of the program planning outwards to the community has proven to be very successful and serves as a good example of innovation.

According to the public survey in Hoboken, people who have ridden e-scooters at least once tend to agree that e-scooters contribute to the innovativeness of city, while people who have never ridden e-scooters tend to disagree. This suggests that support for innovation may be a function of overall acceptance.

Indeed, many strategic goals outlined herein are linked to one another in this way. For example, in San Francisco, public feedback identified parking of e-scooters as a main concern. Policy amendments required e-scooters to be "locked to" a fixed location and have resulted in improved compliance, and consequently, public acceptance.

Proposed KPIs to measure innovation:

- Number of tests and pilot projects
- Involvement of local community
- City's policy on supporting innovation in transportation
- Public survey: "Does micro-mobility contribute to innovation?"

#1 issue is scooters not following the rules of the road

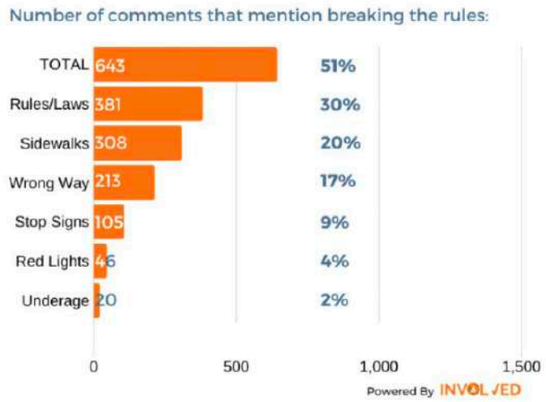
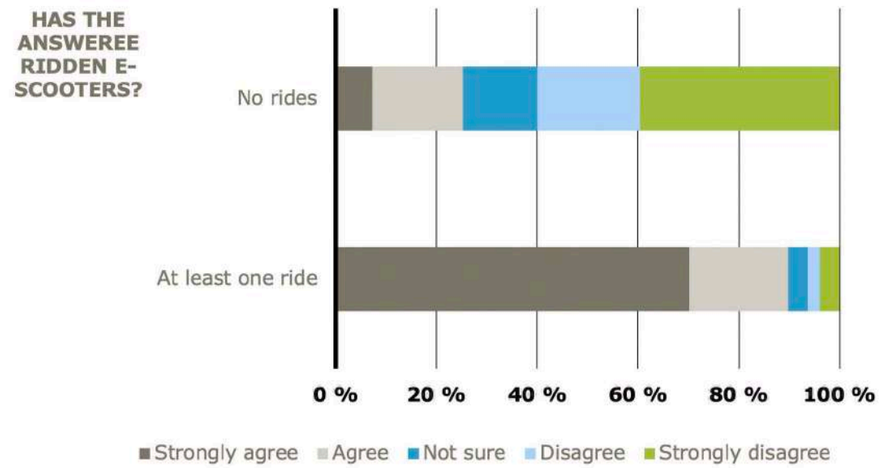


Figure 24 "One-click" survey deployed in Hoboken (Involved, 2019)

> **"Lock-to requirement has proven a practical way to reduce inappropriate parking and cluttering of sidewalks in San Francisco.**
>
> **SFMTA 2019**

E-scooters make Hoboken more innovative?



25. According to Hoboken survey there is a stark difference on people's views on e-scooters and innovation depending on if they have tried riding e-scooters (Hoboken survey 2019)

