Scooting the Boundary
An Analysis of E-Scooter Policy Harmonization
May 2020
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This report was prepared by students in the George Mason University Schar School of Policy and Government’s Masters of Arts in Transportation Policy, Operations, and Logistics (TPOL) in conjunction with a student pursuing a PhD in Civil and Infrastructure Engineering.

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Exciting real-life learning opportunities can be rare in a graduate education program, especially those that deal with emerging technologies, such as e-scooters, and areas of lightly treaded policy ground, such as micromobility. It is in this vein, the entire team would like to thank Chris Stockwell of Bird for giving our team the opportunity to explore this policy topic over the last several months.

The team would also like to thank our faculty advisors Dr. Jonathan L. Gifford and Lauren N. McCarthy for the countless hours spent over the last several months mentoring the team and providing invaluable guidance that leads to the proper formulation, organization, and completion of this report.

About the Schar School of Policy and Government

The mission of the Schar School of Policy and Government is to advance the public good. The Schar School provides students with the knowledge, skills, attitudes, and values to become leaders and managers in the private, public, and nonprofit sectors. These graduates apply the knowledge and skills gained in the classroom at some of the most prestigious companies, consulting firms, nonprofits, multinational organizations, and government agencies in Washington, DC, and beyond.

About the Transportation Policy, Operations, and Logistics Program

The Master of Arts in Transportation Policy, Operations, and Logistics (TPOL) program at George Mason University’s Schar School of Policy and Government is designed for students and practicing professionals engaged in planning, regulating, managing, and operating transportation facilities and services. Students obtain a working knowledge of the theory, policy, law, research, and practices required to effectively and efficiently supply and operate transportation facilities and services.

This report serves as partial fulfilment of the PUBP 722 Practicum in Transportation Policy, Operations, and Logistics course requirements. The course is an in-depth field study of ongoing transportation policy, operations, or logistics situations and requires students to engage in the design and delivery of actions to manage or resolve problems and opportunities. The course is also open to students in other George Mason University degree programs, including, this semester, the PhD in Civil and Infrastructure Engineering.
COVID-19 Statement

During this spring 2020 study, the COVID-19 pandemic is underway, with potentially devastating consequences to multiple transportation services. In addition to shelter-in-place orders, health and safety concerns have led to an overall drop in mass transit and shared mobility ridership. While most cities, including some selected as case studies for this project, have temporarily suspended their e-scooter programs, some others, such as San Francisco, have designated micromobility devices as “essential modes” of transport (Plautz, 2020). New York City has rescinded its ban on e-bikes to aid online food delivery services (Khafagy, 2020). However, e-scooter operators and their ride-hailing investors have actively consolidated their staff and vehicle fleets to accommodate a weakened economy. A majority of use-case analysis included in this study does not account for what the future may bring to the fate of micromobility if the existing conditions extend into the upcoming winter. Indeed, some observers have already called for micromobility companies to partner more effectively with cities to mitigate post-COVID-19 travel behavior shifts towards private automobiles (Moore, 2020).
Executive Summary

While e-scooters have been around since the early 20th century, over the last three years, this technology has transitioned from a fledgeling disruptive technology to an accepted mode for short-distance trips, to even an essential mode of transport during community emergencies (COVID-19). This e-scooter revolution began in 2017 with the rapid deployment of e-scooters in several metropolitan areas throughout the United States. This rapid deployment resulted in an initial pushback by local regulators based on citizen complaints and resulted in many localities banning e-scooters while they developed regulations to manage safe operations and deployment of e-scooter sharing programs.

Given regulation of e-scooters primarily occurs on the state and local levels, the formation of state and local e-scooter regulation has led to a patchwork of laws across the nation. These laws often vary between one political jurisdiction and another within the same metropolitan region, creating confusion for e-scooter users on laws ranging from helmet requirements to permissible riding and parking locations. Our research showed that harmonization of micromobility regulations has been successful in some areas of the U.S. and elsewhere around the globe, and identified areas related to safety and e-scooter operations in the United States ripe for harmonization. Using this information, the team undertook an analysis of disharmonized regulations within six metropolitan areas of the United States: Los Angeles Metro, Miami Metro, Minneapolis-St. Paul, Boston, and Oakland-Berkeley.

The team’s analysis explored cases for and against harmonization, as well as challenges that would need to be overcome to harmonize scooter regulation successfully. The team found that certain policy areas, such as those affecting public safety, would have a greater impact if harmonized among abutting localities. Collaborative efforts between the neighboring jurisdictions can help cities effectively meet the requirements of public and private stakeholders, without requiring reinvention of the wheel.
Definitions

**Application Program Interface (API):** A computing interface that defines interactions between multiple software intermediaries. It defines the kinds of calls or requests that can be made, how to make them, the data formats that should be used, the conventions to follow, and more.

**Dockless Bikeshare:** A bikeshare system that does not require a docking station.

**Dockless E-scooter:** A motorized standing scooter with tandem wheels that is available to the public for rental through a rental system that does not require docking stations.

**Dockless Mobility Systems:** Consist of devices, such as bicycles or scooters, that do not require fixed docking stations for users to receive or return units.

**E-scooter:** A motorized electric powered standing scooter with tandem wheels, and a large deck in the center, on which the rider stands. It is a subset of micromobility.

**E-bike:** An electric bike with a built-in electric motor that assists in propulsion.

**General Bikeshare Feed Specification (GBFS):** The open data standard for bikeshare. GBFS makes real-time data feeds publicly available online in a uniform format so that map- and transportation-based apps can easily incorporate this data into their platforms.

**Geofencing:** The use of GPS or RFID technology to create a virtual geographic boundary, enabling software to trigger a response when a mobile device enters or leaves a particular area.

**Harmonization of Regulations:** Refers to an approach that brings uniformity of regulations or policies between two or more political jurisdictions. It is one response to the problems arising from policy/regulatory differences among political units; it is also one form of inter-governmental cooperation.

**Metropolitan Area:** A region consisting of one or more abutting political jurisdictions with populations that often transverse political jurisdictions for work and (or) leisure activities.

**Metropolitan Planning Organization (MPO):** A federally mandated and federally funded transportation policy-making organization in the United States that is made up of representatives from local government and governmental transportation authorities.

**Micromobility:** Refers to a variety of small devices under 1,000 pounds, operating at speeds typically below 15 miles per hour (mph), and ideal for short trips up to 6 -miles long. Examples include electric scooters, bicycles, skateboards, and other devices designed for short-distance travel.

**Mobility Data Specification (MDS):** A standard for exchanging data between mobility operators and cities or other regulators. Consisting of several APIs, it allows agencies to analyze data from mobility operators in a standardized format as well as implement regulation digitally.

**Permit Program:** A license by a government agency for a business allowing it to conduct operations per existing laws and regulations.
Pilot Program: Also sometimes called a feasibility study or experimental trial, a pilot program is a small-scale, short-term experiment that helps an organization learn how a large-scale project might work in practice.

Political Jurisdiction: A state, city, or county in which citizens are represented by an elected body charged with enacting laws, regulations or ordinances.

Right-of-Way (ROW): A right to make a way over a piece of land, usually to and from another piece of land. A right-of-way is a type of easement granted or reserved over the land for transportation purposes, such as a highway, public footpath, rail transport, canal, as well as electrical transmission lines, oil and gas pipelines. Right-of-way also refers to government-owned land dedicated for use as a roadway or other public way.

Rules of the Road: Is a customary practice developed in the interest of safety and often subsequently reinforced by law, such as always driving on a particular side of the road or yielding the right of way.

Shared Mobility: Refers to transportation services and resources that are shared among users, either concurrently or sequentially. This term broadly includes bikesharing/scooter sharing (a.k.a, shared micromobility), carsharing, ridesharing/ridehailing, public transit, and micro-transit/shuttles.

Shared Mobility Devices (SMDs): Include pedal bicycles, electric bicycles, electric scooters, and electric mopeds. SMDs are provided by private companies and include both docked and dockless systems.

Short Messaging Service (SMS) Payment: A way of paying for goods, services or products via a text message sent from a mobile phone. These payment messages work like standard SMS. With the SMS payment system, purchasers send a text message to pay for an item or service. This text message is sent to mobile payment providers.

Dockless E-scooter: A motorized standing scooter with tandem wheels that is available to the public for rental through a rental system that does not require docking stations.

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Washington DC Metropolitan Area (DMV): Is the area is the metropolitan area centered on Washington, D.C., the capital of the United States. The area includes all of the federal district and parts of the U.S. states of Maryland, Virginia and West Virginia. It is part of the larger Baltimore–Washington metropolitan area.

General Bikeshare Feed Specification (GBFS): The open data standard for bikeshare. GBFS will make real-time data feeds publicly available online in a uniform format so that map- and transportation-based apps can easily incorporate this data into their platforms.
**Short Messaging Service (SMS) Payment**: A way of paying for goods, services or products via a text message sent from a mobile phone. These payment messages work like standard SMS. With the SMS payment system, purchasers send a text message to pay for an item or service. This text message is sent to mobile payment providers.
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Introduction

Over the past decade, shared micromobility, in the form of station-based bikesharing, electric bikesharing, dockless bikesharing and electric scooter sharing, has gradually embedded in the urban transportation network. These modes cater to the urban needs of the residents, visitors and commuters by adequately satisfying a latent demand for their short-distance trips. Given the volatility and disruptive nature of these micromobility services, it is crucial for the cities and policymakers to innovatively update their policy frameworks, and accommodate these new technologies adequately. The historical footprint of regulatory harmonization presents it as a reliable policymaking attribute to effectively align the expectations and policy frameworks of two or more neighboring political jurisdictions. In addition to the transportation sector, internationally, harmonization of regulations has benefitted several other industries like pharmaceutical, banking, education and many more.

Since 2010, several forms of low-speed wheeled transportation devices have become readily available across U.S. cities. Horace Dediu coined the term micromobility for these devices and defined them as "everything that is not a car" and weighing less than 1,000 pounds (Joselow, 2020). Micromobility, as a mode, most commonly includes devices like electric scooters, bikes, e-bikes, and hoverboards. Shared micromobility, as a business model, enables short-term, fee- or membership-based access to on-demand micromobility devices.

Modern shared micromobility first entered the public realm as docked bicycle systems that utilized stationary docks where users could initiate rented time on the bicycles. These bicycles then needed to be returned to a dock owned by the vendor once the customer completed their rental. Dockless bicycles followed, enabled via mobile application platforms. The mobile payment process eliminated the need to return the bike to a stationary dock. In late 2017, a new generation of shared micromobility appeared in the form of e-scooters. The earliest deployments of this technology were by Santa Monica, California-based Bird. The company first deployed "flocks" of dockless e-scooters in San Francisco. Users immediately took to the new devices, and as the concept gained popularity, numerous competitors entered the market worldwide. As a result, by 2018, e-scooters were a common sight on sidewalks and streets in many urban areas.

This rapid expansion was not without friction and ushered in several policy challenges. Recognizing the appeal and usefulness of the devices to the general public, many city governments initiated the integration of micromobility into their transportation plans. However, a lack of robust deployment framework has hamstrung the systematic launch of these e-scooter systems, thereby leading the local jurisdictions to take discrete actions. In some cases, the variety of regulatory actions set back the integration of e-scooters into the urban environment. For example, many states and localities had established rules for bicycle shares, but e-scooters did not meet the criteria to be regulated under bicycle share laws, and in some states, e-scooters were classified similarly to motorcycles. Additionally, several competitors to Bird began to emerge, expanding the spread of e-scooters. The rush to implement local laws to regulate this new form of micromobility under pressure from both supportive and unsupportive constituents led to an uncoordinated patchwork of regulations among multi-jurisdiction urban area across the country.
This report begins the discussion by describing the research methodology and selection of case studies used for policy analysis. What follows is a comparative analysis of policy areas builds on the premise mentioned above, by evaluating the opportunities, barriers, benefits and alternatives to applying regulatory harmonization as a path forward to stabilize the e-scooter sharing industry. Findings of this study project several benefits to the primary end-users, policymakers, service providers and other stakeholders. The report concludes with the team's recommendations regarding the harmonization of e-scooter regulations.

**Research Methodology**

The goal of this report is to identify policy areas where harmonization of e-scooter regulation could be beneficial to multi-jurisdiction urban areas through the evaluation of a subset of e-scooter share programs located in the United States. At the beginning of the project, the team assumed scooter harmonization would be beneficial but was unsure what aspects should be harmonized, and the degree of benefit harmonization could provide. This report summarizes e-scooter regulation trends, commonalities, and differences by examining a series of case studies completed by the project team.

During the initial phase of the project, the team analyzed e-scooters operations in several large urban areas in the United States comprised of diverse regulatory jurisdictions, representing areas where e-scooter customers are likely to cross jurisdictional boundaries during their trips. The locations were also selected to account for various regional and cultural differences across the U.S., representing both Dillon Rule states, where localities can only act on express permission from the state legislature, and Home Rule states, where local governments are granted more authority based on a home rule charter. All the selected case-study locations had or currently have an active presence of Bird Scooters, the project client. The selected locations are:

- Boston, Massachusetts Area
- District of Columbia & Northern Virginia
- Los Angeles and Santa Monica, California
- Miami, Florida Area
- Minneapolis-St. Paul, Minnesota
- Oakland-Berkeley, California

Each of the selected metropolitan areas includes cities with regulatory and (or) policy frameworks in place for the selection of e-scooter share operators, regulation of those operators, and laws governing user behavior, but lacks significant harmonization among neighboring jurisdictions within the metropolitan region.

Following case selection, the legal and regulatory framework, including operating regulations, permitting requirements, and other applicable laws and regulations, for each locality were examined to determine the similarities and differences. The team identified key influential factors of e-scooter policymaking, aspects of to evaluate the benefits, barriers, opportunities and
alternatives, to apply regulatory harmonization effectively. After this identification process, the team conducted research and interviewed micromobility program managers and experts across the country to gain outside perspective on challenges and opportunities related to harmonizing e-scooter regulations. These findings were consolidated into this report and are presented with conclusions based on the evaluation of those findings. The team’s research finds both benefits and drawbacks to e-scooter harmonization. This report examines, through the lens of the six case study regions, what policy areas could be harmonized, its benefits, challenges to achieving harmonization, as well as alternatives to full regulatory harmonization and other relevant findings from our research.
Policy Harmonization

There are many reasons to assume that policy harmonization is a suitable way forward for shared micromobility. Several examples support policy convergence to streamline operations for users and service providers. On the other hand, several factors challenge the pathway toward harmonization. This section reviews the concept of policy harmonization at various levels of government, and the drivers, advantages, and challenges of moving toward harmonization across jurisdictional boundaries.

Globalization is a driver for the appeal in the harmonization of national policies. Majone Giandomenico defines harmonization as constructing “regulatory requirements or governmental policies” of numerous jurisdictions to be indistinguishable or at least more parallel (Majone, 2014, p. 01). Harmonization is one remedy to complications resulting from a policy or regulatory disparities among political entities; it is also a manner to create inter-governmental cooperation. Giandomenico references David Leebron, claiming harmonization “is a normative assertion that the differences in the laws and policies of two, or more, jurisdictions should be reduced” (Majone, 2014, p. 01). Giandomenico citing Leebron, states that this may be accomplished “either by assigning decisions to a common political authority; or by different [localities] adopting similar laws and policies, even in the absence of such a common authority” (Majone, 2014, p. 01).

Types of Harmonization

Policy harmonization can occur at various levels of government to meet the demands of their respective stakeholders. For example, policies at the local level allow more tailoring to the desires of individual communities than those at the state level. Policies at the state and federal level can allow for uniform policy development across local jurisdictions but do not address unique local concerns. While state and local policy most affect e-scooter deployment, federal-level guidance is a primary driver of transportation policy.

Federal Initiatives

Federal involvement is imperative in the cases where a decentralized effort in policymaking at the state level or local level impinges national efficiency and equity objectives (Boadway, 2006). One such example is the common transport policy initiative by the European Union (Article 4(2)(g) from Title VI of the Treaty on Function of European Union (TFEU)) that streamlines the legal provisions among all the member states (Coito & K.W. Blaser, 2020). This uniformity was achieved through harmonization of regulations and administrative provisions, national laws, and the social, technological, and tax environment in which transport services are offered while safeguarding the fair conditions of competition. As a result of the liberalization of the transport markets, a Trans-European Transportation Network was created, with increased activity in the freight and passenger transportation. As this report focuses on transportation, a few examples of federally harmonized policies include seat belt use, EZ Pass toll collection, and air traffic control.
Federal initiatives within the U.S.

