Recent Trends in Bikeshare Technical Memorandum

Memorandum Purpose

This technical memorandum summarizes the state of the bikeshare/micromobility industry today, highlighting key trends that may impact the CRCOG region as it continues to pursue the implementation of a regional micromobility program. Some key findings include:

- Micromobility today is about more than bikeshare. The most significant growth since 2018 has occurred with shared electric scooters (e-scooters).
- Regardless of mode, consumers show a strong preference for electrified micromobility such as electric-assist bicycle (e-bikes) and e-scooters.
- The business model for micromobility has changed significantly over the last decade as private capital has led to the emergence of several for-profit micromobility operators. It remains unclear whether the industry has achieved a sustainable business model, with high turnover in the number of private operators.
- Micromobility has fared better than other modes during the COVID-19 pandemic, with many systems seeing ridership today meeting or exceeding pre-pandemic levels.
- Equipment vendors and operators are innovating in the areas of rider safety and right-of-way management. Better enforcement of parking rules and geofencing are helping to address concerns with micromobility vehicles littering the public right-of-way or posing a hazard to other pedestrians and cyc\lists.

What is Micromobility?

The definition of micromobility has evolved over time with the introduction of new modes and technology. Micromobility describes transportation services that operates shared-use, lightweight, personal use vehicles that are person-powered (e.g., bicycle), powered by a small electric motor, or a combination of the two. While programs like bikeshare have been around since the 1960s, modern micromobility services rely on a few key innovations:

- Automated management of vehicles, notably unlocking and locking of the vehicle.
- User account management, including automated payment and linking trips to users to discourage theft.
- Real-time (or near real-time) tracking of vehicles through either GPS tracking or connected stations.

Background

Even though it is a relatively young form of transportation, bikeshare has experienced significant changes in its technology, form, and operating models over the last decade. When CRCOG first looked at the feasibility of a regional bikeshare system in 2014, there were a few dozen programs in North America. Today the number exceeds 200 programs. In 2014, there were only a handful of for-profit bikeshare operations. Most programs at the time were organized by local governments and non-profits; these programs relied on a mix of public subsidies, sponsorships, and charitable donations to sustain themselves.

By the late 2010s, the industry began to see a fundamental shift in its business model. Over $2 billion in venture-capital backed funding flooded into the bikeshare space.[1] Several start-ups launched dockless free-floating bikeshare programs. Unlike earlier systems, cities with dockless operators often had multiple services competing against one another. These firms began experimenting with alternative technologies such as dockless e-bikes and scooters. As bikeshare no longer described the range of modes operated by this budding industry, the term micromobility was coined.

Since 2017, the industry has been characterized by aggressive competition, with start-ups focused on gaining market share. TNCs Uber and Lyft made major micromobility acquisitions, with an interest in cementing their respective apps as all-inclusive mobility as a service (MaaS) platforms.[2] The shift in the industry has had pros and cons for jurisdictions. Communities have struggled to update their regulations and oversight procedures at the same pace as new technologies and companies emerged. Conversely, jurisdictions that lacked funding to start or expand their own micromobility program could benefit from the new competition by partnering with private firms looking to expand market share.

Today, the industry is at a major inflection point. After years of rapid growth, firms are now feeling greater pressures to become profitable and are less willing to enter risky markets, including suburban communities and smaller cities that have lower demand. The COVID-19 pandemic impacted the industry, as lockdowns and public health concerns led to ridership declines and even the temporary suspension of some systems. Interestingly, micromobility ridership has rebounded faster than other public modes like transit. A recent report by McKinsey and Associates estimates that by 2030 the industry will be valued at over $300 billion.[3] The high valuation is based on predictions that Micromobility companies will continue to consolidate, technology improvements will keep reducing operating costs, and cities will continue to reduce permit fees – in support of transportation alternatives to the car. The question remains how many operators (and what consumer price points) will allow micromobility companies to become financially self-sustaining.

[1] Eliason, Jason, Start it Up: The Future of Micromobility, Medium, January 15, 2021
[2] Teale, Chris Lyft's Motivate acquisition part of industry-wide move toward integrated transit options, Smart Cities Dive, July 5 2018
[3] The Future of Micromobility: Ridership and Revenue in Crisis, McKinsey and Associates, 2020

Industry Growth Trends

As shown in **Figure 1**, annual growth of bikeshare in North America was steady until 2016. During the 2017-2018 period, the arrival of free-floating ("dockless") systems allowed bikesharing to proliferate – including the introduction of a hybrid docked/dockless system in New Haven in February of 2018 and Lime's dockless bikeshare in Hartford in June. The dip in bikeshare systems that happened in 2019/2020 can be attributed to several factors:

- the unsustainable business models some vendors were employing
  - Vehicles not designed for repetitive, commercial use
  - Costs to ride (i.e., per minute) not well calibrated / simply too low
  - Multiple vendors in a single market
- challenges in accessing bicycles and parts - due to demand outpacing supply, and manufacturing and shipping logistics
- pandemic related closures of systems
- a wider industry shift toward scooters.

Data from 2021 shows modest renewed growth in the number of bikeshare systems. The pandemic re-introduced demand for bikeshare, as people concerned about using confined public transportation options chose the personal, door-to-door solution bikeshare provides.