3.12

RESILIENCE

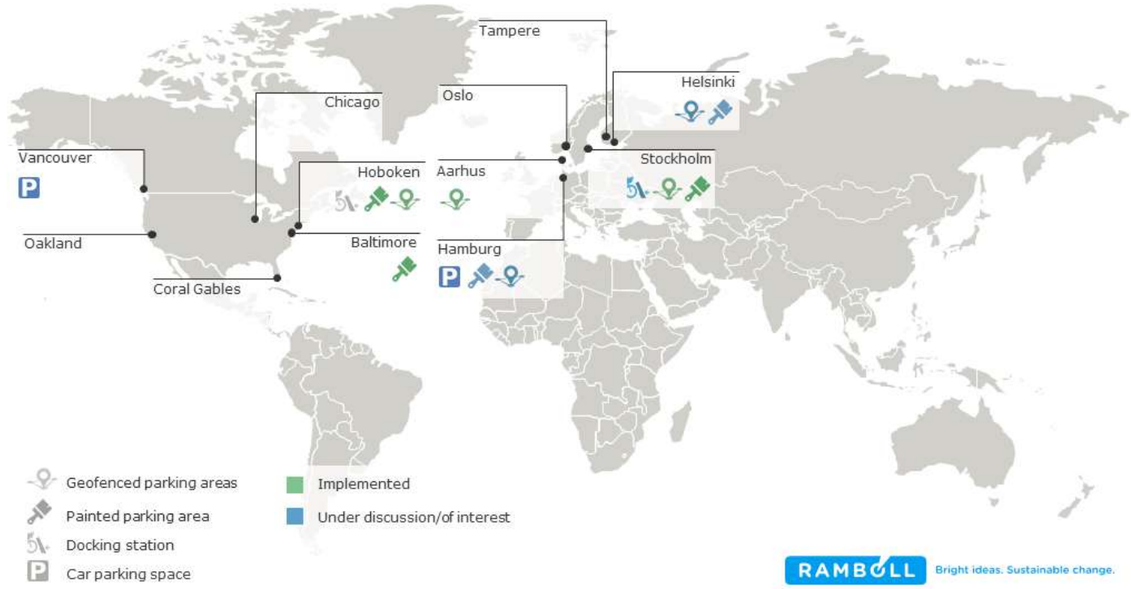
Micro-mobility should strengthen the resilience of the overall transportation system by providing redundancy and more efficient use of existing infrastructure (e.g. bicycle lanes, dedicated parking areas.

More vehicles in existing infrastructure, such as bicycle lanes, demonstrates to the community that there is more value in these facilities, and broadens the support base for further investment. In some cities, where strong and open communication channels between the city and operators have already been established, it is possible to build upon the benefits of having multiple vehicle types.

For example, in Tampere, Finland, operators are entering their first winter seasons where they intend to continue e-scooter use through the winter. While the success of this is still being tested, additional volumes of vehicles in bicycle lanes over the winter will certainly strengthen the justification of both the physical infrastructure itself as well as the additional maintenance required to keep these facilities functional through the heavy winter season.

Proposed KPIs to measure resilience:

- Capacity of bike lanes
- Capacity of parking
- Capacity in public transport
- Percentage of space allocated to “other” transportation modes
- Share of micro-mobility vehicle classes using bicycle lanes
- Share of micro-mobility vehicle classes parking in dedicated parking areas (e.g. micro-mobility hubs)



26. Examples of infrastructure available for parking. Only some of the interviewed cities had implemented or were planning to implement measures. Hoboken had docking stations for 4 months (Ojo), but they were later removed. (Ramboll Municipal Interview 2019)

> **What Hoboken did really, really well for us is they put in the bike lanes first.**
>
> **David Polinchock, Lime**

> **If a city expects to plan on micro-mobility vehicles, it has to be sure they won't disappear all of a sudden!**
>
> **Karen Vancluysen, POLIS**