Seat belts: According to the Insurance Institute for Highway Safety (IIHS), all states and the District of Columbia, except New Hampshire, require adult front-seat occupants to use seat belts. Furthermore, adult rear-seat passengers are also required to use seat belts under the laws of 30 states and the District of Columbia (IIHS, 2020). Primary enforcement laws in 34 states and the District of Columbia allow a police officer to stop and cite a driver solely for not using a seat belt. In states with secondary enforcement, another violation must first be cited prior to police enforcing the seat-belt law. As a result of this partial harmonization, a study by the National Highway Traffic Safety Administration (NHTSA) found that, between 1960 and 2012, seat belts saved more lives—329,715—than all other new vehicle technologies combined, including airbags, energy-absorbing steering assemblies, and electronic stability control (Kahane, 2015).

E-ZPass: The E-ZPass electronic toll collection program is comprised of toll entities that operate across 17 states in the U.S. E-ZPass is widely recognized by the public, and is the world leader in toll interoperability, with over 41 million E-ZPass devices in circulation (E-ZPass Group, n.d.). If each of the 17 states used different electronic toll collection systems, drivers would have to keep different toll collection devices for each state’s individual system. Cross-state travel in vehicles is an effective scaled-up comparison to e-scooter trips occurring across local boundaries.

Federal Aviation Administration (FAA): The FAA is tasked to modernize, operate, and maintain the National Airspace System, regulate civil aviation, develop and carry out programs to control aircraft noise and other environmental effects of civil aviation, and regulate U.S. commercial space transportation (FAA, 2020). This entity has national reach across multiple jurisdictions, and a variety of stakeholders and was specifically created to ensure nationally uniform regulation of aviation.

National initiatives outside the U.S.

Automated Vehicle Technology: The government of Singapore passed an amendment to its Road Traffic Act in 2017 to provide national regulation on the trials related to automated vehicle (AV) technology. The law addresses all activities that "relate to the design, construction or use of autonomous motor vehicles or otherwise relates to advances in the design or construction of autonomous motor vehicles" (Ng & Budiyan, 2017). The law seeks to ensure the safety of all road users and technology operators by imposing strict regulations on testing and compliance. In addition, the law penalizes any individual that intentionally interferes with the AV testing process.

Furthermore, regulatory testing is centrally overseen by the Land Transport Authority (L.T.A.) to avoid inconsistencies or interference from local, regional, and other national agencies. Such centralized governance garners a streamlined testing process, establishing a single point of contact to all the participating entities.
**MaaS initiatives:** Recent developments in standardizing the data sharing specifications have helped the growth and conceptualization of future systems, like mobility as a service (MaaS). Once considered utopian, developing a seamless transportation framework that prioritizes low-emission modes is of prime importance to the transportation providers. With the rise of on-demand mobility through shared and autonomous vehicles in the future, MaaS aggregators may promote seamless cross-border activity (Trimble et al., 2018).

Finland's Ministry of Transportation has deregulated the telecom market to enable MaaS aggregator applications by mandating the accessibility of data from public transportation organizations. Effective since 2018, this initiative is the first known national-level regulatory effort to enhance the establishment of basic requirements for MaaS services (MaaS Alliance, 2017). The Code liberalizes the telecom and transport markets to promote market-based, user-oriented transport services based on healthy competition. The policy harmonizes the data accessibility standards of public transportation services across the nation by facilitating the provisions on the interoperability of booking and payment systems on the same platform.

**State-Level Initiatives**

Similar to national-level initiatives preemptioning state or local initiatives, state-level initiatives empower the state legislatures over the local jurisdictions. While some state initiatives provide regulatory rights to the local jurisdictions, some others preempt the cities and local jurisdictions from having any control. A report from National Association of City Transportation Officials (NACTO) indicates that by the beginning of 2019 private e-scooter operators had introduced at least 44 bills for state-level preemption of device classifications, mostly attempting to preempt the cities from regulating the services at the local level (NACTO, 2019). This scenario is comparable to the state-level policy preemption of Transportation Network Companies (TNCs) in the United States (James, 2018).

Since the launch of Uber in 2010, there has been an unprecedented rise in ride-hailing services across the U.S. through Uber, Lyft, and similar competing operators. Shortly after the launch of Uber (then UberCab), the city of San Francisco issued a cease-and-desist order at a violation fine of $5,000 per event (Kolodny, 2010). Renaming the service to its existing brand, Uber continued its services as it claimed that its business model does not fall within the local taxi cab regulations issued by the San Francisco Municipal Transportation Agency (SFMTA).

Reports suggest, since 2010, ride-hailing companies have lobbied state legislatures to preempt the local regulations with a statewide regulatory framework, which is usually much less strict than the former (James, 2018). Starting with Colorado in 2014, most states, except Oregon, have regulated the operations of the TNCs, thereby withholding regulatory powers from the local jurisdictions. Some other states, including Vermont, Nevada, New York, Pennsylvania, and Maryland, have customized their frameworks by retaining the regulatory rights to their core economic or densely populated regions of Burlington, Las Vegas, New York City, Philadelphia, and Baltimore, respectively. Some of the benefits of state-level regulation are:

- Licensure: Drivers of TNCs are only required to possess a single license to operate
• Insurance: Drivers must possess specific vehicle insurance, avoiding irregularities in requirements relating to commercial insurance

Although the benefits prevent TNCs from patchwork regulations and help them offer seamless service within a state, these benefits often focused on a single stakeholder. The preemptive measure protects the operators from sharing their data for vehicle service locations, and other trip-level information, thereby preventing the cities and local jurisdictions from assessing the impact of such services on their regional transportation goals (DuPuis et al., 2017; Moran, 2016).

However, in some cases, exempted regions like New York City and Portland can impose stronger policy requirements and included strong language in their ordinances for information related to wheelchair-accessible trips. Some other cities, like Seattle, developed a non-binding agreement with the TNCs to receive the average earnings of their drivers to refine their transportation plans effectively.

Local/Regional Initiatives

As discussed in the earlier sections on state-level preemption, data sharing plays a crucial role in helping the cities understand the demand hotspots to be able to prioritize infrastructure improvements and appropriate budget allocation. The data generated by the micromobility systems is one such example. Bikeshare systems in the U.S. have been evolving since 2007, even before the launch of ride-hailing services. Although it took a few years for the cities to realize the importance of harmonizing the data standards, the present-day bikeshare data format, General Bikeshare Feed Specification (GBFS), helped cities in their multimodal planning initiatives. The GBFS standard was derived from the General Transit Feed Specification (GTFS), and also served as a basis for the development of the present-day controversial standard of Mobility Data Specification (M.D.S.). The M.D.S. standard aims to harmonize the data reporting standards of micromobility services across the United States. SFMTA’s program on Mobility Permit Harmonization attempts to streamline its adoption process of new mobility services by bringing all permit programs into one single umbrella. The initiative also aims to harmonize the data reporting standards of all shared mobility services for an efficient way to analyze their impact and monitor their performance long term. However, this initiative applies only to the jurisdiction of SFMTA and does not undertake any cross-jurisdictional collaborations.

An example of cross-jurisdictional collaborations is the partnership between Lime and the metropolitan planning organization (MPO) of the greater Boston region. The Metropolitan Area Planning Council (MAPC) is a regional planning agency that serves the residents and commuters of 101 cities and towns of Metropolitan Boston. As a part of a new long-range regional plan, MAPC has advocated for a region-wide collaborative deployment of a dockless bikesharing system to promote smart growth and regional collaboration. The collaborative effort brings 15 neighboring jurisdictions within and around the greater Boston region on a single platform of agreement, initially with two dockless bikeshare operators, Lime and Spin (Goldsmith & Leger, 2020). Spin decided to discontinue the agreement by 2018, as it indicated an interest in the e-scooter fleet more than bikesharing. Despite the historical evidence that most public-private collaborations in transportation had bitter endings, this collaborative initiative
served the objectives of MAPC throughout its 18 months of the agreement at which time Lime chose not to renew the agreement to focus on e-scooters. The participating jurisdictions include Arlington, Bedford, Belmont, Chelsea, Everett, Malden, Medford, Melrose, Milton, Needham, Newton, Quincy, Revere, Waltham, Watertown, and Winthrop. These regions do not include the areas where Bluebikes (station-based bikesharing of Boston) had an operating agreement.

Through this project, MAPC aimed to understand the impact of dockless vehicles on the mode choice and user behavior within the region. Therefore, the council has advocated deploying the vehicles at no cost to the neighboring jurisdictions, in exchange for a data-sharing agreement with the Lime (Akhavan et al., 2019). The data was collected through M.D.S. The harmonized operational policy among the participating jurisdictions quickly allowed MAPC to assess various trip-level factors that influence the mode choice of residents and commuters from participating regions. The program ultimately helped the MAPC to derive the demand for bikesharing systems in the outer cities of the region, providing insight on cross-border activities and relevant infrastructure requirements. In addition to the case of MAPC, there are several multi-jurisdiction station-based bikeshare initiatives across the nation, such as Capital Bikeshare, which achieved a successful regionally harmonized deployment in the D.M.V. region (Washington D.C., Maryland, and Northern Virginia) that facilitated cross-border bicycling activity in the form of a “Bike Transit” (G. Klein & Vega-Barachowitz, 2015).

After experimenting with the SmartBike project in 2008, the District Department of Transportation (DDOT) serving Washington, DC, moderated a regionally collaborative launch of the Capital Bikeshare system, with the support of the Metropolitan Washington Council of Governments (MWCOG) to bring the partner jurisdictions to a common table. Although Capital Bikeshare jurisdictions operate on a unified deployment structure, the governance model is still decentralized. A recent update plan of Capital Bikeshare, a joint report from DDOT, Kittelson & Associate, Inc., and Foursquare Integrated Transportation Planning, discusses some of the alternatives that the participating jurisdictions may consider (DDOT et al., 2020). The draft report suggests that both centralized and decentralized governance models have their benefits and drawbacks. While centralized governance through a public body can oversee the requirements of day-to-day activities in participating jurisdictions, it may create additional expenses for managing the public body itself. Also, a centralized governance model may increase the decision-making distance between the jurisdictions both in terms of funding and implementation.

On the other hand, the existing decentralized governance model can be revamped by expanding the existing standard operating procedures (S.O.P.) to engage all the participating jurisdictions in a Capital Bikeshare board. This is expected to improve the responsiveness of both the jurisdictions and Lyft, the common operator, to any issues. Also, the draft suggests that an elected chain of command can supplement this decentralized model in quickly attending to the issues outside the normal reporting structures.

As the operational structure of e-scooter sharing closely resembles that of dockless and station-based bikesharing systems, we hypothesize that similar collaborative efforts may improve
the overall serviceability, operational efficiency, and consumer satisfaction of the dockless system. The following discussion presents the implications of such collaborative policy harmonization efforts of e-scooter sharing services.

Background and Overview: The E-Scooter Evolution and Revolution

The use of e-scooters as shared mobility devices (SMDs) is a relatively new concept, mainly developing since the fast and geographically broad rollout of dockless shared e-scooter programs since 2017. Currently, there is no national regulation of e-scooters. This section discusses the evolution of e-scooters and the current state of disharmonized laws and regulations.

Motorized E-Scooter Early History

Baron Karl von Drais de Sauerbrun of Germany first manufactured human-powered, two-wheeled devices, which became bicycles, tricycles and eventually led to the development of kick scooters around the year 1817. Around 1840, some of these devices were motorized with a rear treadle. In 1895, the U.S. issued a patent to Ogden Bolton Jr. for his battery-powered bicycle.

First incorporated in 1913, the Autoped Company of America in Long Island, New York, is considered “the true ancestors of the modern motor scooter.” The devices made by Autoped had the engines mounted over the front wheel, with the clutch and brake operated on the steering column, and people claimed it could reach speeds of 35 mph, although it was unstable when it reached about 20 mph (Mansky, 2019). At that time, safety rules and regulations for motorized vehicles, as well as traffic lights, were 15 years away from being enacted. It is not clear the exact time the market for these products halted, but the last batch of scooters produced by Autoped’s successor Everready occurred in 1921. In addition to safety concerns, one of the major issues that affected the scooter’s commercial success was that the devices were considered too expensive and toys for the rich, thus they were unaffordable for most people (Mansky, 2019).

In 1936, after the Great Depression, a company known as The Cushman Company introduced different types of scooters to meet the demands that Autoped could not meet. However, Cushman and its competitors were gradually sidelined in subsequent years as lawmakers sought to have control over the use of automobiles by enacting motor traffic rules and regulations (Mansky, 2019). As a result, motor vehicle traffic overtook the smaller electric devices, and the road became the domain of the automobile, effectively pausing the integration of various micromobility devices into the streetscape. It would not be until the modern era that such devices would appear on the street again.

E-Scooters: 2.0 (Current Phase)

After a long hiatus from the transportation market, e-scooters made a comeback in the form of SMDs (e-scooter sharing). E-scooter sharing devices were first deployed in Santa Monica, California, in September 2017 by Bird, with many residents gradually embracing the technology and others taking issue the new technology (Laker, 2019).
In a span of just three years, e-scooters reached about 500 million users globally (Temple, 2019). E-scooters are currently available in nearly 350 cities worldwide. The U.S. has more than 100 cities with SMDs deployed. Germany, Austria, France, Denmark, Portugal, Spain, Belgium, Israel, Australia, and other countries have seen a surge in the use of these devices for mobility purposes.

By the end of 2018, NACTO estimated that 38.5 million trips had been taken on shared e-scooters in the U.S. (NACTO, 2019). Potential factors accounting for the increased use of e-scooters are traffic congestion in most U.S. cities, increased usage of GPS-enabled smartphones that enable payment, and private financing that has all fueled the increased supply of the devices (Clewlow, 2018). Research indicates that 70 percent of people consider e-scooters a positive tool because they believe they will expand transportation options, enable a car-free lifestyle, serve as a convenient replacement for short trips in personal vehicles, and are a complement to public transit.

Regulatory Developments

City governments were unprepared for the initial introduction of shared e-scooters in 2017, having minimal or no legal framework governing their use in place. Operators were operating under the mantra “it is better to ask for forgiveness than permission.” Chaos quickly ensued as riders ended their trips by leaving scooters parked in the middle of sidewalks, in front of private businesses, and other disruptive locations. Residents and some officials quickly perceived e-scooters not only as a nuisance, but as a threat to the safety of both riders and non-riders. At a protest in Santa Monica, some residents purposely damaged e-scooters, setting them on fire and throwing them into the ocean (Newberry, 2018). To curtail these actions and restore order, formalized policies and regulations became urgently necessary to enforce traffic rules and regulate the actions of the companies deploying e-scooter. Across the country, local governments took vastly different approaches to the regulation of dockless shared mobility, some proactive, others reactive, as companies deployed devices before governing bodies could adopt laws and regulations.
Pilot Programs and Permitting Structure

All scooter programs in the case studies began as pilot programs and many still remain as pilot programs today. The pilot programs allow for operating permits to be issued to e-scooter share companies that participate in the pilot with the objective that observations made and data collected through the pilot program will inform a codified regulatory framework. The team found in the course of researching this report the policy areas address by locally administered pilot programs were generally consistent; however, the policy areas were addressed differently by each locality with many differences in operator and user regulations between neighboring jurisdictions in the same metropolitan areas.

Pilots and Permits

Most jurisdictions introduced regulation through pilot programs to serve as a medium through which operating rules and regulations can be tested, rider and operator behavior can be observed, and public opinion could be taken into account.

Permits grant operators the privilege to provide services within a limited geographical area. Normally, permits are licenses issued by local and state authorities. Before permits are issued, operators need to meet all the rules and regulations designated by the governing body which has authority over a given jurisdiction.

Factors of the Permitting Process

For a permit to be approved for an operator to conduct business in a political jurisdiction, regulators tend to focus on several factors. Common factors considered by all case study cities through at least one pilot phase include:

Device specifications: The e-scooters to be allowed within a jurisdiction should conform or meet certain standards approved by regulators. These standards differ from one area to the other. If these standards are not met, the regulator reserves the right to refuse or deny the operator license to operate in the jurisdiction. Some examples of these specifications on e-scooters include bell, light, on-board GPS, customer service phone number, unique identifier, and theft deterrent warnings.

Right-of-way operations: Riders are usually expected to yield the right-of-way to pedestrians and give an audible signal before overtaking and passing any pedestrian. It also addresses where and how operators and riders should use the devices in the right-of-way, regarding parking and riding locations and behavior. Many localities prohibit riders from using public sidewalks in specific areas or all of the jurisdiction. This rule may apply to riding and parking devices on sidewalks, especially when impeding a ramp or travel path.

Safety standards: Measures in ensuring the safety of riders or users through education, vehicle monitoring, and vehicle maintenance. It takes the form of insurance requirements,
vehicle requirements, and information operators must communicate to users of systems. (Clewlow, 2019).

**Geo-fencing specifications:** GPS-based geographic boundaries can trigger a response when a mobile device enters or leaves a particular area. This often prevents devices from operating at full capacity by stopping the e-scooter or limiting the speed. Geofencing may not affect scooter performance but could fine an end-user for parking in a prohibite area.