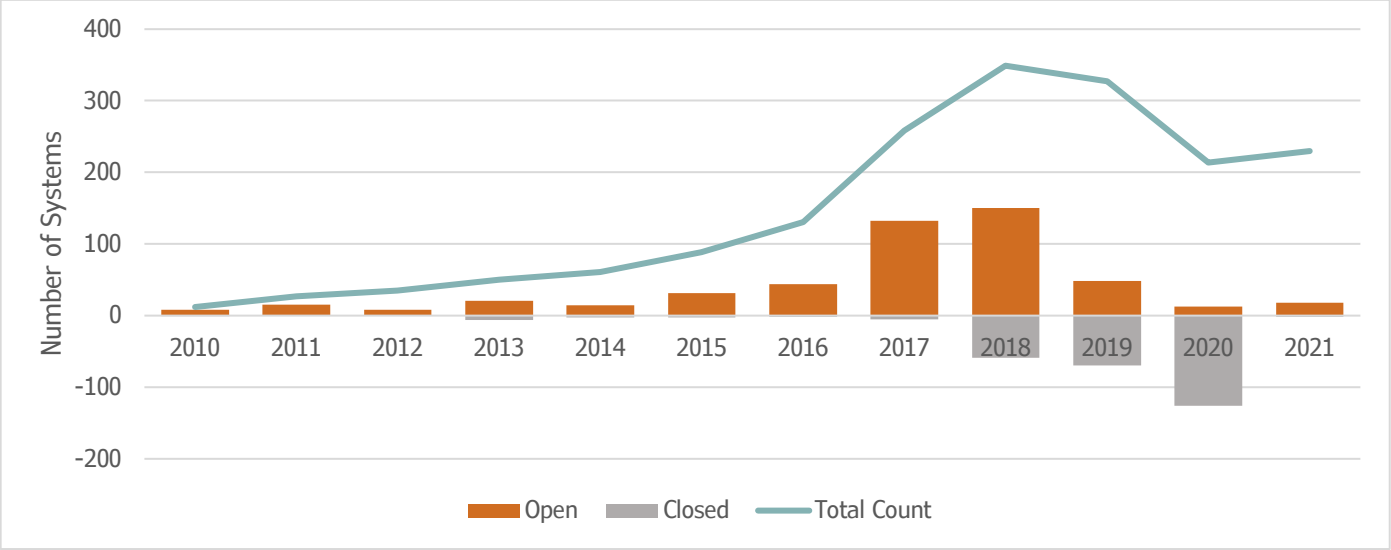

Figure 1: Number of Bikeshare Systems Over Time, data from Meddin Bike-Sharing World Map Mid-2021 Report[4]

It should be noted that the decline in the number of bikeshare systems did not impact overall bikeshare ridership as the programs that closed contributed only a small share of overall ridership (see **Figure 2**). Some ridership increase can be attributed to the traveling public's response to the pandemic - opting for personal transportation vs public, but some of

[4] The Meddin Bike-sharing World Map Mid-2021 Report. Accessed 11/30/2021 from https://bikesharingworldmap.com/reports/bswm_mid2021report.pdf

the systems that closed were already struggling due to low ridership. Since 2018, bikeshare ridership has remained steady nationwide, even as scooter usage has grown exponentially. Scooters today account for about two-thirds of micromobility usage nationwide.

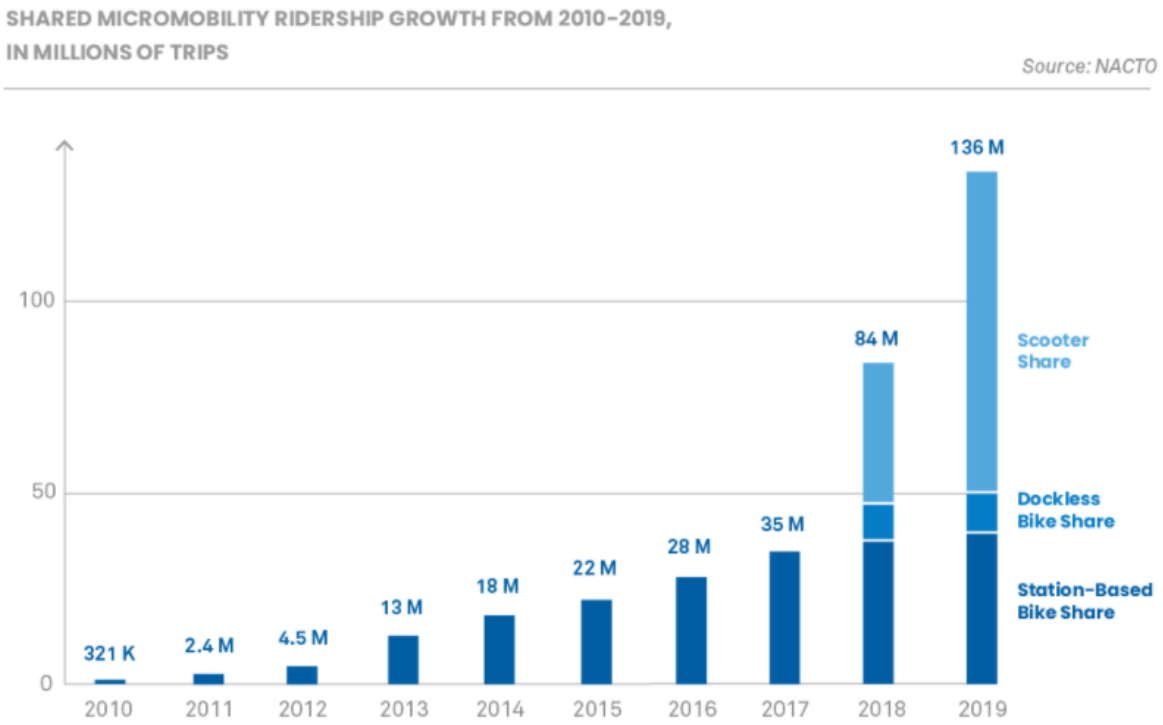

Figure 2: North American Micromobility Ridership by Year, 2020 NACTO State of Micromobility Report[5]

Of the over 200 North American cities and towns with a micromobility program, the majority offer bikeshare, either as the sole micromobility mode (44 percent of communities), or in conjunction with scooters (33 percent of communities) (**Figure 3**). Increasingly, cities are choosing to offer a combination of scooter and bikeshare options, opting for hybrid docked/dockless bikeshares, and including e-bikes in their fleets.