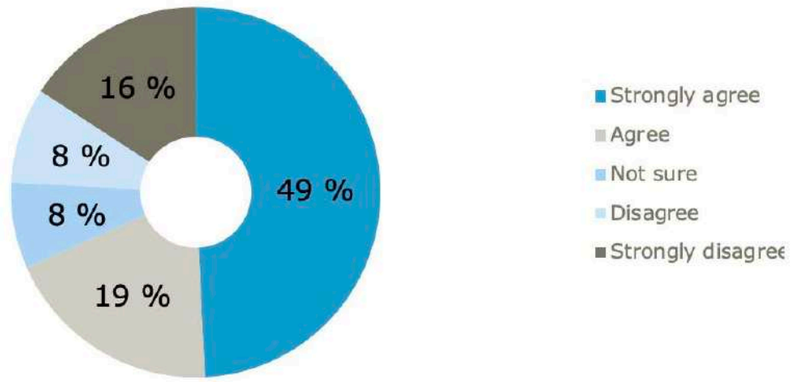
According to NACTO (2019), in the United States monthly and annual shared bicycle pass holders are more likely to ride during rush hour, suggesting they are using shared bicycles for commuting. People who buy day or single passes ride more likely outside rush hours and on weekends, which implies social, shopping or recreational use.

E-scooter usage closely follows the same trend as single ride bicycle use, so they are probably also used for other trips than commuting. However, there are no monthly or annual passes for e-scooter systems so it remains speculative if different subscription options would increase e-scooter usage for commuting, resulting in more viable options for everyday mobility. According to a Bird survey in Paris, 33 % e-scooter trips were done in combination with public transport.

According to e-scooter policy review commissioned by Agora Verkehrsvende and German cities, e-scooters have potential to improve transport system resiliency. In areas with limited public transport they can provide a convenient alternative while in towns and smaller cities they can supplement public transport. In urban centers they can help reduce overcrowding in public transport and provide an alternative in case of service delays or disruptions.

In cities where public transport is crowded it's not a bad thing that some people choose micro-mobility.

E-scooters make it easier for me to get around (in Hoboken, n=2087)



27. For most of the people e-scooters help them to get around (Hoboken survey 2019)

> **If we are encouraging people to use [e-scooters], we need to reflect on use of space and discuss space allocation.**
>
> **City of Chicago**

4 HOW WE PRODUCED THIS REPORT

This study was only possible thanks to contributions from many sources. In the early stages of structuring our effort, we recognized that while there were quite a few publications available and being released about micro-mobility, many of them were focused on a specific city or region or contained general advice and metrics about micro-mobility programs. We wanted to build upon the strong foundations of these publications by pushing the ways of describing micro-mobility programs beyond the summary statistics of fleet size and trip counts towards metrics that enabled cities to better gauge the success of their efforts.

Our challenge was to leverage Ramboll's global network and experience to gather valuable insights, anecdotes, and useful data from a wide selection of contributors to produce a point of reference that would be useful to multiple stakeholders in the context of individual communities.

To do this, our team collected and reviewed the state of practice available via existing studies, publications, and articles to better understand what cities were up to and how their efforts related to the establishment of universal strategic goals. This effort was admittedly not comprehensive, but the spectrum of references considered allowed us to form a strong basis for more targeted input sources. With this foundation we then pursued three data input channels:

- **Operational Data:** Our team was able to evaluate some of the data available to the City of Hoboken via its data management platforms, RideReport and Populus. In addition, we discussed the use of specific data sets with both Lime and Voi.

- **Municipal Interviews:** A major source of our inputs came from one-to-one interviews with municipal officials, operators, and other major actors in the micro-mobility theatre, such as NACTO in North America and POLIS in Europe. We conducted short interviews via phone or online conferencing during which we asked targeted questions about local activities related to the themes presented herein, and specifically about approaches to the strategic goals.

- **Public Surveys:** Several public surveys had already been conducted in cities such as Portland and Paris. We considered these results and worked in collaboration with the City of Hoboken, NJ to identify more targeted questions that could build upon the in-depth survey already planned for the ending days of Hoboken's six-month micro-mobility pilot program. In addition, a City Councilmember in Hoboken had polled the local constituency via a single-question email survey using clever data analytics by Involved to gather opinions about the pilot program. These data were useful in validating the City's survey as well as identifying interesting trends

Data input channels

Operational Data

- Trip counts
- Utilization
- Coverage

Municipal Interviews

- Local & State Laws
- Available Infrastructure
- Business Models

Public Survey

- Community Perception
- User Preference
- Safety Concerns
- Impact on Mode Choice

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