**Fee structure:** These are funds received by the cities (regulators) for using the public rights-of-way, rendering administrative and enforcement services, infrastructure improvements and access enhancements for underserved communities. The fees are generally deposited into "New Mobility Account" to be managed by the regulators (Shaheen & Cohen, 2019) These fees are often paid by the operators before and after their permits applications are accepted. Examples of some of these fees are administrative fees for the operation permit or device fees charged per device deployed within the jurisdiction.

**Fleet specifications and information:** The operator is required to provide the type of vehicle to be used in operation, the number to be used, and detailed information about the device, such as the weight, battery type, GPS accuracy, top speed, and safety features.

**Insurance and financial liability:** Operators must be insured at all times to handle or settle any legal disputes that may arise. In most cases, the city and its officials are never to be held liable for any loss or injury that may occur as a result of using the devices.

**Equity and environmental justice:** Equal access should be offered to all members of a community irrespective of one's income, gender, geography, age, or mode of payment. Jurisdictions may impose geographic deployment requirements to ensure operators provide devices for use in socioeconomically disadvantaged communities.

**Data sharing and compliance:** For regulators to be able to make better-informed decisions, operators are required to furnish them with information. This often takes the form of creating platforms that provide information to various stakeholders. Some of this information can only be analyzed when operators make available real-time trip data, parking compliance data, and maintenance data to the stakeholders (Shaheen & Cohen, 2019). As a result, data sharing and compliance are one of the most important factors regulators consider when approving permits for scooter operating companies, as it helps cities expand scooter-friendly multimodal infrastructure (Clewlow, 2019).

The factors above are key to understanding the permitting process, as the process is relatively consistent across jurisdictions. While individual political jurisdictions may create their own scorecards and internal scoring processes, the permitting and program management process
are relatively consistent across the jurisdictions in the case studies and present potential areas for harmonization.
Analysis

The team’s research found a number of areas where harmonization could successfully occur and benefit the majority of stakeholders, based on the fact that several metropolitan areas and their composing political jurisdictions have similar categories of the regulation (operational rules, helmet laws, etc.) and methods of choosing e-scooter sharing operators (pilot programs). The cases for harmonization, such as improved customer experience, also seemed to echo across metropolitan regions, as did many of the challenges.

Analysis of Key Areas for Harmonization

In the analysis of the six case studies, the team found a number of key areas that both influenced every region and would be areas where consistency would need to be achieved to achieve harmonization.

Geographic Context

Some factors that are influential for e-scooter harmonization across cities include the amount of land encompassed within a city, the scale of borders with neighboring cities, the population density of a city, amenities available, proximity to public transit, and climate. One objective of incorporating shared micromobility as part of a city's transportation offerings is to decrease dependency on automobiles, and facilitate first-mile last-mile transport options. First and last-mile transportation remains a challenge for transportation planners as it is where the most congestion occurs, resulting in time delays and wasted energy. This creates its own set of negative externalities, such as pollution and greenhouse gas emissions, and degrading public health. However, e-scooters are unable to solve inefficiencies in sprawled city developments.

One example, the Dallas-Fort Worth area was examined, and it was swiftly determined that as Dallas is about 400 square miles, and Fort Worth is about 350 square miles it is unsuitable for e-scooter operation (Hoopfer, 2017). Furthermore, the city of Fort Worth's population of 778,573 compared to the city of Dallas’ 1.24 million, equates to roughly 2,200 and 3,100 residents per square mile, respectively. In comparison, the population density in Chicago is 11,960 people/square mile (Zipper, 2020). Since the average e-scooter trip is slightly over 1 mile, the lower densities in suburban cities generating fewer trips, high rebalancing costs, and local regulation and permit fees making it undesirable for e-scooter operators (Zipper, 2020). Conversely, according to the Rose, Schellong, Schetzberger, & Hill, article "How E-Scooters Can Win a Place in Urban Transport," a midsize, non-car-centric city such as Austin, Lisbon, Nice, or San Diego with mild weather are classified as a "Scooter Paradise." (Rose et al., 2020).

Another example that raises geography as part of the decision to operate is the City of Miami. The City of Miami is divided into five districts. Out of all the districts, only District 2 hosts an e-scooter program. The bordering districts of Miami are opposed to e-scooters, as the corresponding commissioners consider e-scooters a safety hazard. A neighboring city to Miami, Coral Gables, shares common borders with the District 2 and District 4 to the east. However, in view that District-4 does not authorize the usage of e-scooters, there is only a 1.40-mile border that runs between District 2 and the city of Coral Gables. The real value of cross-jurisdictional
policy harmonization may be measured based on the potential number of users and trips that fall under a cross-border activity. The relatively small border that is shared between these jurisdictions suggests that the cost of harmonizing may outweigh the benefits that can be generated from it, both in operational and service perspective. The City of Miami impounds scooters abandoned beyond District 2 jurisdiction, thereby charging operators $25 per incident. Since the beginning of the program in April of 2019, the city impounded about 358 (Lime), 253 (Jump) and 335 (Lyft) scooters, respectively (Poblete, 2020). One of the greatest challenges for the operators providing service in this region is that adjacent districts are displeased with repeated presence of District-2 e-scooters in their premises. Although, the City of Coral Gables is not included as part of the City of Miami districts and shares its own border with District-2, the City of Coral Gables only allows Spin and Bird to operate with a fleet less than 100.

A separate example, regulation harmonization case for the City of Charlottesville, University of Virginia (UVA), and Albemarle County, where the three entities agreed to adopt the City’s permit as the parent permit. Since the location of UVA campus falls within the Albemarle Charlottesville M.P.O., the campus is split between the two jurisdictions of the county and the city and is served by publicly maintained roads. This setting necessitates that one entity (county or the city) would oversee permitting of e-scooter devices supplying the university campus. As a result, the three entities agreed to adopt the City's permit as the parent permit, which includes the selection of the e-scooter operator (Pietila et al., n.d.).

**Decision Scorecards**

The method a city chooses which and how many e-scooter operators it needs is also a vital factor whether an operator decides to provide service in that city.

One example is Oakland, CA, which specifies detailed criteria on how each provider's e-scooter application will be evaluated. Oakland's permit clearly states that each application shall be evaluated on ten "Shared Mobility Principles," including "inclusive outreach and engagement, racial equity, traffic safety, equitable access to services, public transit, affordability, healthy communities and environment, employment and economic development, privacy and personal data, and collaboration and accountability (City of Oakland, 2019). According to Oakland's criteria, each of these principles is evaluated on a scale of 1 to 10, and a minimum total score of 70 is required to obtain a permit. Conversely, Berkeley, CA, the neighboring city, following the same state laws provides no such guidance. This creates less transparency in the operator approval process.

According to anecdotal evidence collected during an interview with Paul DeMaio, Principal at MetroBike, L.L.C., he stated Arlington County followed the model set by San Francisco Metro Transit Authority. The model is composed of a permit process, and each application is evaluated on ten transportation goals to determine how applicants respond to the needs of Arlington's transportation plan goals. DeMaio mentioned that this year, Arlington received seven or eight applications that were evaluated, and were compared how each applicant's response may meet those goals. Some applications are more in-depth than others, while some do better in responding to equity needs. The county evaluates the program more
holistically and assigns different weights for each goal based on the importance of that transportation goal for the county.

Washington, D.C.’s DDOT also has an evaluation criteria based on the following eight weighted goals: accountability (21%), sound equipment design (3%), safety (27%), innovation (10%), equitable access (15%), labor (11%), sustainability (3%), and data (10%) (DDOT, 2020b). This evaluation process is a blend of Oakland and Arlington.

An evaluation process may either persuade or dissuade some operators from applying, limiting the potential for competition and fleet diversity. Excluding a scorecard or other evaluation technique may favor larger, more experienced operators, as they have experience launching their services in more markets. Requiring strict state laws that govern e-scooters may also result in limited diversification of operators. However, lack of clarification as in the example of Berkeley also creates hardships and possible barriers to entry for operators.

Lack of Collaborative Effort

Collaboration, or lack thereof, among adjoining jurisdictions is a chief consideration for e-scooter operators. As previously stated, Miami only allows e-scooters in one of its five districts, District 2. District 2 contains a 1.4-mile boundary with Coral Gables. The worth of cross-jurisdictional policy harmonization is quantified from the capability of users making trips that fall between borders, economies of scale that may result from operational efficiencies, reduced redistribution costs, and penalties enforced by the cities. Coral Gables only permits Spin and Bird to operate with a fleet less than 100, which limits revenues and increases potential penalties, thereby resulting in low operating income and slim profit margin. Conversely, Alexandria, VA, is accepting some lead from Arlington, VA, to achieve common transportation goals, which should induce more operators to apply.

Right-of-Way Policies

An interesting observation, under Minnesota state motorized foot scooter laws, scooters may not operate on sidewalks except when necessary to enter or leave adjacent property. Also, e-scooters must be operated on the right-hand curb as close as practicable except when passing another vehicle or making a left-hand turn. A left-hand turn requires the operators to dismount the scooter and walk it across the street. The minimum operating age is 12 years old, and persons under 18 are required to wear a helmet. Scooters are required to have a headlight and a tail light and operate no faster than 15 mph.

Geofencing

Geofencing was observed in each city covered within this report. The one unique exception was in Minneapolis where e-scooters are not geofenced and can be ridden everywhere in the region, including St. Paul and the city suburbs. However, once the rental is complete that scooter may no longer be rented until it is returned within the borders of Minneapolis proper.
User Safety

E-scooter speed limits, the requirement to wear a helmet, permission to drive on a sidewalk, and operation on the street or bike lane remain inconsistent across the nation. California state law intentionally required helmet use while utilizing an e-scooter (Chiland, 2018). On January 1, 2019, the requirement to wear a helmet was repealed, but operators still recommend its use. Yet, e-scooter riders under the age of 18 years must continue to wear helmets. The youngest age observed in order to ride a scooter that was identified is under Minnesota state motorized foot scooter laws, which is 12 years old. Another inconsistency is L.A. allows e-scooters to operate up to a maximum speed of 15mph, but in adjacent West Hollywood and in Beverly Hills e-scooters may not exceed 5mph (White, 2019).

Equity Requirements

All cities reviewed in this study included equity requirements through discount programs, a cash payment method, and/or the distribution of scooters. In addition, operators in Berkeley needed to present a plan to put into service adaptive scooters for users with disabilities no later than 6 months of the pilot (City of Berkely, 2018). Oakland elaborated upon these requirements by adding that: i. operators must facilitate a method to receive and respond to complaints in multiple languages, including, but not limited to, Spanish and Chinese, ii. operators must ensure a website or app feature exists for users and non-users to recommend Scooter parking locations, and iii. operators shall offer free or discounted helmets at in-person events, or through their mobile application or website (City of Oakland, 2019).

Community Engagement

Community engagement requirements varied across jurisdictions from providing education on safe scooter use, promoting discount programs, distributing free or discounted helmets, and different methods for commuting with the operators. Two prominent examples are Oakland’s requirement for operators to deliver a proposal for community engagement, including a list of planned presentations, activities and events with community-based organizations, and operators shall offer free or discounted helmets at these in-person events, or through their mobile application or website.

The Case for Harmonization: The Consumer Experience and Safety

Consumers are the top stakeholders who could potentially benefit from a harmonized e-scooter regulation. User safety and experience have a direct link and are a decisive factor in the success of the e-scooter shared mobility service.

Harmonized regulation is necessary for e-scooter users to cross the border without having to deal with different sets of rules and the confusion that might accompany that. Findings from case studies in Virginia and California confirmed that cross-border activity does exist.

In Virginia, an evaluation report of Arlington County’s e-scooter pilot program, which was conducted by Mobility Lab, indicated that 10% of the total trips reported either starts or ends in Washington (Arlington County, 2019). E-scooters began appearing in the City of Alexandria, Virginia, shortly after Arlington County has initiated its pilot program. Similarly, a Populus heat
map of trip endpoints in the City of Fairfax, Virginia shows many of these trips end in neighboring jurisdictions of Fairfax County (City of Fairfax, 2020). Comparatively, scooter traffic in jurisdictions that adopted harmonization is moving seamlessly, as in the case of the City of Charlottesville, University of Virginia (UVA), and Albemarle County in Virginia. Another case for harmonization is in California, where riders are enjoying trips back and forth between Los Angeles and Santa Monica.

The Case Against Harmonization: Lack of Best Practices

There is no agreement on what kind of techniques and technologies operators use to control cross-border trips. Some e-scooter companies equip their devices with geofencing technology that will allow them to operate only within the boundaries of a participating jurisdiction. Some operators, however, use non-restricting geofencing technology that would not hamper border crossing or reduce speed significantly to discourage cross-border activity.

In order for cross-border trips to be seamless, harmonization needs to occur at the operator level. Having conflicting operators on both sides of borders would likely result in many one-way trips, making the ride not as profitable, as scooters would be lying somewhere unused. Additionally, the operator would be burdened with the cost of collecting these devices for recharge from areas that are not participating in the service.

Achieving this level of operator harmonization, however, has not been an easy task, regardless of the level of collaboration between the adjacent jurisdictions. Part of the challenge lies in establishing common criteria for selecting potential operators. If this is achieved, it could also provide some assurance for operators. However, jurisdictions might have concerns over a coordinated selection process, such as the potential for violating procurement rules by favoring an applicant simply because they were selected to operate in a neighboring jurisdiction.
turn, could reduce competition and substantially lower the growth of small and promising mobility entrepreneurs.

Demand on e-scooters is expected to grow. This is evident from the rapid spread and adoption rate of e-scooters as a method of sustainable short-distance travel. Many urban centers around the U.S. are expected to grow, with more population expected to move to the cities (Zarif et al., 2019).

With this growth, safety becomes an important issue. It is understood that municipalities will need to regulate scooters in a way that captures the potential benefits while alleviating the risks (Riggs & Kawashima, 2020). Regulating safety equipment like a helmet, speed limit, and scooting on sidewalks are essential parts of a state or municipal law. Many municipalities do encourage the use of helmet through the operator but do not make it a requirement. Harmonizing these helmet laws across neighboring jurisdictions is critical for user safety, especially the need to expand the requirement to wear a helmet to include adult riders. For instance, in Minnesota's Twin Cities, 18-year-old and younger riders are required to wear a helmet; while in Washington, DC and Virginia, the requirement is 16 and 14 respectively.

Because helmet wearing is not related to specific area characteristics such as climate, geography, existing infrastructure or the lack thereof, it might be easier to regulate it at the federal level. On the other hand, speed and sidewalk riding policy harmonization could be effective if achieved at the state and/or jurisdiction level. For users to know what to expect could improve safety and compliance when riders cross borders. This is important given the challenges associated with enforcement in the field because of dispersion and continuous movement of the devices.

In conclusion, a simpler approach to scooter regulation harmonization might be to regulate these devices in the same way bikes are regulated. This would also have an added safety benefit. If e-scooters were made subject to the same rules as bikes, it would be less confusing to riders, non-riders, and law enforcement. Harmonized rules will have a lasting impact on safe riding.
**Challenges of Harmonization**

There are a number of challenges to harmonization worth considering should governments look to move forward with the harmonization of scooter regulation. Some key drawbacks that need to be considered are lack of regulatory tailoring, the impact stakeholder feedback has on the program, and hampering of creative alternatives.

To effectively harmonize between two or more localities, it's necessary to develop ordinances and policies that are applicable to all localities, reducing the ability to tailor the needs of individual communities. While abutting jurisdictions in most municipalities have many similarities, there will invariably be differences between the desires of their populations and their representatives. For example, in Minneapolis-St. Paul, the city of St. Paul required a contribution of funds toward their park system to account for the use of park trails by scooters while Minneapolis had no such requirement. This will require coordination between two or more political bodies (municipal governments) that are led by elected officials with political concerns that may not coincide with what's best for the overall scooter program. The need to accommodate the policy desires of all municipalities could result in policies that don't meet the full desires of any of the municipalities involved. The coordination that harmonization requires also raises the chance of a deadlock between municipalities should they disagree on the proper course of action for policy problems.

When regulations are harmonized the feedback of individual constituencies can be diluted. For example the citizens of Berkley may feel strongly about keeping the cost of scooter programs minimal because of the large college student population, but the citizens of Oakland may be focused on maximizing the costs passed onto the consumer to minimize Oakland taxpayer finds going towards a program only utilized by a subset of residents. The costs of the program are typically passed on to the scooter sharing operation in the form of a per-scooter fee, which if regulations are fully harmonized would need to balance the concerns of both communities to arrive at an acceptable solution that would likely dissatisfy one or both constituencies.