An article in the Journal *Transport Reviews* in 2020 found that "the dockless design of bikesharing systems significantly improves users' experiences at the end of their bike trips. Individuals can instantly switch to a dockless shared bike without the responsibility of returning it back to a designated dock. Additionally, the high flexibility and efficiency of dockless bike-sharing often makes the bike-sharing systems' integration with public transit even tighter than that of traditional public bikes, providing an efficient option for first/last-mile trips."[6]

The hybrid docked/dockless model works well in Portland, OR, where the reliability of the docks is especially attractive paired with the flexibility of returning a bike anywhere (for a

[5] Shared Micromobility in the US: 2019, NACTO, August 2020

[6] Zheyan Chen, Dea van Lierop & Dick Ettema (2020), Dockless bike-sharing systems: what are the implications?, Transport Reviews, 40:3, 333-353, DOI: 10.1080/01441647.2019.1710306.

fee). According to The National Association for City Transportation Officials (NACTO) this system is not easily replicated in less densely populated cities, however. NACTO's 2018 Micromobility in the US report states that, "Smaller station-based bike share systems without a dense network of stations or a large number of bikes had low vehicle utilization rates, as the factors that make a bike share system successful — a high number of bikes conveniently placed over a large area — were absent."

A 2021 study from the National Center for Sustainable Transportation at UC Berkeley found that dockless bikeshare systems can provide greater availability of bikes for communities of concern than for other communities, attracting more trip demand because of a larger service area and frequent bike rebalancing practices. The study's authors also noticed that the existence of electric bikes helps mitigate the bikeshare usage gap between communities of concern and other tracts.[7]

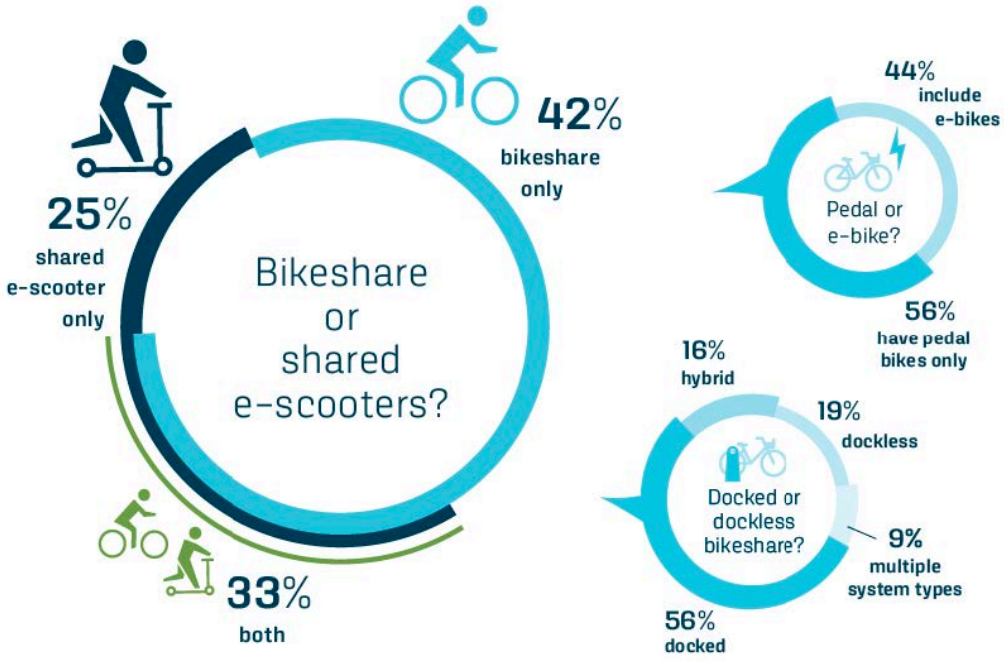

Figure 3: Make-Up of Micromobility Programs in North America, 2020 NABSA State of the Industry Report

[7] Jaller, M., Niemeier, D., Qian, X., & Hu, M. (2021). Dock-based and Dockless Bikesharing Systems: Analysis of Equitable Access for Disadvantaged Communities, UC Davis: National Center for Sustainable Transportation.

According to the North American Bikeshare and Scootershare Association (NABSA), there was better representation of low income, Black, Hispanic, or Latino, and female users in 2020 compared to 2019.[8]

System Type

Micromobility modes can be divided into two broad categories. **Docked** services – such as New Haven used for their bikeshare system in 2018 – utilize stations where users can pick-up and return bicycles. Most docked systems embed the digital hardware and locking mechanisms on the stations themselves, although a few docked systems have GPS units on the bicycles themselves. A few, like Bike New Haven, utilize "dumb docks", in which the bikes are similar to dockless bicycles and the stations are essentially designated bicycle racks.

Dockless, or free-floating systems, allow users to start or end a trip without the use of a station. Dockless systems embed digital hardware and the locking mechanism onto the vehicle itself. A user can merely end their trip in any permitted location, which could be a specified parking area, any public bike rack, or parked properly anywhere on a public sidewalk.

In many cases, dockless micromobility can be just as simple to find and use. The GPS or RFID technology that creates a virtual geographic boundary that establishes and enforces approved parking and travel zones (geofencing) has become increasingly accurate. Overall, the traveling public has become increasingly familiar with app-based maps and navigation.

[8] North American Bikeshare and Scootershare Association (NABSA), 2nd Annual Shared Micromobility State of the Industry Report, 2021.