Harmonization of scooter regulation can also inhibit the agility of regulators and prevent new and novel solutions developed by scooter owners far from being quickly implemented. To harmonize regulation, consensus needs to be established which takes time and often occurs either between municipal lawmakers directly or through an intermediary organization such as a metropolitan planning organization. As new technologies that would require cooperation of regulators in developing the rules and regulations, new problems may arise that require quick solutions and implementation which may be delayed while the lawmakers convene and negotiate.
Recommendations to Encourage Harmonization

Recommendation: Consistent Information for Non-Users

The introduction of new business models necessitates public engagement programs, as public opinion could have a significant impact on regulation. Despite the rapid adoption and obvious demand for e-scooters as a method of sustainable short distance travel, e-scooters continue to face stricter regulations. Engagement programs could highlight the benefits of scooters to the general public by focusing on their positive impact. This shared mobility service connects commuters to transit by filling the first/last mile travel gap, reduces car trips, manages parking demand, and minimizes congestion and pollution. All these are common strategic goals that many cities and municipalities are trying to achieve. Rider behavior issues like unsafe riding and improper parking can impede access to sidewalk and A.D.A. curb ramps. This in turn contributes greatly to the distress and anxiety of pedestrians and people with disabilities toward e-scooters because of the potential risk of injury. Educating the public on basic parking and riding rules could go a long way to improve predictability and public opinion, and help gain support for the new service.

The goal of engaging non-users and the public at large in a uniform way is a shared responsibility between municipal governments and operators. For governments, it is important to conduct outreach programs to ensure information sharing with non-users. Equally important is to inform the public of the means and mechanisms they could use to communicate urgent issues and complaints concerning obstructed access to A.D.A. ramps and sidewalks. Governments could also require vendors to conduct periodic outreach events throughout the year to address concerns. On the other hand, operator companies should organize periodic public outreach and safety events. They should also develop built-in systems that would encourage safe riding and penalize bad behavior as a way to assure non-users that their concerns are taken seriously.

Recommendations: Robust Feedback Loop for Jurisdictions

With the many benefits that e-scooters can provide, it is important for cities to develop policies that mitigate the adverse impacts, since these policies are often shaped by negative public concerns regarding issues like blocked access to pedestrian routes. It is vital for cities and municipalities to strike a balance between remaining attuned to the concerns of their constituents and continuing to benefit from the service. This could only be achieved through a robust feedback loop to inform and guide their policy decisions.

There are multiple ways to achieve this goal. One way is the implementation of pilot programs to study best policy practices that line up with jurisdiction goals and service needs. A 2020 paper study by Riggs and Kawashima shows that more than half of the cities they studied have started e-scooters program with a pilot prior to implementing a permanent permitting system (Riggs & Kawashima, 2020). Other ways include conducting surveys, installing a complaint reporting system, and sharing of data. Surveys are a good way of getting information for which the existing data is not sufficient(AAPOR, n.d.). A complaint management system is essential in bridging the gap between constituents and policymakers. The standardization and
sharing of data would benefit jurisdictions and operators alike by making available valuable information that would help guide their planning.

Alternatives to Harmonization

Alternatives to harmonization of regulation include maintenance of separate systems, partial harmonization, and the establishment of voluntary consensus. One option is maintaining the status quo in many cases, and not having a formal harmonization process in place, leaving it up to municipal lawmakers to develop scooter regulation. While this option avoids many of the challenging aspects of harmonization, our research as discussed in this report has shown there are many benefits to harmonization worth considering.

Partial harmonization involves harmonizing on one aspect of scooter regulation, for example basic operating rules, while municipalities maintain separate regulations for things like operation of scooter sharing programs. Minnesota achieved partial harmonization of their program by adopting a state scooter law that dealt with operating rules and parking restrictions while leaving the regulation of scooter sharing programs to localities. This method has been helped make the "rules of the road" universally understood while allowing adaptation of the scooter sharing programs to meet the needs of the individual municipalities. This however has its own challenges. For example, by not fully harmonizing, scooters are still restricted from beginning trips in adjacent cities. Additionally, economic equity criteria is different between the cities, and this requires scooter share owners to redistribute scooters nightly to vastly different regions ranging from ward-specific redistribution requirements in Minneapolis to general scooter caps in the city center in St. Paul, placing a reliability burden in low-income scooter riders and the burden of costly redistribution on scooter share owners.

The development of voluntary consensus standards is another alternative to harmonization and involves the scooter industry developing a set of voluntary standards and/or code of conduct and agreeing to abide by those standards in their business practices and asserting this to the municipality. A consumer code of best practices could also exist and consumers could be asked to agree to abide by it in order to rent a scooter and/or utilize scooters in a municipality. Both would likely need to be developed by a body representing the scooter industry such as a trade association. This would require the municipality to trust the industry and scooter operators would abide by these voluntary set of standards rather than mandating them under regulation. Given the history of early scooter deployments and resident complaints, relying on municipalities to seed power seems unlikely and something that would be politically unpopular. From a consumer standpoint you also risk the consumer not knowing or abiding by the voluntary guidelines despite asserting they would. Further, voluntary standards make liability for accidents and other mishaps more difficult to assign, and giving the industry the power to develop the standards opens the door to ambiguous standards that could impose unintended obligations on the municipality, scooter share operator, and/or the consumer.
Findings and Conclusion

E-scooter sharing is a subset of present-day shared micromobility services, which includes station-based and dockless free-floating bikesharing services. Unlike the station-based bikesharing system which gained steady popularity over the past decade, e-scooter sharing quickly gained their place through their disruptive launch. In 2018 alone, riders took 38.5 million shared e-scooters trips, outpacing the shared-bicycle system by 2 million trips. Indeed the disruptive nature of e-scooters upended the micro-mobility market. While mixed reactions to e-scooters persist, e-scooter sharing has transitioned from a fledgling disruptive technology to an accepted mode for short distance trips, to even an essential mode of transport during community emergencies (COVID-19), in just three years. Yet, various public and political responses remain, and the future of the market remains uncertain. Given such a level of volatility, it is crucial for the cities and policymakers to continually innovate and update their policy frameworks, to be able to accommodate these new technologies adequately.

The study attempts to supplement the current efforts of cities and regional transportation planning organizations to efficiently craft their policies in order to help these emerging micromobility services remain viable. The study examined whether harmonization of e-scooter policies through centralized or decentralized governance can strengthen their utility and serviceability. The report included detailed case studies of the evolution footprint of e-scooter sharing policymaking in 12 municipalities across bordering jurisdictions, from states across the United States and a federal district: California, Washington, D.C., Virginia, Florida, Massachusetts, and Minnesota.

Earlier studies indicate that the average trip length of shared e-scooters to be less than 2.5 miles, and that users primarily use this mode for multiple purposes, including work/school trips, First/Last mile connectivity, and utilitarian trips (Chang et al., 2019; Liu et al., 2019; Noland, 2019). Interviews with planning practitioners reveal that there is a potential for cross border activity between the cities. Such a potential may primarily exist in a geographical setting where a central business district (CBD) of one jurisdiction shares borders with another jurisdiction. However, interest in a cross-border activity may not entirely agree with the policy design of neighboring jurisdictions. While it is found that some cities require disabling the device as soon as it crosses their border, others choose to levy considerable fines on users or operators. Also, any differences within the policy sub-clauses of neighboring jurisdictions may lead to confusion about usage and safety rules among the users that commute from suburbs in one jurisdiction to the CBD in another jurisdiction.

A review of e-scooter ordinances from several cities indicated similar patterns in their ordinance structure and regulatory requirements. Such a commonality in the ordinance adoption suggests potential opportunities for collaboration between the neighboring jurisdictions. Such collaborative efforts can help in developing a single set of standard operating procedures (SOPs) to keep both the users and non-users informed. One example of such collaboration is Capital Bikeshare in the Washington D.C. metro area. This bikesharing system operates in a decentralized governance of six participating jurisdictions, while presenting itself as a unified
system to its users. Each participating jurisdiction owns its bikeshare stations, but shares the user revenue based on different factors.

Some of the crucial aspects of e-scooter regulations found by comparing the existing regulations are equitable service, device specifications, geofenced areas, sidewalk policies, user safety, and data sharing requirements. While the equity hotspots and geofencing details vary with the individual city, the remaining categories of the ordinances have a high potential to be tailored for a collaborative environment. In addition to that, a commonality in operator selection among the neighboring jurisdictions strengthens the case for harmonization.

Federal or State involvement can be effective in harmonizing the high-level vehicle standards, and user safety standards like minimum age limit, and helmet requirements. However, cities may need some freedom to regulate several other aspects like speed limits, road user guidelines, and service equity with respect to their local context. A report from National Association of City Transportation Officials (NACTO), indicates that by the beginning of 2019, private operators had introduced at least 44 e-scooter bills for state-level preemption of device classifications, mostly attempting to preempt the cities from regulating the services at the local level (NACTO, 2019). Such a legislative action could impair cities from effectively achieving their regional transportation goals.

The study also evaluated the potential strengths and weaknesses of policy harmonization and its relative impact on the individual stakeholders. End-users can benefit from policy harmonization, as it creates uniformity in what users and non-users (especially, people with disabilities) can expect from urban streets. In a competitive gig-economy, e-scooter operators seek to develop a strong customer base to ensure long-term sustainability and to attract sufficient private investment. Cross-border collaboration benefits the operators by improving their fleet management capabilities, serviceability, government relations, and also in building a strong customer base. However, such initiatives might place smaller e-scooter companies at a disadvantage, as they may lack the initial capital to be able to expand on par with established competitors. Under such situations, cities can resort to micromobility sandboxes, public-private partnerships, and federal support. Also, with a recent upsurge of private capital investments from technological giants like Uber, Lyft, Alphabet Inc., and Ford, harmonization can attract more venture capitalists and Mobility-as-a-Service (MaaS) aggregators to invest and thrive alongside the e-scooter operators.

A primary determinant of policy harmonization is the geographical layout of a region, which may reinforce any existing disinclination of cities towards collaboration. Also, with an average e-scooter trip length less than 2.5 miles, a collaboration between sparsely populated or geographically distant jurisdictions can outweigh any benefits created from it. Furthermore, interviews with planning practitioners indicate that such collaborations may limit cities from innovatively tackling their local level service demands and emergencies. However, successful collaborations like Capital Bikeshare of Washington D.C., and Lime’s bike contract with MAPC, Boston, suggest that well-defined objectives and swiftly tailored contract clauses can override such drawbacks.
Therefore, the findings of this study suggest that collaborative efforts between the neighboring jurisdictions can help cities effectively meet the requirements of public and private stakeholders, without reinventing the wheel. However, it is essential to note that, by the time this report was released, the COVID-19 pandemic was underway, with potentially devastating consequences for some e-scooter companies. A majority of use-case analysis included in this study did not account for what the future may bring to the fate of micromobility. Indeed, some have already called for micromobility companies to partner more effectively with cities to mitigate post-COVID-19 travel behavior shifts towards private automobiles (Moore, 2020). The findings of this study can provide some initial guidance to all stakeholders in how most effectively to do so.
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Appendix A – Case Studies

Appendix A contains case studies executed by the project team over the life of the project. These case studies were developed based on internet research as well as searches of academic literature and in-person as well as telephonic interviews with managers of e-scooter programs.

The team would like to thank the following interviewees that made these case studies possible:

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<tr>
<th>Name</th>
<th>Position</th>
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<tr>
<td>Joshua Cantor</td>
<td>Director of Parking &amp; Transportation</td>
<td>George Mason University</td>
<td>2/3/2020</td>
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<td>Janet Walker</td>
<td>Program Manager, Parking &amp; Transportation</td>
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<td>Emily C. Warren</td>
<td>Director of Policy, Principal</td>
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<td>Rebecca White</td>
<td>Director of Parking &amp;Transportation</td>
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<td>Katie Monroe</td>
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<td>Hardy Mathew</td>
<td>Program Director for Planning and Performance</td>
<td>AASHTO</td>
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<td>Henry Dunbar</td>
<td>Director of Active Transportation</td>
<td>Arlington County</td>
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<td>Sharon Guan</td>
<td>Manager</td>
<td>Land Transport Authority (LTA), Singapore</td>
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<td>Juli Lee</td>
<td>Associate</td>
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<tr>
<td>Zack DesJardins</td>
<td>Bikeshare &amp; Scootershare Planner</td>
<td>MetroBike, LLC</td>
<td>4/1/2020</td>
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<td>Contractor for Arlington County Commuter Services,</td>
<td>Arlington County, VA</td>
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<tr>
<td>Sharada Strasmore</td>
<td>Shared Micromobility Planner</td>
<td>District Department of Transportation, Washington, DC</td>
<td>4/3/2020</td>
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<tr>
<td>Paul DeMaio</td>
<td>Capital Bikeshare &amp; Shared Mobility Manager</td>
<td>MetroBike, LLC</td>
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<td>Carol Schweiger</td>
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<td>Patricia Tice</td>
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<td></td>
<td>PhD Candidate</td>
<td>University of Central Florida</td>
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The case studies that informed this report are provided in their entirety in this appendix in the order listed below.

- Boston, Massachusetts Area
- District of Columbia & Northern Virginia
- Los Angeles and Santa Monica, California
- Miami, Florida Area
- Minneapolis-St. Paul, Minnesota
- Oakland-Berkeley, California
Boston, Massachusetts Area

The greater Boston area is unique in its management approach to e-scooters, as there is precedent for regional management of dockless mobility. In 2018, the Metropolitan Area Planning Council (MAPC) oversaw a dockless bike pilot program that allowed Lime and Spin to operate app-based dockless bicycle rental services in 15 jurisdictions in the greater Boston area, expanding far beyond the scooter case study area, which includes the Cities of Boston, Cambridge, and Sommerville and the Town of Brookline (Harmon, 2018). Lime continued to provide dockless bikeshare service, including e-bikes since 2019, until January 2020, when the company opted not to renew and agreement with MPAC to focus the business on e-scooters (Acitelli, 2020).

The four jurisdictions observed in this case study include more urbanized jurisdictions of the region that are served by the Massachusetts Bay Transportation Authority’s (MBTA) light rail system. Somerville and Cambridge, which sit across the Charles River from Boston proper and Brookline, banned the operations of e-scooter companies and have stated that they plan to wait for regional guidance or regulation of e-scooters. MAPC has convened meetings to discuss e-scooters with representatives from Boston, Somerville, Cambridge, Brookline, and Watertown but has not issued any regional guidance.

Bird was the first operator in the region in July 2019, deploying devices in Somerville and Cambridge without permits until receiving cease-and-desist orders from local government (DeCosta-Kilpa, 2019). Jurisdictions prohibiting the operation of scooters cite state law, grouping e-scooters with mopeds, which requires break lights and turn signals not available on most e-scooters (Gavin, 2019).

The two jurisdictions that have explored the permitting of e-scooters as SMDs, Boston and Brookline, have taken two very different approaches to regulation. Brookline implemented a eight-month pilot from April through November 2019, and Boston passed legislation for a permanent e-scooter program in March 2019 (Town of Brookline, n.d.). Although Boston has a permitting structure in place established by an adopted ordinance, the City has yet to permit any operators, pending Governors Charlie Baker’s signature on a state law differentiating e-scooters from mopeds (Vaccaro, 2020).

Brookline Dockless Scooter Pilot

Three companies participated in the Town’s e-scooter pilot program—Bird, Lime, and Spin—the latter two having already operated in the region’s dockless bicycle pilot. Brookline’s pilot program concluded November 15, 2019, and Select Board member Heather Hamilton, who championed the pilot, said they are unlikely to reauthorize a program until abutting localities allow operation as well to get a better sense of scooter use beyond the small jurisdiction (Vaccaro, 2020).

Some local advocacy organizations, including the Pedestrian Action Committee and the Community Aging Network, have expressed strong opposition to approving future dockless mobility operation in the Town (Constantine, 2020).
Rules of the Road

The Town of Brookline pilot required users to obey traffic rules and traffic control devices, such as signs and signals and yielding to pedestrians.

- **Age limit:** Users must be 18 years or older.
- **Sidewalk riding:** Pilot regulations prohibit riding on sidewalks.
- **User safety:** Helmets are required for all e-scooter users.
- **Speed limit:** 15 mph
- **Curfew:** E-scooter may only be used between 6:00 AM to 9:00 PM. Reasons for cited elsewhere for implementing time-of-day regulations have included danger of riding in the dark and to minimize using e-scooters under the influence or alcohol.

Operations

Regulations governing the actions of operators can be extensive. In Brookline, these regulations included:

- **Fees:** $1,000 license fee, plus $1 per device per day
- **Fleet size:** 100 devices per operator is the initial fleet cap, but an increase in fleet size may be allotted for demonstrating 3 rides/device per day. By June 18, 2019, Lime was operating 150 scooters and Bird was operating 125 scooters demonstrating a high utilization rate.
- **Equity:** Brookline requires operators to provide low-income and veteran discount programs. A cash payment option is encouraged but not required.

Enforcement of these policies is not reported, but the Town or Brookline’s e-scooter website stated that Town police did have authority to enforce rider behavior and Town transportation staff within the Department of Public Works were responsible for enforcing operator-focused regulations (Town of Brookline, n.d.).