Figure 4: Bike New Haven's dock-based system - on launch day in February 2018

As previously implied, there is inequity in the geographic distribution of dock-based bikeshare – further substantiated by a 2021 study in the Journal of Transport Geography, asserting that "the distribution of docked systems is extremely unequal, and …dockless systems greatly reduce geographical inequalities relative to docked."[9]

The study establishes that low-density areas and neighborhoods with low median household incomes, smaller shares of young people, and fewer zero-car households have limited micromobility service, and that "Docked services are less prevalent in communities of color, and the implementation of dockless systems yields mixed outcomes for racial equity."

The report "Cementing a Framework for Equity in Micromobility," published by the Bedford Stuyvesant Restoration Corporation, is one of several good resources to guide the CRCOG region's stakeholders through the steps of creating an equity-driven mission, vision, and set of principles for the program, ensuring better access to and use of shared micromobility systems in underserved communities.[10] The National Association of City Transportation Officials (NACTO) has a series of "Bike Share Equity Practitioners' Papers" that provide excellent guidance on the topic as well.[11]

[9] Si'an Meng, Anne Brown, Docked vs. dockless equity: Comparing three micromobility service geographies, Journal of Transport Geography, Vol. 96, 2021.
https://www.sciencedirect.com/science/article/pii/S0966692321002386
10 https://betterbikeshare.org/resource/cementing-an-equity-framework-for-micromobility/
11 https://nacto.org/walkable-station-spacing-is-key-to-successful-equitable-bike-share/

Vehicle Type

One important global trend in bikeshare is that the communities that have welcomed it into their transportation network have also welcomed in other shared (and electric) mobility devices such as scooters, e-bikes, and mopeds. A 2021 study comparing utilization of various Micromobility vehicles in Zurich, Switzerland showed that the density of vehicles, trip duration, and time of day influenced people's decisions about what type of vehicle they preferred. For morning commutes, docked bikeshare was the most popular. E-scooters were mostly used for very short trips, while bikes and e-bikes were used for substantially longer trips. [12]

Scooters continue to grow in popularity, and according to a 2019 study by students at MIT's "Senseable Cities" Lab, achieve an average utilization of 1.17 times per day, relative to the average of 0.47 times per day a shared bicycle is used.[13]

A study published this year showed that electric bikes are ridden farther - and in less densely populated areas - than conventional bicycles.[14] The popularity of e-bikes is proven by the number of e-bike sales to consumers – up 145 percent from 2019 to 2020, more than double the rate of classic bike sales.[15] Most of the largest US bikeshare systems are introducing e-bikes into their fleets. In cities where e-bikes are introduced alongside traditional bikeshare they have generally seen much higher utilization.

All shared electric vehicles require battery charging. Operators generally use two different approaches to ensuring batteries remain charged. Most systems in North America utilize swappable batteries. Street technicians can replace depleted batteries and charge batteries at a centralized location. This approach requires limited fixed charging infrastructure but requires staff to actively manage batteries across the network. Alternatively, some operators utilize charging stations in the field, typically built into docked micromobility stations. In-field charging remains uncommon due to the cost of capital equipment and station hardwiring.

Safety

Micromobility services bring with them a certain amount of risk for both users and other road and sidewalk users. According to the U.S. Consumer Product Safety Commission there were a total of 7,700 Emergency Department visits attributed to e-scooters in 2017, and approximately 700 attributed to e-bikes.[16]

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[12] Daniel J. Reck, He Haitao, Sergio Guidon, Kay W. Axhausen, Explaining shared micromobility usage, competition and mode choice by modelling empirical data from Zurich, Switzerland, Transportation Research Part C: Emerging Technologies, Volume 124, 2021, https://www.sciencedirect.com/science/article/pii/S0968090X20308445

[13] Rui Zhu, Xiaohu Zhang, Dániel Kondor, Paolo Santi, Carlo Ratti, Understanding spatio-temporal heterogeneity of bike-sharing and scooter-sharing mobility. Computers, Environment and Urban Systems, Volume 81, 2020. Accessed on 11/30/2021 at https://www.sciencedirect.com/science/article/pii/S0198971519305812

[14] Si'an Meng, Anne Brown, Docked vs. dockless equity: Comparing three micromobility service geographies, Journal of Transport Geography, Volume 96, 2021. Accessed 11/30/2021 at https://www.sciencedirect.com/science/article/pii/S0966692321002386

[15] Accessed on 11/30/2021 at https://www.nytimes.com/2021/11/08/business/e-bikes-urban-transit.html

[16] Tark, James, Micromobility Products-Related Deaths, Injuries, and Hazard Patterns: 2017–2019, U.S. Consumer Product Safety Commission, 2020.

For reference, there were an average of 3.4 million emergency department (ED) visits for motor vehicle crash injuries from July 1, 2017 to July 1, 2018.[17]

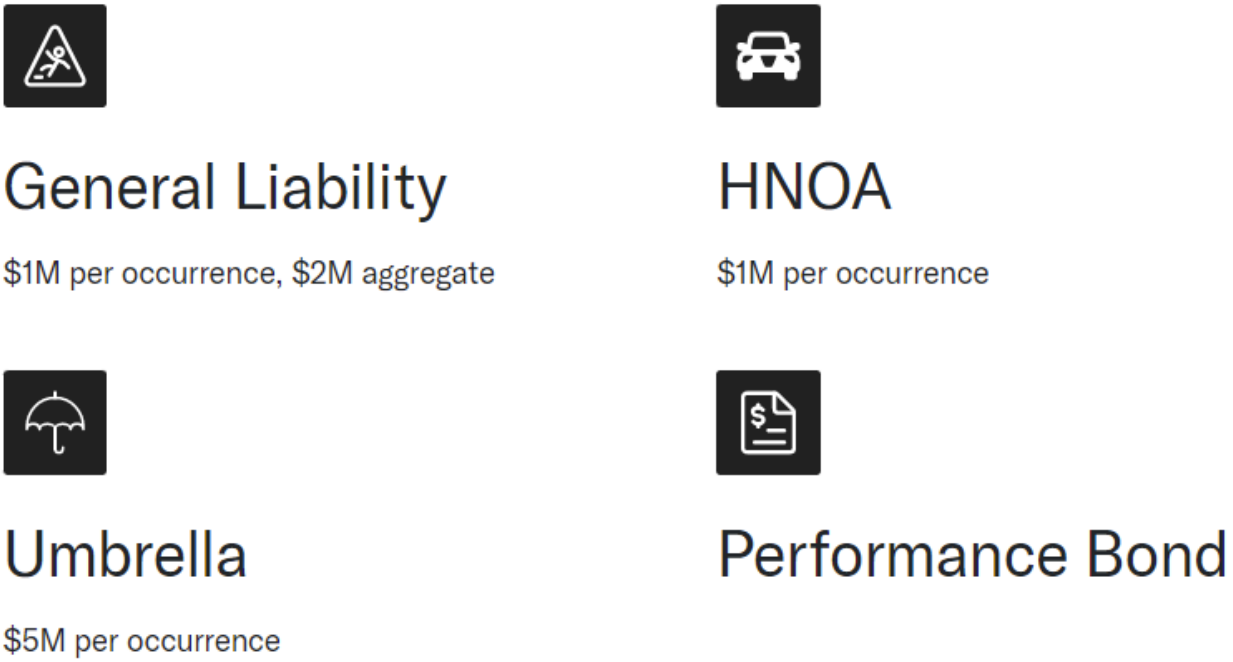
A recent study of injuries on electric scooters by the CDC found that 48 percent of dockless scooter injuries sampled in Austin, Texas resulted in head trauma.[18] Low rates of helmet use contribute to high rates of head injury; a study of emergency room visits in Southern California found that of the 249 patients with injuries related to scooters, only 10 were wearing a helmet and 100 had sustained some head trauma.[19] There are a few possible reasons why scooters have a higher injury rate: the instability of the vehicles themselves, especially earlier models that had smaller wheels; the public's unfamiliarity with scooters (most bikeshare users know how to cycle prior to using bikeshare); and a lack of standard protocol for where scooters are ridden. In Connecticut, e-bikes and e-scooters are afforded the same rights and responsibilities as conventional (pedal) bicycles. See attached **Appendix A** and **Appendix B** for state legislation governing e-bikes and e-scooters.

In addition to the safety of those riding a scooter or bicycle, there is a safety risk to pedestrians, especially with regard to dockless equipment. If parked improperly on a sidewalk or on a roadway, dockless vehicles can block the public right of way and pose a safety hazard.

The micromobility industry has addressed safety in several ways. More robust vehicle design, improved lighting, and more advanced self-diagnostics make the vehicles themselves safer. Initiatives to provide or discount helmets for riders, encouraging them to bring their own helmets, and providing rider safety information videos, as well as guidance on the vehicle and in-app, are among the personal safety measures that have improved and expanded since the earliest days of micromobility. The rider must take personal responsibility for attending to these however.

According to FounderShield – a firm that insures micromobility companies, the following are the minimum insurance requirements a micromobility company must meet to operate a public system (HNOA = Hired and Non-Owned Auto Insurance):[20]

[17] Davis D, Cairns C. Emergency department visit rates for motor vehicle crashes by selected characteristics: United States, 2017–2018. NCHS Data Brief, no 410. Hyattsville, MD: National Center for Health Statistics. 2021.
[18] Dockless Electric Scooter Injury Study, Austin Public Health, 2018; Micromobility Products-Related Deaths, Injuries, and Hazard Patterns: 2017-2019, Consumer Protection Bureau, 2020
[19] Trivedi, Tarak K et al. Injuries Associated with Standing Electric Scooter Use, Journal of the American Medical Association, 2019; 2(1)
[20] https://foundershield.com/industry/micro-mobility/



Rider education features and programs are provided in the app used to register for and access micromobility vehicles. These include mandatory safety quizzes, destination mapping features, and in-app compliance measures with tiered penalties to encourage proper use of vehicles.

Infrastructure – primarily bike lanes – are also expanding to provide safer places for bike and scooter riders to travel. Some communities charge micromobility providers a fee per vehicle or per ride that can be used to pay for safer facilities. The City of Miami reports that it has received about $2.4 million under its electric scooter share pilot program, which has funded new bike lanes. Electric bicycles may be ridden where bicycles are permitted to travel in the state of Connecticut – with exceptions for Class 3 e-bikes (defined as "an electric bicycle equipped with a motor that engages only when the rider operates the electric bicycle's foot pedals, and that ceases to engage when the electric bicycle reaches the speed of twenty-eight miles per hour") and on unpaved trails and paths – unless specifically permitted. Each municipality in Connecticut may regulate where e-bikes are permitted through local ordinance. See **Appendix A** for Connecticut's *Act Concerning Electric Bicycles, Traffic Control and Parking and Traffic Authorities*.

Finally, improvements in technology and operating procedures have addressed certain safety concerns that are especially prevalent with dockless and/or electrified systems. Geofencing means operators can set location-specific speed restrictions, for example limiting how fast riders can travel in a public park as opposed to on city streets. Geofencing and parking verification procedures help to ensure riders properly park their vehicle at the end of the trip in the designated location, although are not infallible.

Culture and Etiquette

Micromobility companies have developed effective ways of nudging riders towards positive behavior. Users view in-app prompts, may experience automatic slowing or stopping in

restricted zones, and receive incentives for parking that aids in fleet rebalancing and equitable distribution of vehicles. In-app rider education features and programs including mandatory, customizable safety quizzes, inclusion of destination mapping features which provide suggested safety routes and more. They also incorporate an in-app compliance measure with tiered penalties to encourage proper use of vehicles. Efforts to build a community of users – through local hiring, engaging local community leaders, reaching out to local residents at events, providing rider training classes, and offering discounted fares to riders on limited incomes – builds a culture of respect and recognition of micromobility as legitimate transportation.