City of Boston

Although the City adopted an ordinance to allow operators to apply for permits to operate shared e-scooters in Boston in March 2019, no e-scooter operators have received a permit to operate as of May 2020. In January 2020, State Representative William Strauss said the legislature hoped to pass the drafted legislation differentiating e-scooters from mopeds, and therefore, legalizing most e-scooter models before summer, but the COVID-19 pandemic has likely disrupted that major action to enable SMDs to operate in throughout the Boston area (Vaccaro, 2020).
District of Columbia and Northern Virginia

Washington, DC

After e-scooters made their appearance on the West Coast, the greater Washington, DC, region received its first e-scooter deployments. The District Department of Transportation (DDOT), which regulates transportation within the District of Columbia, was the first agency in the region to launch a pilot program in September 2017. It was extended twice during the 15-month term while the District regulators worked to figure out long-term rules and a broader mobility innovation program so the District is not caught by surprise when future innovations are deployed.

Eight companies were approved under the pilot program, with a limit of 400 vehicles per fleet per company. These companies are: Bird, Lime, Razor, Bolt, Jump, Lyft, Skip, and Spin. The same companies continued operating under the 2019 pilot permit phase. DDOT allowed each company to operate up to 600 dockless vehicles per type of vehicle, and to grow their fleets by 25 percent each quarter at the agency’s discretion.

New guidelines issued in October 2019 outlined a new scoring system of a 198-point scale, limiting the number of operators to be awarded 2020 permits to the four highest scoring companies. The new scoring system awards 25 percent of points based on past performance evaluation. This puts Lime, Bird, Razor, and Bolt at a disadvantage because DDOT found their overall past performance not to be satisfactory. The four companies approved under the current 2020 permit are Jump, Lyft, Skip, and Spin (DDOT, 2020b).

Another major change aiming to improve user experience was to increase the number of vehicles that each company may operate, resulting in fleet cap increase from 600 to 2,500. This change was made in response to The Institute for Transportation and Development Policy, which estimates that the right ratio of vehicles to people is 10 to 30 per 1,000 residents.

Other key changes were the reduced speed limit from 15 mph to 10 mph, and the addition of a requirement for vehicles to have a speed governor installed as part of the 2020 permit requirements updates.

These changes created an increase in differences with the shared mobility pilot regulations in the neighboring jurisdiction of Arlington County, Virginia, where 10 percent of the total trips reported either start or end in DC.

Key points of divergence between these two jurisdictions are the reduced speed limit, and the reduced fleet diversity in terms of operators. The speed limit for e-scooters in Arlington is still 15 mph, compared to the new 10 mph in DC. In addition, seven out of the eight companies that originally operated in DC are still approved to operate in Arlington County. GPS-based geofencing stops devices owned by operators that are not permitted in the District from crossing jurisdictional borders.
Rules of the Road

- **Age restriction**: N/A
- **User safety**: Users are not required to wear helmet while riding e-scooter. Operator are encouraged to provide customers a free helmet within 20 days of request.
- **Speed limit**: Maximum operating speed on roads and bike lanes was decreased from 15 mph during the pilot phase to 10 mph (§ 50–2201.04a. Operation of personal mobility devices). The speed limit on sidewalks is 6 mph. All devices are required to have a speed governor that ensures the vehicle will not travel in excess of 10 miles per hour on level ground.
- **Sidewalk riding policy**: No sidewalk riding within the Central Business District.
- **Parking policy**: Dockless vehicles must be parked in street parking corrals or the furniture zone of the sidewalk where one exists, and must maintain a pedestrian travel space at least 5 feet wide (DDOT, 2020c).

Operations

- **Operating cost**: An application fee of $50 per permit; a technology fee of $25 per permit; $250 fee for the initial permit to operate in the public right-of-way; $100 fee for each annual renewal of the permit to operate in the public right-of-way. Additionally, DDOT imposes a variable fee per vehicle depending on the month when the dockless sharing vehicle will enter into operation in the District. This per vehicle fee varies from $5 in the month of December to $60 in January (DDOT, 2020a).
- **Equity requirements**: DDOT requires a low-income customer plan that waives any applicable vehicle deposit and offers an affordable cash payment option and unlimited trips under 30 minutes to any customer with an income level at or below 200% of the federal poverty guidelines, subject to annual renewal. Operators must also conduct a marketing campaign at their own cost in Equity Emphasis Areas to promote the use of dockless sharing vehicles and inform users of the available low-income customer plan (DDOT, 2020a).
- **Data sharing**: Operators are required to provide monthly data reports of anonymized trip data. If the operator operates more than one type of vehicle, they must provide a separate GBFS version 1.0 API as well as the private API per vehicle type. Providers must inform DDOT to which vehicle type each API corresponds (DDOT, 2020a).
- **Geofencing**: Operator are required to respond to requests to administer geofences, which may include alterations to the permitted service area, within 24 hours. This may also include speed reduction to 0 mph, 3 mph, and 6 mph; and financially disincentives to end user; and/or financially incentivize user behavior to end user (DDOT, 2020a).
• **Fleet diversity**: Starting January 2020, the number of operators reduced from eight under the pilot program to four only under the 2020 permit. Vehicle fleet may include bicycles, motorized/electric bicycles, and electric Scooters. Separate permit application is required for each vehicle type. Adaptive vehicles are encouraged as a bonus, and do not count towards maximum vehicles allowed (DDOT, 2020a).

• **Fleet cap**: Each operator must have a minimum of 500 devices, and no more than 2,500. Requests for fleet increase will be evaluated semi-annually at the discretion of DDOT, which will grant approvals after evaluating a company’s performance (DDOT, 2020a).

• Which will grant approval based on good performance during the period prior to the evaluation and program need.

• **Indemnification** All operators are required to sign the indemnification terms to hold the District harmless (DDOT, 2020a).

• **Insurance** Operators are required to maintain the insurance coverage set forth below at all times during the term of the Permit and any use of the public right-of-way:
  - Commercial General Liability Insurance coverage of $1,000,000 per occurrence with the District as an additional insured;
  - Workers’ Compensation Insurance coverage for all employees involved in operations pertaining to this Permit including Employer’s Liability Insurance coverage of at least 100,000 per occurrence .
  - $10,000) refundable surety bond

**Northern Virginia**

Some Northern Virginia localities, including Arlington County and the City of Alexandria, implemented pilot programs shortly after DDOT, but other jurisdictions with less e-scooter activity had to develop programs in response to a new Commonwealth of Virginia law that went into effect January 2020.

In February 2019, the General Assembly passed a law allowing shared mobility devices to operate in Virginia and, as a Dillon Rule state, gave local governments authority to establish regulations or a pilot program for these new devices. Because State legislation allow e-scooters to operate in Virginia even if the localities do not adopt their own regulations, localities rushed to put regulations into place. Once a locality adopts regulations, an e-scooter company will need to have an approved permit, pay required fees, and sign a memorandum of understanding before they could deploy their devices.

**Arlington County**

Arlington County was the first jurisdiction in Northern Virginia to have implemented an e-scooter program. The County Board adopted regulations for micromobility devices in November 2019 following a nine-month pilot program that was launched in October 2018 and completed in December 2019 after a six-month extension (Arlington County, 2019). In Arlington County,
these micromobility devices include pedal bikes, e-bikes, e-scooters, and motorized skateboards. There are currently seven companies that are approved under the 2020 permit program to operate in the County—Bird, Jump, Lime, Lyft, Razor, Skip, and Spin.

After the pilot phase and subsequent evaluation, the County received and implemented recommendations to improve the service. Recommendations included accelerated implementation of protected bicycle lanes, which in turn resulted in prohibiting riding on adjacent sidewalks, and the addition of parking corrals.

Rules of the Road

Users of micromobility devices in Arlington County are required to obey rules of the road per the Virginia State Code Sec.46.2-905, which governs traffic signals, signs, and requires riders to yield to pedestrians.

- **Age restriction**: N/A
- **User safety**: The County rules do not specify any age limit, nor do they require wearing a helmet unless indicated by the operator. However, the State of Virginia code requires riders 14-year-old and under to wear helmets.
- **Speed limit**: The state code limit the speed to 15 miles per hours (mph), by which the county chose to abide. These devices are allowed on bike lanes, trails, and most sidewalks. As for riding on sidewalks, the speed limit is 6 mph where allowed.
- **Sidewalk riding policy**: The County allows riding on sidewalks with two exceptions: next to a protected bike lane, and on areas designated as prohibited by signage.
- **Parking policy**: Upon the street against the curb, or in a corral marked and designated for the purpose. Scooter should not be parked where it impedes the normal movement of pedestrian or vehicular traffic, or where parking is prohibited.

Operations

- **Operating cost**: A non-refundable application fee of $1000, and initial annual operations fee of $80 per each approved micro-mobility device (Arlington County, 2020a).
- **Equity requirements**: Pursuant to § 14.2-122.D., the Operator shall implement an approved Equity Plan with required elements agreed upon by the County Manager or designee. Service Requirements in the Interest of Equity include the deployment of a minimum of fifteen percent (15%) of Permit-holder’s Micro-Mobility Devices in service in locations that are outside of the Rosslyn-Ballston and Richmond Highway Metro corridors, as identified on the General Land Use Plan’s (GLUP) Map. Permit-holders shall provide discounted access programs to encourage use by lower-income community members. Permit-holders shall not discriminate against non-drivers by requiring a driver’s license as the only form of acceptable proof of minimum age, but
shall accept one or more legal alternate forms of proof of minimum age (Arlington County, n.d.).

- **Data sharing**: Under the data sharing requirements, operators must make their data available on the Application Program Interface (API), the General Bikeshare Feed Specification (GBFS) standards, and the Mobility Data specification (MDS) standards.

- **Geofencing**: County does not specify any requirements. Similarly, there are no requirements for reporting safety data.

- **Fleet diversity**: There are currently seven companies that are approved under the current permit program to operate in the county. These are Bird, Jump, Lime, Lyft, Razor, Skip, and Spin. Vehicle fleet may include pedal bikes, electric power-assisted bicycles (e-bikes), motorized scooters (e-scooters), and motorized skateboards (Arlington County, 2020b). Separate permit application is required for each vehicle type. Adaptive vehicles are encouraged as a bonus, and do not count towards maximum vehicles allowed.

- **Fleet cap**: The initial Countywide fleet cap for 2020 is 2,000. Permits may be approved up to that amount; however, the Manager may increase or reduce the Countywide cap at any time. Once an operator is allocated a permitted fleet size, if the operator is able to demonstrate sufficient demand for their devices (i.e. an average of 3+ trips/device/day over a calendar month) and compliance with the terms of the permit, then they may request additional devices on a month-by-month basis.

- **Indemnification**: Operators are required to sign the indemnification terms to hold the County harmless.

- **Insurance**: Operator must present the City with Certification of Insurance that has the following minimum coverage in force for Workers Compensation - Virginia statutory workers compensation (W/C) coverage, including Virginia benefits and employer's liability with limits of $100,000/100,000/500,000. b. Commercial General Liability - $1,000,000 per occurrence, with $2,000,000 annual aggregate covering all premises and operations and including personal injury, completed operations, contractual liability, independent contractor, and products liability. The general aggregate limit must apply to this MOU. Evidence of contractual liability coverage must be typed on the certificate. c. Business Automobile Liability - $1,000,000 combined single-limit (owned, non-owned and hired). d. Additional Insured – The City and its officers, elected and appointed officials, employees and agents must be named as additional insureds on all policies

- **Surety Bond**: The Permit-holder shall maintain a refundable surety bond of 25.00 for each MicroMobility Device.

**City of Alexandria**

Shortly after Arlington started their pilot program for e-scooters, the devices began appearing in neighboring City of Alexandria. In response, the City launched a pilot program in November
2018 to allow private companies to operate shared mobility devices for a nine-month pilot period. The pilot program was managed under existing laws and regulations, and a signed memorandum of understanding between the operators and the City. Existing federal, state and city laws and regulations were applicable to scooters during the pilot program. The permits under the first phase pilot program were extended through December 2019 to allow time for the City to implement and evaluate program changes (City of Alexandria, 2019a). Seven companies were approved under the phase I pilot program to operate in the City—Bird, Jump, Lime, Lyft, Bolt, Skip, and Spin. Under phase II, only five companies applied and were approved—Lime, Bird, Razor, Spin, and Hellbiz (City of Alexandria, 2019b). For phase II, the following key changes were implemented as a result of the evaluation of phase I:

- A ban on riding scooters on any sidewalk in the City. Phase I permitted riding on sidewalks where bicycle were also allowed.
- Installation of additional parking corrals.
- More equitable distribution of scooters across the city (City of Alexandria, 2020).

**Rules of the Road**
The City of Alexandria also followed the Virginia State Code Sec.46.2-905, requiring e-scooter users to obey traffic signals and signs and requires riders to yield to pedestrians.

- **Age restriction:** None
- **User safety:** State code requires riders 14-year-old and under to wear helmets.
- **Speed limit:** The state code limit the speed to 15 miles per hours (mph), by which the City chose to abide.
- **Sidewalk riding policy:** E-scooter and e-bike riding is not permitted on sidewalks. Riding is allowed on streets, bike lanes, and certain trails. Riders must follow all applicable traffic laws.
- **Parking policy:** Dockless vehicles must be parked in street parking corrals when available. It should not be park where it impedes the normal movement of pedestrian and vehicular traffic, or where parking is prohibited. Operators are required to stage in a corral if one exists on the blockface of a staging location.

**Operations**

- **Operating cost:** Current permit fee is $10,000 per application in addition to a $75 per device.
- **Equity requirements:** Require 20% of each operator’s fleet be deployed and maintained in areas identified by City staff that provide more equitable distribution of devices across the City. Require participation in income-based discount programs. Require alternative rental mechanisms besides smartphones (e.g. call- or text-to-rent) and cash payment options. Encourage operators to incorporate local workforce development into their staffing plans. Currently, Bird, Lime, Spin, and Razor provide low cost plans for riders who qualify, and provide
non-smartphone access (SMS or call to unlock devices) and non-credit card payment options.

- **Data sharing:** Under the data sharing requirements, operators must make their trip data available on the Application Program Interface (API) that is compliant with the Mobility Data Specification (MDS), the General Bikeshare Feed Specification (GBFS) standards. Require MDS feed or some other more detailed compliant information (Consistent with Arlington).
- **Geofencing:** Required for No Parking Zones and parking corrals locations.
- **Fleet diversity:** There are seven companies approved under the phase I pilot program to operate in the City. These are Bird, Jump, Lime, Lyft, Bolt (instead of razor in Arlington), Skip, and Spin. And five companies for phase II. These are Lime, Bird, Razor, Spin, and Helbiz. Vehicle fleet may include dockless bicycles and scooters. Require braille, embossed lettering, QR codes, etc. to enable those with vision disabilities to report improper parking (Consistent with Arlington).
- **Fleet cap:** Maximum of 200 scooter (pilot) per operator. Companies may request an additional 25 devices based on four consecutive weeks of use of the permitted maximum number of vehicles being used an average of at least 3 trips per day.
- **Indemnification:** The City indemnified itself in the MOU so that operators assume liability.
- **Surety Bond:** The Permit-holder shall maintain a $10,000 refundable surety bond.
- **Insurance:** Operator must present the City with Certification of Insurance that has the following minimum coverage in force (consistent with Arlington County) for Workers Compensation - Virginia statutory workers compensation (W/C) coverage, including Virginia benefits and employer’s liability with limits of $100,000/100,000/500,000. b. Commercial General Liability - $1,000,000 per occurrence, with $2,000,000 annual aggregate covering all premises and operations and including personal injury, completed operations, contractual liability, independent contractor, and products liability. The general aggregate limit must apply to this MOU. Evidence of contractual liability coverage must be typed on the certificate. c. Business Automobile Liability - $1,000,000 combined single-limit (owned, non-owned and hired). d. Additional Insured – The City and its officers, elected and appointed officials, employees and agents must be named as additional insureds on all policies.

**City of Fairfax**

In July 2019, the City of Fairfax launched the program allowing shared mobility devices (SMDs), including e-bikes and e-scooters, to operate. The program started with an initial nine-month term, with the possibility of renewal for additional three months if requested by the operator. Three companies were approved under the program—Bird, Lime, and Spin (City of Fairfax, 2020).

Under this program, e-scooters were also permitted on George Mason University’s main Fairfax Campus, with certain restrictions concerning riding areas and parking. The operators had to sign a separate memorandum of understanding with the University.
The City required operators to provide information about any plans to operate in the only neighboring jurisdiction, Fairfax County, and on George Mason University’s campus.

**Rules of the Road**

The City of Fairfax also followed the Virginia State Code Sec.46.2-905, which required micromobility users to obey traffic signals and signs and requires riders to yield to pedestrians.