Financial Sustainability

There has been a growing understanding that micromobility systems are transit, and like bus and road networks, require public investment. New provisions in the infrastructure bill make funding available for bikeshare systems and allow membership costs to be covered by pre-tax commuter benefits.

There remains a major division in the micromobility industry between not-for-profit and for-profit programs. Many bikeshare systems continue to rely on public funding, sponsorships, and charitable giving to supplement rider revenue. Private dockless bike and scooter operators have long operated at a loss although recent Initial Public Offerings have put renewed pressure on these firms to make a profit. In the last few years, the private micromobility industry has made steps to operate more sustainably. Private dockless operators have seen modest industry consolidation, having increased their user fees to generate more revenue, and have invested in more robust vehicle technology to increase vehicle lifespan.

Environmental Sustainability

Shared bikes, e-bikes, and electric scooters are built to be more durable than they were initially, and their life spans are now counted in years rather than months. They must, however, be maintained, redistributed (usually referred to as “rebalancing”), and if electric, charged. The process for doing this maintenance, moving, and charging generally requires the use of gas- or diesel-powered service vehicles, adding vehicle miles and emissions to local air. Swappable batteries can cut down on some of this service vehicle travel because only the batteries – not scooters or bikes – need to be transported. Also, newer batteries with better storage capabilities allow longer trip distances, reducing the number of charges required per day. LINK’s electric scooters can travel up to 60 miles on a charge. Considering the average 1.4 miles per trip and 3-4 trips/day the vehicles in Hartford receive, charging of each electric scooter is only required once or twice/week.

Communities should require clarity from operators on these aspects when procuring micromobility services, considering full ‘life cycle’ emissions associated with the manufacturing process, batteries, replacement frequency, and rebalancing, as well as the broader circular economy principles.

Open Data

The North American Bikeshare and Scooter Association (NABSA) has developed open data standards to help facilitate data and information sharing. The Mobility Data Specification (MDS) has standardized the generation and reporting of data that can be easily shared to

inform planning decisions and integration with transit and other transportation modes. Similarly, the General Bikeshare Feed Specification (GBFS) has created a standardized format to integrate micromobility systems into existing trip planning platforms like Google Maps.

The micromobility data management platform *Populus* provides four areas data from shared bikes and scooters can inform:

- Information as a basis for decisions regarding subsidies (e.g., data demonstrates reduction of single occupancy vehicle use as a result of shared mobility operations at scale)
- Information regarding inclusion and accessibility goals (e.g., is there adequate vehicle supply in underserved areas?)
- Information to safeguard the quality of the public space and encourage the use and discoverability of shared mobility so as to reduce congestion (e.g., where in the city should parking areas be created?)
- To safeguard the quality of the public space and promote safety (e.g., at what places is shared mobility creating nuisance/unsafe situations in the public space?)[21]

Conclusion

Micromobility has undergone rapid changes in the handful of years since it became widespread in North America. Dockless technology and the arrival of e-scooters and e-bikes have made micromobility systems more resilient and fluid. Vehicle design and advances in GPS and sensor technology will continue to make individual rides safer and more predictable, and an archive of data and literature on best practices has developed to inform new systems. Perhaps most importantly, a paradigm has emerged in which municipalities partner with micromobility companies to fill an important transportation need.

[21] Mobility Data Standards: What they are and How to Implement Them, Populus, 2021.

Appendix A

Excerpts from Connecticut's *Act Concerning Electric Bicycles, Traffic Control and Parking and Traffic Authorities*

Sec. 3. Section 14-1 of the 2018 supplement to the general statutes is repealed and the following is substituted in lieu thereof (*Effective October 1, 2018*):

Terms used in this chapter, sections 1 and 2 of this act and this section shall be construed as follows, unless another construction is clearly apparent from the language or context in which the term is used or unless the construction is inconsistent with the manifest intention of the General Assembly:

(13) "Class 1 electric bicycle" means an electric bicycle equipped with a motor that engages only when the rider operates the electric bicycle's foot pedals, and that ceases to engage when the electric bicycle reaches the speed of twenty miles per hour;

(14) "Class 2 electric bicycle" means an electric bicycle equipped with a motor that may be used exclusively to propel the electric bicycle, and that ceases to engage when the electric bicycle reaches the speed of twenty miles per hour;

(15) "Class 3 electric bicycle" means an electric bicycle equipped with a motor that engages only when the rider operates the electric bicycle's foot pedals, and that ceases to engage when the electric bicycle reaches the speed of twenty-eight miles per hour;

Sec. 10. Subsection (a) of section 14-286a of the general statutes is repealed and the following is substituted in lieu thereof (*Effective October 1, 2018*):

(a) Every person riding a bicycle, as defined in section 14-286, or an electric bicycle, as defined in section 14-1, as amended by this act, upon the traveled portion of a highway shall be granted all of the rights and shall be subject to all of the duties applicable to the driver of any vehicle subject to the requirements of the statutes relating to motor vehicles, except as to those provisions which by their nature can have no application and except that each town, city or borough and the Office of the State Traffic Administration within its jurisdiction as provided in section 14-298, as amended by this act, shall have authority to regulate bicycles and electric bicycles as provided in section 14-289, as amended by this act, and said section 14-298, as amended by this act, and except as provided by section 14-286c, as amended by this act. No parent of any child and no guardian of any ward shall authorize or knowingly permit any such child or ward to violate any provision of the general

statutes or ordinances enacted under section 14-289, as amended by this act, relating to bicycles or electric bicycles.