- **Age restriction:** None
- **User safety:** The City rules do not specify any age limit, nor do they require wearing a helmet. However, the State of Virginia code requires riders 14-year-old and under to wear helmets.
- **Speed limit:** The state code limit the speed to 15 miles per hours (mph), by which the City chose to abide.
- **Sidewalk riding policy:** E-scooter and e-bike are prohibited from riding on sidewalks. Riding is allowed on streets and bike lanes only. Riders must follow all applicable traffic laws.
- **Parking policy:** E-scooter vehicles must be parked next to a bike rack or by the curb not obstructing travel paths.

**Operations**

- **Operating cost:** Current permit fee is $5,000 per application in addition to a monthly usage fee of $0.05 per trip to be paid on the 15th of each month for the previous month’s trips.
- **Equity requirements:** NA
- **Data sharing** Under the data sharing requirements, operators must make their trip data available on the Application Program Interface (API) that is compliant with the Mobility Data Specification (MDS), the General Bikeshare Feed Specification (GBFS) standards. Require MDS feed or some other more detailed compliant information (Consistent with Arlington).
- **Geofencing:** Required for No Parking Zones and parking corrals locations.
- **Fleet diversity:** There are three companies approved to operate in the City under the current pilot program. These are Bird, Lime, and Spin. Vehicle fleet may include “dockless” or “floating” bikeshare or scootershare. Require braille, embossed lettering, QR codes, etc. to enable those with vision disabilities to report improper parking.
- **Fleet cap:** Maximum of 250 SMDs (include “dockless” or “floating” bikeshare or scootershare) per operator. Companies may request an additional 25 devices based on
four consecutive weeks of use of the permitted maximum number of vehicles being used an average of at least 3 trips per day.

- **Indemnification:** The City indemnified itself in the MOU so that operators assume liability.

- **Surety Bond:** The Permit-holder shall maintain a $5,000 surety bond, which the City may use to pay costs related to removing and storing devices that do not comply with these permit requirements, if such costs are not born by Operator.

- **Insurance:** Operator must present the City with Certification of Insurance that has the following minimum coverage in force (consistent with Arlington County) for Workers Compensation - Virginia statutory workers compensation (W/C) coverage, including Virginia benefits and employer’s liability with limits of $100,000/100,000/500,000. b. Commercial General Liability - $1,000,000 per occurrence, with $2,000,000 annual aggregate covering all premises and operations and including personal injury, completed operations, contractual liability, independent contractor, and products liability. The general aggregate limit must apply to this MOU. Evidence of contractual liability coverage must be typed on the certificate. c. Business Automobile Liability - $1,000,000 combined single-limit (owned, non-owned and hired). d. Additional Insured – The City and its officers, elected and appointed officials, employees and agents must be named as additional insureds on all policies.

**Fairfax County**

Fairfax County Board of Supervisors approved the operation of e-scooters and other SMDs in November 2019. The service will be regulated by Fairfax County Department of Cable and Consumer Services through a permitting process to allow operation beginning January 1, 2020 (Jordan, 2020). To date, no SMD operators are permitted to operate in Fairfax County.

Some of the County’s program requirements include:

- Permittees will use their best efforts to offer Shared Mobility Devices in all areas of the County and will not restrict the devices to any specific geographical area of the County.

- Permittees will comply with Chapter 11 (Human Rights Ordinance) of the County Code and all other applicable laws governing fairness and equity to all persons in the County.

- Permittees are encouraged to provide a cash-based or non-smartphone payment mechanism.

- (Permittees will maintain a place of business or office with telephone service within the County or within thirty miles of the County (Fairfax County, 2020).

The County is working to develop a coordinated process for complaints with neighboring jurisdictions. Once implemented, the first year data will be summarized and shared with the public.
Notable Virginia Case

City of Charlottesville – University of Virginia – Albemarle County, Virginia

Although not located in the greater Washington, DC, region, research on Virginia SMD activity uncovered a notable case of coordinated e-scooter regulations near the University of Virginia (UVA) in the City of Charlottesville and Albemarle County, which surrounds the entire City. The City of Charlottesville launched a dockless mobility pilot program in November 2018 that included e-bikes and e-scooters and lasted until end of July 2019. Since this pilot, the City has adopted formal regulations. The UVA campus is uniquely situated within the Charlottesville/Albemarle Metropolitan Planning Organization (MPO). The campus is divided between the two jurisdictions and is served by publicly maintained roads. This setting necessitated that one entity (county or the city) take the lead in permitting the dockless SMDs serving the UVA campus. Currently, the city permit is the parent permit that both UVA and Albemarle County requires for operation, allowing one entity to vet and approve the operators. Each entity has the opportunity to add requirements under their own agreements in accordance with local goals.
Los Angeles and Santa Monica, California

In September 2017, shared micromobility providers deployed dockless e-scooters throughout the bordering cities of Los Angeles and Santa Monica, California, without warning to or approval from local governments. To regulate these devices, the Los Angeles Department of Transportation (LADOT) and City of Santa Monica established pilot programs to regulate and evaluate dockless e-scooter rental operations more than a year after the initial deployment. A summary of each regulatory program development is provided below.

LADOT
Timeline of Events
- October–November 2018: Received applications for and awarded 120-day conditional permits
- December 2018: Launch one-year dockless on-demand mobility permit
- January 2019: LADOT opens permit application for one-year pilot (deadline Feb. 15, 2019)
March 2019: One-year pilot begins (Puente & Nelson, 2019)

LADOT has not issued program findings at the time of this study.

Pilot Program Regulations
LADOT approved seven operators for its initial one-year pilot program. Operator permits included fleet size limits, allowing larger fleets for operators deploying in Disadvantaged Communities (DACs), socioeconomically or historically disadvantaged communities as defined by LADOT. The maximum possible fleet size is 10,500 devices per operator. Approved operators and their fleet sizes include:

- Bird (6500 with 3500 DACs)
- Lime (5500 with 2500 in DACs)
- Lyft (4000)
- Jump (2750)
- Spin (10500 with 8000 in DACs)
- Sherpa (670)
- Bolt (500) (source: Fonseca, 2019)

Road Rules
Road rules govern user behavior including age limits, traffic operations, parking and more. LADOT pilot regulations are summarized below.

- Age restriction: 18 years or older having a valid California driver's license
• **Sidewalk policy:** California state law prohibits riding on sidewalks (No sidewalks unless to leave property, no beach paths) Fines for sidewalk riding is $197.

• **Speed:** Speed limit cannot exceed 15mph.

• **User safety:** Wearing of helmet was repealed on January 1, 2019 but company recommends its use. Scooter riders above 18 years of age are not required to wear helmets when riding but it is a requirement for people under the age of 18 years which most scooter companies prohibits (Chiland, 2018).

• The scooters should be ridden on surface streets closest to the right-hand curb as possible

• Bicycle lane usage are strongly recommended as operators have marked or increased bike lanes by painting them green

• Only one person at a time may ride a scooter

• **Parking policy:** Riders must park scooters without blocking sidewalks, drive ways, color curbs (fire lanes, handicap spots, loading zones) and paths. LADOT has provided marked spots for scooter parking. Operators have parking zone locations on their apps as well to guide users in parking

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**Operations**

• **Operating cost:** Non-refundable annual permit application fee of $20,000 and $130 per vehicle. To ensure equity, a discounted fee of $39 will be charged per vehicle in the San Fernando Valley since it’s considered a disadvantaged community.

• **Equity requirements and plan:** In order to ensure that access transportation is fair to all, Los Angeles factors in disadvantaged communities (D.A.C.) by giving operators discounts to operate in such communities. Operators should have a detailed plan periodically (quarterly) in the offering of their service which should give the option for people to pay by cash, non-smart phone options and others. This is the reason why a company like Spin has a greater vehicle cap size in the area as identified in early paragraphs.

• **Geofencing:** Exists in L.A. as there are restrictions on services in certain areas. Examples are: geofencing could be seen in West Hollywood where scooters had been banned from parking within city limits but can ride through the city to somewhere else and in Beverly Hills, geofencing prevents scooters from working since its considered illegal in that jurisdiction and even if the scooter worked, it will not go faster than 5mph and others (Walker, 2018).

• **Data sharing (GBFS and M.D.S.):** In Los Angeles, Mobility Data Specification (M.D.S.) standards are the data analyzing tools used by the operators and the city to gather information on the usage of the scooters. As part of the permit approval procedures, the Los Angeles Department of Transportation (LADOT) has ensured that it can track and
monitor the usage of the scooters in order to be able to make informed decisions with regards to policy, rules and regulations based on the data made available as these vehicles are operated.

- **Fleet cap:** Maximum of 10,500

- **Indemnification:** The city and all of its agents and or stakeholders are to be held harmless which is a requirement under the permit.

- **Insurance:** Operators are to procure and maintain these insurance agreements for the duration of the permit;
  - General commercial liability insurance with a minimum liability limit of $5,000,000 which lists the "City of Los Angeles, its officers, agents and employees" as primary additional insureds.
  - Automobile insurance with minimum liability not less than $1,000,000 with the city, officials and agents listed as primary insureds.

- **Community Engagement Plan:** Operators should engage with the community and stakeholders periodically. This is to ensure that education and relevant information are being addressed and handled to ensure the smooth operation of these programs.

Santa Monica

Bird and Lime were some of the operators to deploy in Santa Monica and operated by the slogan of “scoot first, regulate later.” The Santa Monica City Council having being faced with these chaos and complaints approved a 16 month pilot program to regulate and study scooters that launched in September 2018. At the time of the pilot, four companies were the operators that were used and are (Fonseca, 2019b):

- Bird (750 electric scooters)
- Jump (250 electric scooters, 750 e-bikes)
- Lime (750 electric scooters)
- Lyft (750 electric scooters)

The 16 month pilot was to have expired on the 30th of December, 2019 but on January 28th, 2020 the Council voted to extend the first pilot program through June 2020. A 60 page report on the first pilot was also published indicating the insight the City has received and measures they are going to put in place moving forward. This led City officials to reveal that there will be a second pilot program with intensified regulations and requested for new applications. The submission deadline for the second pilot is April 2nd, 2020 at 5pm.

*Road Rules*

- **Age:** 16 years and older with a driver's license or permit
• **User safety:** helmet is only mandatory for riders younger than 18 years of age. Riders 18 years of age and above are **no longer mandated** to wear helmets due to the law passed by Governor Jerry Brown which went into effect on January 1st, 2019.

• One person per device

• **Speed limit:** 15mph

• **Sidewalk riding policy:** Prohibited when riding in sidewalks, beach bike path, ocean front walk and 3rd Street Promenade as one exposes him or herself to fines. Riding in bike lanes are highly recommended.

• **Parking policy:** Best places for parking are in the "furniture zone", the section of the sidewalk between the curb and pedestrian through zone, corrals and bicycle racks. Parking on sidewalks, curb ramps, doorways are prohibited.

**Operations**

• **Operating cost:** Annual operator fee $20,000 as well as a per device fee of $130. Operators must also pay monthly a Public Right of Way (PROW) fee of $1 per device per day due no later than 15th day of each month. This is different from the tax obligations the operators bear. These fees are due prior to the commencement of the pilot.

• **Equity requirements:** Should be accessible to all. Payment options should also include all forms of payment in order to enable its accessibility whether or not one has his or her phone or not and to mention but few

• **Data sharing:** Mobility Data Specification (M.D.S.) is the one in use. Operators must provide accurate data through a publicly accessible Application Programming Interface (API) which makes API endpoint available to the public for viewing data, querying data and mapping.

• **Geofencing:** Devices must be capable of being controlled automatically to a maximum speed if 5mph or safely ceasing operation within an area, limiting ride end or beginning in order to regulate parking behavior.

• **Insurance & Indemnification:** Operators are to obtain and maintain a valid insurance and indemnification agreement that favors the City. The City of Santa Monica, it's elected and appointed officials, agents and stakeholders are not subject to any claims.

• General commercial liability insurance with a minimum liability limit of $5,000,000 which lists the "City, its officers, agents and employees" as primary additional insured.

• Automobile insurance with minimum liability not less than $1,000,000 with the city, officials and agents listed as primary insureds.
Conclusions

Difference in Operators and Difference in Geofencing rules

From the case, Los Angeles has about 8 scooter operating companies' whiles Santa Monica has only 4. The good thing here though is that, 4 out of the 8 companies operate in both jurisdictions. They are Bird, Jump, Lime and Lyft. With that said, riders of these 4 companies enjoy seamless service compared to that of other companies.

However, there were different geofencing rules that applied to certain operators in a specific location. For instance, although Beverly Hills had banned scooters from operating in its boundaries in Los Angeles that rule felt different on a lime scooter when compared to others like Bird or Jump. A jump rider will find the scooter slowing to the Beverly Hills speed limit of 5mph from the L.A. city limit of 15mph, while a Bird will stop completely at the border and a Lime operated vehicle can cruise through the city at 15mph but will not be able to end the trip like the others (Sharp, 2019).

This brings in to question why there is not a harmonized regulation that applies equally to these operators but differ from one to the other. Are there different decision scorecards being used to determine their operability in the area? This leads to confusion in riders as what may work in an area today on a particular company's electric scooter say Bird may not work on a Lime. Eli Kaufman an executive director of the Los Angeles County Bicycle Coalition affirms this (Sharp, 2019).

Equity issues

Each of these jurisdictions had a priority in deciding which scooter operators they allowed to operate in their area. Although Los Angeles made rules and regulations and permitted operators with licenses to operate in the area, from the case study it can be deduced that most of the regulators decisions were centered on equity. That is, regulators wanted to ensure that everyone was not left out and trips were affordable and accessible to all. This led to them increasing fleet sizes for operators like Spin that was willing to expand most of its services to the San Fernando Valley an area considered to be a disadvantaged community. However, the initial fees charged for using these devices within their first few minutes of use and subsequent minutes of use have proven to be quite expensive for most residents not only in the San Fernando Valley area but also among riders in some parts of Santa Monica. Initially, devices cost $1 to unlock, then 15 cents per minute to ride. Companies are now charging about 23-30 cents a minute. This has therefore undermined the regulators efforts in ensuring equity to the public which should be strictly looked.

Fleet size, safety and enforcements

Analyzing the Los Angeles region for instance which has about 30000 + electric scooters being operated in the area, it will definitely increase safety and accident issues. With these safety and accident issues raised, will law enforcements and regulators be able to handle and deal with issues that arise? No. This is because records on scooter related accidents were not easily identifiable as all accidents in the area had been classified under motor traffic accidents from year to year. How then will regulators be able to know the trend in the occurrence of scooter
related accidents and be able to address that with policy which could be harmonization of certain rules for instance? Research points to the fact that it is rather the fire department and a group of Doctors at UCLA that began to document the number of accident scenes they were called and treated respectively that gave count or revealed certain trend in accidents. (L.A. Police reports did not detail the number of collisions that were scooter centered as there are no differentiators in 2 wheel vehicles involved in accidents (Fonseca, 2019a). The Los Angeles Fire Department however had some data on some accidents scenes they had been called to that involved scooters. The Fire Department only started tracking e-scooter related accidents late 2018 and by the time of the writing of the article, 74 incidents had occurred. 55 out of those 74 incidents involved someone being transported to the hospital. Erik Scott the department’s spokesperson said. A case series by some research group made up of health professionals in Los Angeles showed that out of the accidents that occurred with e-scooters, 91.6% and 8.4% represented riders and non-riders who got injured respectively out of the 249 cases they recorded. 27 patients representing 10.8% were younger than 18 years of age. Only 4.4% wore helmets from the total sample of ridership which means that about 94.3% were not wearing helmets when the accidents occurred (Trivedi et al., 2019). The common types of injuries are head injuries, fractures, lacerations, sprains and others. The highest amongst them from the case is head injuries which was about 40.2%, followed by fractures with 31.7% and so on)

Santa Monica, on the other hand is considered one of the best as it offers the best variety as well as safety infrastructure is concerned (Walker, 2018). This is because the regulators chose to limit the number of operators and vehicles deployed in their jurisdiction giving them the chance and power to adequately manage these devices. This is evident in the soaring number of issued tickets by the West Traffic Division of the Los Angeles Police Department (LAPD) (Puente & Nelson, 2019). Santa Monica police officers wrote over 1,000 tickets to scooter and e-bike riders between June 2017 and early September 2019.

Despite these good strides made in the Santa Monica area, city officials say they cannot solve bad rider behavior through enforcement because of how spreads out the devices are and how quickly riders are zipping around (City of Santa Monica, n.d.). This seemed interesting given their fleet size and number operators. What will the city officials and enforcement agencies in the Los Angeles area have to do and say then?

To some extent, the rules and regulations for the accepting of applications and the issuance of permits by the regulators for both areas are harmonized. This is however not evident in restrictions that apply from one operator to the other. An example of which can be cited as that of the differences in geofencing rules that existed from one operator to the other.
Miami, Florida Area

Florida State Laws Regulating E-Scooters

In reference to the Florida Senate bill CS/CS/HB 453 (Chapter 2019-109) – SJ 624, the state of Florida has passed a legal authorization for counties and municipalities to regulate micromobility devices, effective from June 18, 2019. The bill provides that the operators shall possess all the rights and responsibilities that were currently applicable to bicycle users, except the duties imposed by specified provisions that by nature do not apply. It exempts the requirement of particular registration, licensing, insurance requirements, and driving license requirements from the users. Furthermore, the bill explicitly requires the operator/service provider to be responsible for collecting and securing all micromobility devices when the National Weather Service issues a severe weather warning. It does not prevent the local government from exercising its regulatory authority concerning the operation of micromobility devices or motorized scooters on streets, highways, and sidewalks under its jurisdiction (House Bill 453, 2019).

Even before the statewide legalization of micromobility devices, operators have established their e-scooter services across several cities in Florida, including Fort Lauderdale, West Palm Beach, Orlando, Tampa, and Tallahassee. E-scooters in Miami-Dade County, are primarily found in two places: The City of Coral Gables and Miami’s Commission District 2, which includes the neighborhoods of Bayfront Park, Brickell, Coconut Grove, Edgewater, Park West, Maurice Ferré Park, Omni, Midtown Miami, Morningside, and the Bayside Historic District, the Central Business District, plus segments of Wynwood.

Miami Area E-Scooter Operations

E-scooters first appeared on the streets of Wynwood, a neighborhood of Miami, in April 2018, around the same time that several cities across the U.S. began issuing cease-and-desist orders (Lima, 2018). Within two months of their launch, the e-scooters sparked mixed opinions among the users and non-users. By June 2018, the City of Miami had issued cease-and-desist orders to allow time to develop standard operating standards and policies (Wile, 2018a). Only the District 2 commission of the city of Miami favored the e-scooters, as it includes most dense areas of the city. While it took the city of Miami about six months to make their decision whether to launch the e-scooters back on streets, the city of Coral Gables quickly acted on it by permitting limited operators on their streets (Wile, 2018b). The city of Coral Gables reserved its sidewalks and streets to only 300 scooters, operated by Bird and Spin as a limited-period pilot program. The District 2 of Miami permitted about 3500 e-scooters from six different operators, including Bird and Spin.

Geographic Context

The City of Miami is divided into five districts. Out of all the districts, only District 2 currently permits an e-scooter program. The neighboring districts of Miami have indicated no interest or explicit opposition to allowing e-scooter program with commissioners citing a safety hazard. Coral Gables, the only local other Miami-area jurisdiction with an e-scooter program, borders Miami District 2 and 4 to the east. Because District 4 does not permit usage of e-scooters, only a
1.4-mile section of the Miami-Coral Gables border allows scooter trips to cross between jurisdictions.

Earlier research suggests that the average trip length by e-scooter user is approximately 1.2 miles, and the greatest benefits of cross-jurisdictional policy harmonization would occur in urban areas where trips are likely to cross multiple jurisdictions. The relatively small border that is shared between these jurisdictions suggests that harmonization may not benefit many users.

The City of Miami impounds the vehicles that are parked or left outside District 2 and charges operators $25 per incident. Since the beginning of the program in April 2019, the City impounded about more than 925 scooters owned by Lime, Lyft, and Jump. For operators such as Lime, the rate of vehicle impoundment is proportional to their vehicle fleet. The operators also claim that e-scooter sightings outside the geofence are a result of high demand on the other side of the border. The proximity of the neighboring jurisdictions makes it much easier for the scooters to violate the geofence, as it only takes a single street to cross (Poblete, 2020).

One of the biggest challenges here is that the neighboring districts are not interested in e-scooter programs and openly opposed to the repeated presence of District-2 e-scooters in their borders. The city of Coral Gables does not fall under the City of Miami districts and shares its borders with Miami District 2; however, their e-scooter program is a much smaller scale than District 2. Currently, the Coral Gables only permits two operators—Spin and Bird—to operate fleets of less than 100 devices.

Road Rules
Road rules govern user behavior including age limits, traffic operations, parking and more. The regualtions of Miami District 2 and Coral Gables are summarized below.

- District 2
  - **Age restrictions**: Users must be 18 years of age or older and must have a valid driver's license, state identification, or passport, which must be scanned or provided to vendors as proof of age. Furthermore, parents may not allow minor children to use scooters.
  - **User safety**: Users are not required to wear a helmet on e-scooters, but helmet use is strongly recommended. Also, only one person at a time may ride an e-scooter.
  - **Speed limit**: E-scooters cannot exceed 15 miles per hour on streets and bike lanes and 7 miles per hour on sidewalks.
  - **Sidewalk policy**: Users can ride on sidewalks or streets and are encouraged to ride in bike paths and bike lanes where available.
  - **Parking Policy**: Do not park on sidewalks that reduce the width to <3 ft and areas without a sidewalk. Leave at least a 6 ft wide gap for the pedestrians and A.D.A. access.
• City of Coral Gables:
  o Age restrictions: In the first ordinance by Coral Gables, the age limit was restricted to 18 yrs., or older. However, the new amendment removes that requirement.
  o User safety: The city strongly encourages users to wear a helmet but does not impose a requirement
  o Speed limit: There is some grey area in the maximum speed specification. While the city defines share mobility devices of speed less than 15 mph as motorized scooters, it was later removed in the amended ordinance. However, it appears that the e-scooters are considered motorized scooters.
  o Sidewalk policy: Users can ride scooters on the sidewalks except for the places with official posting.
  o Parking policy: Do not park in the areas where the minimum clear sidewalk width reduces below 3 ft, and in the areas where the minimum sidewalk width less than 6 ft at any location, and in the areas with no sidewalk.

Operations
Operations regulations are imposed on the operators that own and deploy shared mobility devices and can include geofencing where their devices can be ridden, permit fees, and equity requirements.

• Geo-fencing:
  o District 2: Allowed only in District 2 of Miami within Coconut Grove, Brickell, Downtown Miami, Midtown, Edgewater, Morningside, and Wynwood (east side of N. Miami Avenue and east only).
  o Coral Gables: As of 2018 (latest available information), e-scooters are permitted between Douglas Road (S.W. 37th Avenue) and Red Road (S.W. 57th Avenue) and north of Blue Road to S.W. 8th Street (Wile, 2018b). However, the ordinance does not specify this geo-fencing requirement (as of Oct 2019 amendment).

• Operating costs:
  o District 2: License fee - $50,000; Scooter fee - $1/device/day; Clearance fee - $25/veh.; Performance bond - $50,000
  o Coral Gables: The ordinance does not provide any information on the operation fees charged by the city, except that the operators are required to pay right-of-way fees per device per day. The amount was not specified. The performance bond or an irrevocable letter of credit issued by a certified bank in Florida is required for a payable amount of $50,000.
• Equity requirements:
  o **District 2:** The operators are required to conduct community outreach events, particularly targeting the low-income households, for providing equal opportunity to all groups of residents. These are to be conducted at the cost of the operator.
  o **Coral Gables:** While the city requires the operators to provide a solution for non-smartphone users to rent the scooters, other aspects of equitable service (like subsidized pricing and deployment) were not strictly imposed.

• Fleet Diversity:
  o **District 2:** As of Feb 14, the city of Miami hosts nine dockless operators including Bird (476), Bolt (244), Jump (595), Lime (595), Lyft (595), Spin (305), Baus (100), Wheels (125), Helbiz (100). Only a few companies, including Jump, Lime, Lyft, and Wheels, were permitted for an increase in their fleet as of December ’19 (Poblete, 2020).
  o **Coral Gables:** Spin and Bird (as of October 2019)

• Vehicle cap:
  o **District 2:** The initial number of vehicles is limited to 100, with less than 50 vehicles per operator, for the first two weeks. However, the vehicle cap is increased monthly by 25% if the average vehicle utility ratio is greater than three trips/veh/day. Also, the number of vehicles should not exceed the minimum number of vehicles that are required to attain a vehicle utilization ratio of 3. In case the utilization ratio is found to be lower than two veh trips/day, the fleet is reduced by 25%
  o **Coral Gables:** The city limits the number of vehicles to 300, with an opportunity for the increase in the fleet based on the vehicle utilization ratio and demand. The ordinance does not specify clear limits on the utilization ratio.

• Data sharing:
  o **District 2:** Operators are required to provide the city with aggregated data, anonymized trip level information, in addition to an API for public sharing of the location data.
  o **Coral Gables:** The cities require the operators to share an API for real-time information on the vehicles operating within the city. Also, the city requests for bi-weekly reports on anonymized ridership data, trip details, and incident reports. However, the language does not seem strong.

• Compliance:
- **District 2:** Vehicles or users violating the regulations must be reported to scooters@miamigov.com or Miami parking authority. Operators should respond to the complaints within one hr., with a team available 24 hrs. $25 ticket for violating user regulations, and $100 fine to operators for violating age/vehicle occupancy restrictions.

- **Coral Gables:** The operator is required to provide the contact on two local operational staff, along with a 24x7 customer service number. The complaints should be answered within 2 hrs. Vehicles stagnant for more than 48 hrs at a place are required to be removed. In the event of a storm, the vehicles are required to be removed within 12 hours of notice.

**Effectiveness of Regulations in Practice**

Regulations are only effective if enforcement powers exist and they are exercised. Miami District 2, the City of Coral Gables, and their neighbors are experiencing different outcomes of the District 2 and Coral Gables programs.

**Miami District 2**

Despite the strong language in the ordinance, the city reportedly failed at enforcing the road rules and user safety regulations (Bojnansky, 2020). For example, an article reported that the sight of tandem riding and underage riding to be prevalent in the downtown of Miami. During a Bayskate event in the downtown, several users were found to be violating the age and vehicle occupancy restrictions. Part of the reason is that there is no way to control who rides the scooters, except verify them during the account authorization. So, kids riding under the assistance of their parents is not a rare sight. Another important aspect is the enforcement is only up to the Miami parking authority, but not the Miami police department.

The commissioner of Miami’s District 2 (Ken Russell) received strong criticism from the other commissioners of neighboring districts (especially districts 3 and 4), suggesting that they are not interested in the e-scooter programs and the scooters from District 2 clutter the sidewalks in their districts (Wile, 2018c).
Coral Gables
The public works department of Coral Gables is currently responsible for the enforcement of the e-scooter program. The city prohibits users from riding near Giralda Plaza or any crowded sidewalks, including those on Miracle Mile. The operational hours are limited to 7 am to 8 pm (Wile, 2018b). Unlike the other cities, the operators were expected to recharge the scooters due to a relatively small fleet size.
Conclusions

Operator-Level Harmonization
In this case, the two jurisdictions decided to work with different operators. While Miami works with nine different operators, the city of Coral Gables works with Bird and Spin. One of the reasons for this difference is that the city of Coral Gables adopted e-scooters much earlier than the other cities and jurisdictions within Florida. When e-scooters made their overnight debut into the streets of Miami, in the first quarter of 2018, cities like Miami and Coral Gables temporarily terminated the services in the first 60 days to develop a clear set of ordinances (Bunao, 2018; Lima, 2018). While Miami took almost a year to bring back the e-scooters, Coral Gables allowed them back within a few weeks (Wile, 2018b). The city decided to work with a single operator at first (Spin) and then allowed the second operator (Bird) to join the program gradually. One of the reasons for choosing to work with fewer operators is because they believe that these selected operators have been highly cooperative and supportive during the temporary suspension time. Although Miami allows these two providers to operate in District 2, it is not clear if the devices are allowed to move between the borders. However, the ordinances from the two cities indicate the violation, impoundment, and confiscation criteria for the alien devices, with charges ranging between $25 and $500. Therefore, such harmonization can improve operational efficiencies and lead to a significant cut down on the costs related to maintenance and fleet management.

While operator level harmonization may allow for cross-jurisdictional movement of the vehicle fleet, their serviceability and user satisfaction, it may also substantially lower the growth of small and budding mobility entrepreneurs. For example, achieving such a level of harmonization between District-2 and Coral Gables may put companies other than Spin and Bird at a disadvantage, as they are not allowed in Coral Gables. In addition to that, companies have to significantly improve their fleet size and staff size in order to serve larger areas competitively.

Decision-Making and Scorecards
The Decision-making process marks one of the critical differences between jurisdictions. Miami's District-2 has a larger e-scooter program when compared to its neighboring Coral Gables jurisdiction. Since the launch of the program, the program expanded from Six operators to Nine operators. The fleet size of an individual operator may vary based on their performance that is measured on multiple levels, which includes vehicle utilization ratio and policy violations. In Miami District-2, the overall fleet size increased from 300 vehicles to 3000 vehicles. Like several other cities, District-2 of Miami evaluates its fleet based on different performance metrics like fleet size, ability to incentivize good behavior and safety. The tolerance limit on the number

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**Authorized Fleet per Scooter Vendor (Source: City of Miami as of Jan 2020)**

<table>
<thead>
<tr>
<th>Vendor</th>
<th>Number of Scooters</th>
<th>December Size Increase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bird</td>
<td>476</td>
<td>Yes</td>
</tr>
<tr>
<td>Bolt</td>
<td>244</td>
<td>No</td>
</tr>
<tr>
<td>Jump</td>
<td>595</td>
<td>Yes</td>
</tr>
<tr>
<td>Lime</td>
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<tr>
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<tr>
<td>Spin</td>
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<tr>
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of policy violations, incident rates, and the vehicle impoundment count may vary by the size of the program and the city itself. Therefore, cities like Coral Gables, with relatively smaller micromobility program, may have lesser tolerance for these metric-based evaluations.
Minneapolis–St.Paul, Minnesota

The twin cities of Minneapolis and St. Paul, Minnesota, began their respective scooter share programs in 2018 following complaints by residents about scooters that were rapidly deployed throughout the region by an early entrant into the scooter share industry. Minneapolis was already in the process of developing an ordinance for licensing scooters based on the rising popularity of scooter share programs nationwide, but the city opted to accelerate the process when a scooter company began operating in the region. The Minneapolis city council fast-tracked the long-planned legislation and passed a formal ordinance that established a scooter sharing program and rules for scooter use in the city.

The City of St. Paul established their ordinance shortly after Minneapolis, despite there not being any ordinance already under consideration during the 2018 rapid deployment, over concerns of scooters blocking rights-of-way. Ordinances established by both cities were built upon the foundation established by the Minnesota state legislature in a 2005 scooter law.

Minnesota State Scooter Laws

The 2018 scooter ordinances Minneapolis and St. Paul adopted reference state-defined motorized foot scooter operating rules. These rules, passed in 2005, have operating requirements similar to many U.S. municipalities with pilot or long-term shared micromobility regulation.

Rules of the Road

Under Minnesota state motorized foot scooter laws, scooters may not operate on sidewalks, except when necessary to enter or leave adjacent property, and scooters are also not allowed to carry passengers other than the operator. The minimum operating age is 12 years old, and persons under 18 years of age are required to wear a helmet. Scooters are required to have a headlight and a tail light and operate no faster than 15 mph.

Operating Requirements

Scooters must be operated on the right-hand curb as close as practicable, except when passing another vehicle or making a left-hand turn. To perform a left-hand turn, the operator is required to dismount the scooter and walk it across the street. Operators are exempt from the right-hand requirement when operating elsewhere on the street is "reasonably necessary" to "avoid impediments or conditions that make it unsafe to continue along the right-hand curb or edge, including; but not limited to; fixed or moving objects, vehicles, bicycles, pedestrians, animals, surface hazards, or narrow lanes."

Scooters may be operated on bicycle paths, lanes, trails, or bikeways that are not reserved for the exclusive use of non-motorized traffic unless the local authority prohibits operation.

Low Power Vehicle (Scooter and eBike) Sharing Operations

While Minneapolis and St. Paul scooter operations are governed by state operating rules, each city has their own regulations governing scooter sharing operations.
Minneapolis Scooter Sharing Program Requirements

Locality Operating Requirements
By city ordinance, no person may operate a scooter sharing program without written agreement with the city. Vehicles that violate this requirement are subject to impoundment and can be sold at auction after 30 days. Each scooter sharing operator's individual contract governs specific requirements put on them by the city.

Geofencing
Scooters are not geofenced and can be ridden anywhere in region, including St. Paul and the city suburbs provided the battery life is sufficient; however, once the rental is ended that scooter is no longer available to be rented until it is returned to the borders of Minneapolis proper.

2018 Scooter Pilot Program
Bird and Lime participated in the 2018 Scooter Pilot Program, which ran August–November 2018. Operators submitted a questionnaire to the city with information including maintenance, hiring, education and outreach, data, and privacy.

Operating Cost
The pilot program was capped at a maximum of 200 scooters in the first two months of the pilot, increasing to 400 in the final two months. The 200 scooters and subsequent expansions were split evenly between the operators. There was a $20 fee per scooter, with discretion for the Public Works Director to add an optional $1 per scooter per day additional fee.

Operating Requirements
Scooters were required to be parked upright using a kickstand and be parked in the furnishing zone of the sidewalk as to not impede pedestrian access. The Minneapolis Public Works Director had the discretion to impose geofencing to restrict operations in the event there were an excess number of violations.