Sec. 11. Section 14-286b of the general statutes is repealed and the following is substituted in lieu thereof (*Effective October 1, 2018*):

(a) Any person operating a bicycle or an electric bicycle, as defined in section 14-1, as amended by this act, upon a roadway at less than the normal speed of traffic shall ride as close to the right side of the roadway as is safe, as judged by the bicyclist, except when:

(1) Overtaking or passing another vehicle proceeding in the same direction;

(2) Preparing for a left turn at an intersection or into a private road or driveway;

(3) Reasonably necessary to avoid conditions, including, but not limited to, fixed or moving objects, parked or moving vehicles, bicycles, pedestrians, animals, surface hazards or lanes that are too narrow for a bicycle or an electric bicycle and a motor vehicle to travel safely side by side within such lanes;

(4) Approaching an intersection where right turns are permitted and there is a dedicated right turn lane, in which case a bicyclist or electric bicyclist may ride on the left-hand side of such dedicated lane, even if the bicyclist or electric bicyclist does not intend to turn right;

(5) Riding on a roadway designated for one-way traffic, when the bicyclist or electric bicyclist may ride as near to the left-hand curb or edge of such roadway as judged safe by the bicyclist or electric bicyclist; or

(6) Riding on parts of roadways separated for the exclusive use of bicycles or electric bicycles, including, but not limited to, contra-flow bicycle lanes, left-handed cycle tracks or bicycle lanes on one-way streets and two-way cycle tracks or bicycle lanes.

(b) Persons riding bicycles or electric bicycles, as defined in section 14-1, as amended by this act, upon a roadway shall not ride more than two abreast except on paths or parts of roadways set aside for the exclusive use of bicycles or electric bicycles. Persons riding two abreast, as provided in this subsection, shall not impede the normal and reasonable movement of traffic, and, on a laned roadway, shall ride within a single lane.

(c) No person riding upon any bicycle, electric bicycle, as defined in section 14-1, as amended by this act, motor-driven cycle, roller skates, skis, sled, skateboard, coaster, toy vehicle or any other vehicle not designed or intended to be towed shall attach the same or such person to any vehicle moving or about to move on a public roadway nor shall the operator of such vehicle knowingly permit any person riding a bicycle, electric bicycle, motor-driven cycle, roller skates, skis, skateboard, coaster, sled, toy vehicle or any other vehicle not designed or intended to be towed to attach the same or such person to such vehicle so operated or about to be operated, provided any person operating a bicycle solely by foot or hand power may attach a bicycle trailer or semitrailer thereto, provided such trailer or semitrailer is designed for such attachment.

(d) No person operating a bicycle, as defined in section 14-286, or an electric bicycle, as defined in section 14-1, as amended by this act, upon a roadway, path or part of roadway

set aside for exclusive use of bicycles or electric bicycles shall carry on such bicycle or electric bicycle a passenger unless such bicycle or electric bicycle is equipped or designed to carry passengers, provided any person who has attained the age of eighteen years may carry any child while such person is operating a bicycle propelled solely by foot or hand power, provided such child is securely attached to his person by means of a back pack, sling or other similar device. The term "child", as used in this subsection, means any person who has not attained the age of four years.

(e) No person operating a bicycle, as defined in section 14-286, or an electric bicycle, as defined in section 14-1, as amended by this act, shall carry any package, bundle or other article which prevents such person from using both hands in the operation of such bicycle or electric bicycle. Each person operating such bicycle or electric bicycle shall keep at least one hand on the handlebars thereof when such bicycle or electric bicycle is in motion.

(f) Violation of any provision of this section shall be an infraction.

Sec. 12. Section 14-286c of the 2018 supplement to the general statutes is repealed and the following is substituted in lieu thereof (*Effective October 1, 2018*):

(a) Each person riding a bicycle or an electric bicycle, as defined in section 14-1, as amended by this act, upon the traveled portion of a highway and intending to make a left turn after proceeding pursuant to the provisions of section 14-244 or subsection (b) of this section may, in lieu of the procedure prescribed by section 14-241, approach as close as practicable to the right-hand curb or edge of the highway, proceed across the intersecting roadway and make such turn as close as practicable to the curb or edge of the highway on the far side of the intersection, provided such procedure is not prohibited by any regulation issued by any town, city, borough or the Office of the State Traffic Administration.

(b) Each person riding a bicycle or an electric bicycle, as defined in section 14-1, as amended by this act, upon the traveled portion of a highway and intending to make a right turn may in lieu of the procedure prescribed by section 14-244, before turning and while in motion or if stopped while waiting to turn signal such turn by extending his right hand and arm horizontally with forefinger extended.

(c) No person operating a bicycle or an electric bicycle, as defined in section 14-1, as amended by this act, upon the traveled portion of a highway and intending to make a right or left turn shall be required when making a signal of such intention to make such signal continuously.

Sec. 13. Section 14-288 of the general statutes is repealed and the following is substituted in lieu thereof (*Effective October 1, 2018*):

(a) Each bicycle or electric bicycle, as defined in section 14-1, as amended by this act, operated upon the public highway, during the times or under the conditions as provided in subsection (a) of section 14-96a, shall display a lighted lamp upon the forward part of such bicycle or electric bicycle. Such lamp shall, when lighted, emit a white light which in clear weather shall be visible at a distance of not less than five hundred feet in the direction in which such bicycle or electric bicycle is proceeding. Each bicycle or electric bicycle shall also, at all times, be equipped with a reflector or reflecting tail light lens, which reflector or lens shall be attached to the rear of such bicycle or electric bicycle in such manner as to reflect rays of light thrown upon the same, and such reflector or reflecting tail shall be

visible at a distance of not less than six hundred feet from the rear when illuminated by the head lamps of a motor vehicle. Such bicycle or electric bicycle shall also be equipped with reflective material so placed and of sufficient size and reflectivity to be visible from both sides of such bicycle or electric bicycle at a distance of not less than six hundred feet when illuminated by the head lamps of a motor vehicle. Each bicycle or electric bicycle shall also, at all times, be equipped with a braking device sufficient to enable the operator thereof to stop within twenty-five feet on dry, level and clean pavement when moving at a speed of ten miles per hour. No person shall equip a bicycle or an electric bicycle with a siren or device which emits a whistle or use a siren or device which emits a whistle while operating a bicycle or an electric bicycle.

(b) Operation of a bicycle or an electric bicycle, as defined in section 14-1, as amended by this act, in conflict with any provision of this section shall be an infraction.

Sec. 14. Section 14-289 of the general statutes is repealed and the following is substituted in lieu thereof (*Effective October 1, 2018*):

Each town, city and borough shall have authority to make any ordinance not inconsistent with section 14-286 or 14-288, as amended by this act, or any regulation of the Office of the State Traffic Administration issued pursuant to section 14-298, as amended by this act, respecting governing and controlling the use of bicycles and electric bicycles, as defined in section 14-1, as amended by this act, within such town, city or borough, with appropriate penalties for violation thereof, which ordinances may include provisions requiring annual licensing of bicycles or electric bicycles and providing for registration of any sale of, or change of ownership in, a bicycle or an electric bicycle.

Appendix B

An Act Regulating Electric Foot Scooters (PA 19-162—sHB 7141)

Transportation Committee

SUMMARY: This act defines "electric foot scooters" (e-scooters) and generally gives e-scooter riders the same rights, privileges, and duties that existing law provides for bicycle riders. The act also (1) generally allows municipalities to regulate e-scooters, to the extent that state law does not conflict with such regulations, and (2) requires the Office of the State Traffic Administration's (OSTA) regulations to cover e-scooter operation on highways and roads under its jurisdiction.

The act also expands the state's vulnerable user law to (1) cover instances when a driver causes "substantial bodily harm" to a vulnerable user and (2) make e-scooter riders vulnerable users under the law.

Lastly, the act (1) requires e-scooter riders under age 16 to wear helmets; (2) expands the acceptable helmet standards for bicyclists, electric bicycle (e-bikes) riders, and others; and (3) makes numerous technical and conforming changes related to e-scooters and e-bikes.

EFFECTIVE DATE: October 1, 2019

E-SCOOTER DEFINITION

The act defines "electric foot scooter" as a device that:

1. weighs 75 pounds or less;

2. has two or three wheels, handlebars, and a floorboard that can be stood on while riding;

3. is both electric motor- and human-powered; and

4. has a maximum speed of 20 miles per hour or less, with or without human propulsion on a paved level surface.

STATE AND LOCAL REGULATION OF E-SCOOTERS

The act generally authorizes OSTA to regulate e-scooters within its jurisdiction (i.e., on state highways and roads on state-owned property). The office has this authority with respect to bicycles and e-bikes.

By law, OSTA must adopt regulations governing highways and roads in its jurisdiction, including the operation of motor vehicles and bicycles. The act additionally requires these regulations to cover e-scooter operation.

Existing law authorizes municipalities to regulate bicycles, as long as their ordinances do not conflict with state laws or regulations. The act extends this authority to allow municipalities to regulate e-scooters. Thus, among other things, municipalities can adopt ordinances requiring annual licensing of e-scooters or registration of e-scooter sales and ownership changes.

PARKING E-SCOOTERS

The act allows a person to park an e-scooter on any sidewalk, as long as (1) it is parked in a manner that does not impede the reasonable movement of pedestrians or other sidewalk traffic and (2) doing so is not prohibited by a municipal ordinance or OSTA regulation.

CONFORMING CHANGES TO TREAT E-SCOOTERS LIKE BICYCLES

The act makes conforming changes to treat e-scooters like bicycles and e-bikes. Among other things, it:

1. exempts e-scooters from emissions inspections;

2. requires e-scooter riders to comply with driving laws applicable to bicycles (e.g., signaling before turning);

3. requires motor vehicle operators to treat e-scooters like bicycles (e.g., when passing);

4. imposes a 100% surcharge on fines for certain moving violations involving a motor vehicle and an e-scooter;

5. prohibits parents and guardians from authorizing or knowingly permitting their wards to violate state laws or local ordinances on e-scooters; and

6. makes it an infraction not to equip e-scooters with lights and reflectors.

HELMET REQUIREMENTS

E-Scooter Helmet Requirements

Under existing law, helmets must generally be worn by (1) e-bike riders and passengers and (2) anyone under age 16 who rides a bicycle, non-motorized scooter, or skateboard or who wears in-line or roller skates.

The act additionally requires e-scooter riders under age 16 to wear helmets. It also requires the Department of Consumer Protection to post on its website material concerning the dangers of riding an e-bike or e-scooter without a helmet and promoting the use of helmets while riding them, which it must do under existing law for bicycles, skateboards, and roller and in-line skates.

Helmet Standards

The act expands the acceptable helmet standards by requiring anyone who must wear a helmet to wear one that conforms to specifications established by the American National Standards Institute (ANSI), the United States Consumer Product Safety Commission (CPSC), the American Society for Testing and Materials (ASTM), or the Snell Foundations' Standard for Protective Headgear for Use in Bicycling. Under prior law, (1) helmets worn by e-bike riders and passengers had to meet the standards set by CPSC or ASTM and (2) other helmets had to meet the standards set by ANSI or the Snell Foundation. The act requires businesses that rent e-scooters to provide helmets to renters that meet the applicable standards, as they are required to do under existing law for bicycle rentals.

Finally, the act makes a corresponding change by extending the sales tax exemption for bicycle helmets to include helmets that conform to CPSC or ASTM standards. By law, unchanged by the act, the exemption applies to helmets that meet standards set by ANSI and the Snell Foundation.