The pilot program had data requirements for each operator that were designed to evaluate the impact of scooters.

2019/2020 Scooter Pilot Program
Minneapolis decided in March 2019 to reintroduce scooters to the city via a second-phase pilot, increasing the cap to 2,000 scooters and allowing up to four companies to participate. Although similar to the 2018 program, the 2019 program added new equity requirements designed to increase scooter deployment to underserved neighborhoods and required operators to have low-income pricing programs and alternative access options, such as cash payment, for people who don't have smartphones.

Operating Cost
The $20 fee (from operators to the city) per scooter was increased to a $100 per scooter fee.

Equity
Distribution requirements are as follows:
● At least of 30% of scooter fleets (min. 600) must be distributed throughout the Areas of Concentrated Poverty in Minneapolis (North, Northeast, South)

● No more than 40% of scooter fleets (max. 800) may be distributed to downtown and the surrounding neighborhoods (North Loop, D.T. East/West, Elliot Park, Loring Park)

● The remaining 30% can be distributed according to companies approved applications

Notably, despite being one of the original two pilot program participants in 2018, Bird was not selected as a 2019 scooter program participant. JUMP, Lyft, Spin, and Lime were selected. The city noted that "Bird's responses to questions related to climate, equity, and prosperity goals were below expectations."

The pilot program ended in March 2020.

St. Paul Scooter Sharing Requirements
Following the rapid deployment of scooters in 2018, St. Paul passed an ordinance and established a two-month pilot program allowing 200 scooters operated by Bird and Lime.

Operating Requirements and Geofencing
Many of the requirements were identical to Minneapolis’ and the only geofencing that applies is that scooters are capped at 10 mph on designated parkland.

Equity
The 2019 scooter pilot program in St. Paul, like Minneapolis, increased the number of scooters to 2,000 and allowed up to four vendors. Unlike Minneapolis, only three vendors applied and all three were chosen—Bird, Lime, and Spin. The 2019 program introduced the following equity requirements:

● A minimum of 30% of the fleet must be distributed throughout Areas of Concentrated Poverty where 50% or more of the residents are people of color (ACP50) as defined by the Metropolitan Council

● A maximum of 150 scooters operated by each vendor may be distributed within the Downtown Entertainment District as defined in Municipal Code Section 409.02

Operating Cost
The duration of the St. Paul program was April–November 2019. A similar $100 per scooter fee was paid to St. Paul, and a park impact fee of $0.25 per scooter per trip was paid for rides that begin or end on park land. Operators were also responsible for reimbursing the city for staff time spent moving scooters parked in prohibited locations at the rate of $35 per move and $20 per day for impoundment fees.

Conclusions
Minnesota appears to have been very proactive on scooter regulation by passing a law in 2005, making Minnesota one of a handful of states that had scooter laws prior to the popularization of dockless shared mobility. Even by 2018 fewer than 10 states had scooter laws. Prior to this
legislation, scooters would have been classified as motorcycles under Minnesota law and thus subject to motorcycle driver licensure, vehicle registration, and other applicable laws. However, registration laws in Minnesota required the recording of a vehicle identification number (V.I.N.), which scooters were too light to qualify for. Further, scooters fell below the weight limit to require a motorcycle license, despite the requirement that all "motorcycles" only be operated by licensed motorcycle operators. Because scooters did not meet the criteria to adhere to these two regulations, they would effectively have been outlawed because there was no means for them to comply with the law.

The solution of passing state laws presents one path to harmonization by enacting legislation at a level of government that is more attuned to the needs of particular communities, as opposed to blanket federal legislation. The path Minnesota took was to prescribe general operating rules for scooters, such as age limits, safety requirements, and permissible operating locations through state law. As the state legislation remained silent on scooter share programs, the cities of Minneapolis and St. Paul were empowered to regulate these programs under the powers of their respective home rule charters. Providing for general operating rules at the state level while leaving the regulation of the scooter share programs to localities seems an effective split given that most of the state outside of Minneapolis and St. Paul is rural and trips utilizing micromobility are unlikely.

While this state-level regulation provided some degree of consistency in general operating rules, there still remained differences between the local ordinances enacted to regulate the scooter share programs, and the methods by which the cities went about selecting operators for the respective scooter programs, that have been detrimental to harmonization.

Both cities opted to begin as pilot programs. In 2018, given how hastily legislation was passed and the sharing programs were established, all operators who wanted to participate in Minneapolis and St. Paul's scooter sharing programs were admitted, provided they agreed to the respective city's terms and conditions. However, both cities were more selective in 2019 chose different operators for their 2019 programs. The most notable difference is Minneapolis allowed all interested parties to participate in their pilot program in 2018, while in 2019 Bird was the only company that was not chosen as a participant in their pilot program. While the scorecards were not made public, when asked by the press why Bird was not chosen the city spokesperson said that Bird's response to a number of the benevolence sections of their questionnaire (sections on climate, equity, and prosperity) did not meet their expectations. Bird responded to this by urging their customers to contact their councilmember.

Meanwhile, St. Paul selected all companies that applied (Bird, Lime, and Spin as JUMP did not apply). These conflicting participants mean that while you can ride a non-participating scooter into another jurisdiction, once the session ends that scooter can only be reactivated once its been returned to a participating jurisdiction, making trips only one-way. While both cities established scooter distribution criteria for their cities in their 2019 programs, the criteria varies between the two cities. Both cities did have identical per-scooter fees that needed to be paid to the
municipality to participate in the scooter share program, and St. Paul went further by charging the scooter operators for staff time required to relocate illegally parked scooters.

Given the close relationship between Minneapolis and St. Paul both geographically (the region is known as the Twin Cities and share suburbs) and economically (many companies have offices in both cities and citizens commute between the two on a regular basis), it may be beneficial for them to establish a joint 2020-2021 scooter pilot program. Despite having similar experiences, beginning as a pilot would allow them to establish a coordinated operation rhythm and build working relationships with each other’s municipal departments. Common criteria and scorecards would go a long way towards providing certainty to operators when applying for the programs. Common economic equity criteria would ensure benefits are shared across the Minneapolis/St. Paul region rather than restricted by geography and municipality. Finally, common operators would ensure trips could be consistently made across the Mississippi River in both directions.

Minneapolis and St. Paul already have a forum for this through the Metropolitan Council, their local metropolitan planning organization that provides planning services in transit, water treatment, and housing—services often regulated by municipalities. Utilizing this forum, which consists of elected officials and citizens from across the region, both cities could effectively harmonize their programs to promote consistent scooter regulation across the region.
Oakland-Berkley, California
This case study will focus on a subset of micromobility, specifically e-scooters, and their operations in two adjacent California cities, Oakland and Berkeley.

State Laws Governing E-scooter Operation in Oakland and Berkeley
Both Oakland and Berkeley are governed by California state law, which does include provisions regulating the use of e-scooters. California State law Vehicle Code (CVC), Division 11. Rules of the Road [21000 - 23336] (Division 11 enacted by Stats. 1959, Ch. 3.), Chapter 1. Obedience to and Effect of Traffic Laws [21000 - 21296] (Chapter 1 enacted by Stats. 1959, Ch. 3.) Article 5. Operation of Motorized Scooters [21220 - 21235] (Article 5 added by Stats. 1999, Ch. 722, Sec. 5.) provides guidance for E-scooter operations. In California, a motorized scooter (also called an electric scooter) is defined as a vehicle that has two wheels, handlebars, a floorboard that can be stood upon while riding, and a motor that powers the vehicle (Croll, 2020). California State law Vehicle Code, Division 11., Chapter 1., Article 5., Section. 21235 declares that the operator of a motorized scooter shall not do any of the following:

- Operate a motorized scooter unless it is equipped with a brake that will enable the operator to make a braked wheel skid on dry, level, clean pavement.
- Operate a motorized scooter on a highway with a speed limit in excess of 25 miles per hour unless the motorized scooter is operated within a Class II or Class IV bikeway, except that a local authority may, by ordinance or resolution, authorize the operation of a motorized scooter outside of a Class II or Class IV bikeway on a highway with a speed limit of up to 35 miles per hour. The 15 mile per hour maximum speed limit for the operation of a motorized scooter specified in Section 22411 applies to the operation of a motorized scooter on all highways, including bikeways, regardless of a higher speed limit applicable to the highway.
- Operate a motorized scooter without wearing a properly fitted and fastened bicycle helmet that meets the standards described in Section 21212, if the operator is under 18 years of age.
- Operate a motorized scooter without a valid driver's license or instruction permit.
- Operate a motorized scooter with any passengers in addition to the operator.
- Operate a motorized scooter carrying any package, bundle, or article that prevents the operator from keeping at least one hand upon the handlebars.
- Operate a motorized scooter upon a sidewalk, except as may be necessary to enter or leave adjacent property.
- Operate a motorized scooter on the highway with the handlebars raised so that the operator must elevate his or her hands above the level of his or her shoulders in order to grasp the normal steering grip area.
• Leave a motorized scooter lying on its side on any sidewalk, or park a motorized scooter on a sidewalk in any other position, so that there is not an adequate path for pedestrian traffic.

• Attach the motorized scooter or himself or herself while on the roadway, by any means, to any other vehicle on the roadway (California Legislation, 2019).

However, notwithstanding any other provision of law, the local authority or the governing body of a local agency having jurisdiction may provide further ordinance regarding e-scooter operation. As such, each jurisdiction, Berkeley and Oakland, released guidance for e-scooter operations within their respective regions.

Authorization to Operate
Both Oakland and Berkeley have local standards for e-scooter operations within the confines of California law. Additionally, UC Berkeley governs e-scooter use on university-owned land. Therefore, these two jurisdictions and one entity may consider reviewing their regulations holistically and searching for opportunities to harmonize these regulations.

Berkeley
On December 4, 2018, the City of Berkeley launched the "Shared Electric Scooter Pilot Franchise" (SESP). Exhibit A "Shared Electric Scooter Pilot Program Terms and Conditions" outlines general provisions under which E-scooter companies shall operate. The SESP stated that it would last twelve (12) months, and the City would award franchises to no greater than three (3) operators. Per the SESP, Berkeley would limit the program to 1,200 scooters in total (400 scooters per operator). According to Ben Klein's and Rachel Barber's February 2019 article, "UC Berkeley study finds electric scooter market divide," Lime, Bird and Razor were part of Berkeley's SESP pilot (B. Klein & Barber, 2019). Some of the goals of the SESP is to:

• Diversify mobility options of residents, employees and visitors to Berkeley,

• Protect Public Health and Safety,

• Avoid waste by ensuring scooters in Berkeley are robust enough for commercial use,

• Avoid sidewalk, pathway, and Americans with Disabilities Act (A.D.A.) blockages,

• Reduce emissions from short trips and connections to transit,

• Maximize user awareness of safe and legal behaviors for operating shared mobility devices,

• Create an enforceable framework for managing shared mobility services,

• Ensure use of the Public Right of Way (PROW) benefits public mobility, and

• Ensure private operators respond to pervasive issues and service complaints (City of Berkely, 2018).
Oakland

The City of Oakland initiated the "Dockless Scooter Share Program Terms and Conditions + Permit Application" on May 3, 2019. The permit defines a "Dockless Scooter" or "Scooter" as "any two-wheeled device that has handlebars, has a floorboard that is designed to be stood upon, and is powered by an electric motor." Section 10.18.020 of the Oakland Municipal Code (O.M.C.), states that the "City Administrator… is authorized to review, approve and issue dockless scooter operator permits to operators who submit applications to operate such programs within city" limits. O.M.C 12.08.012 also states that "it shall be unlawful for a dockless scooter share Operator to provide a scooter share system within the City without first obtaining an encroachment permit from the Department of Transportation." From the time permits are issued they are valid for one-year, and operators must renew permits annually. According to Carolyn Said's July 2019 *San Francisco Chronicle* article, "Oakland OKs 3,500 rental e-scooters from Bird, Lime, Lyft, Clevr," four E-scooter operators have been given permits to operate up to a total of 3,500 E-scooters in Oakland (Said, 2019). The two largest operators, Bird and Lime, have each been given authority to operate a fleet of 1,000 vehicles. However, as of April 7, 2020, according to the New Urban Mobility Alliance, due to the COVID-19 pandemic, there are no functioning operators remaining in Oakland (NUMO Alliance, 2020).

Local Operating Regulations

Both Berkeley and Oakland's specific e-scooter operations are outlined below (California Legislation, 2019; City of Berkely, 2018; City of Oakland, 2019).

Road Rules

- Berkeley
  - **Age restrictions:** Users must be 15 1/2 years of age or older and must have a valid driver's license or instruction permit (CVC 21235). Minimum age to receive an instruction permit in California is 15 ½.
  - **User safety:** Users are not required to wear a helmet on e-scooters, unless the user is under 18 years of age (California Legislation, 2019).
  - **Speed limit:** E-scooters cannot exceed 15 miles per hour on streets and bike lanes (CVC 22411).
  - **Sidewalk policy:** E-scooters can legally ride on a sidewalk if they are leaving or entering an "adjacent property." Besides this reason, it is illegal to ride E-scooters on sidewalks (CVC 21235).
  - **Parking Policy:** Users shall ensure their vehicles are not parked in a way that impedes the regular flow of travel in the PROW, or in any way that impedes A.D.A. compliance. Scooters shall not be parked within 15' of street corner pedestrian ramps. "Legal" parking includes the landscaping or furniture zone of sidewalk.

- Oakland
Age restrictions: Minimum age requirement is 15 ½ due to instruction permit requirement. (CVC 21235).

User safety: Users are not required to wear a helmet on e-scooters, unless operator is under 18 years of age (California Legislation, 2019).

Speed limit: All Scooters shall have a governor that restricts electric assisted speed to 15 mph when operated on a level surface. Speed limits will be re-evaluated on a quarterly basis. The City reserves the right to revise the speed limit based on collision and injury data as recommended by Oakland Department of Transportation ("OakDOT"). Operator must agree to further reduce speeds within areas designated by the City, if such technology is available.

Sidewalk policy: Riding on sidewalks is prohibited at all times. "No Riding On Sidewalks" in no less than 48-point font, shall be printed on every Scooter.

Parking policy: User shall ensure their vehicles are not parked in a way that impedes the regular flow of travel in the PROW, or in any way that impedes A.D.A. Compliance. Operators shall propose to the City a minimum of one designated Scooter parking area per 15 permitted Scooters.

Operations
Operations regulations are imposed on the operators that own and deploy shared mobility devices and can include geo-fencing where their devices can be ridden, permit fees, and equity requirements.

Geo-Fencing
- Berkeley: Operators will coordinate with City Staff to establish geo-fenced "no parking" zones, reduced speed zones, and areas of distribution (service area).
- Oakland: Operators shall introduce geo-fencing around designated scooter parking areas and instrument in-app technology to require its use in highly dense zones.

Operating Costs
- Berkeley: Application fee ($2,500), Franchise fee ($20,000 annually) and a “Public Property Maintenance Fund” deposit ($10,000).
- Oakland: Application Fee ($2,500) non-refundable one-time fee. Upon application review and permit issuance, the following fees will be due prior to launching services.
  - Permit Fee: $30,000 annual fee
  - Vehicle Fee: $64 per vehicle per year
  - Parking Fee: $0.10 every time a Scooter is parked or left standing in a metered zone during meter hours of operation
Equity Requirements

- Berkeley:
  - Operators shall present a plan to put into service adaptive scooters for users with disabilities no later than 6 months of the pilot.
  - Operators must provide an equity program for low-income users. This includes making available ways for qualifying users to gain access to service without credit card or smartphone.

- Oakland:
  - Operators must deliver a proposal for community engagement, including a list of planned presentations, activities and events with community-based organizations, Business Improvement Districts, and other key stakeholders.
  - Operators must facilitate a method to receive and respond to complaints in multiple languages, including, but not limited to, Spanish and Chinese. A summary of complaints must be given to OakDOT on a quarterly basis.
  - Operators must ensure a website or app feature exists for users and non-users to recommend Scooter parking locations, and report this data to OakDOT.
  - Operators shall offer free or discounted helmets at in-person events, or through their mobile application or website.

Fleet Diversity

- Berkeley: Lime, Bird and Razor were part of Berkeley’s SESP pilot (B. Klein & Barber, 2019)

- Oakland: Four E-scooter operators from Bird, Lime, Lyft, Clevr (Said, 2019).

Vehicle Cap

- Berkeley: Fleet total will not surpass 1,200 scooters for the pilot. A maximum of 400 scooters per operator, set to be modified periodically based on ridership. Operator(s) may begin their pilot with fleet size no greater than 200 scooters in service per operator (600 total) and the fleet size may fluctuate to maintain 4 rides per scooter per day (City of Berkely, 2018).

- Oakland: 3,500 E-scooters. The two largest operators, Bird and Lime, have each been given authority to operate a fleet of 1,000 vehicles (Said, 2019).

Data Sharing

- Berkeley: Operators are required to provide the city with aggregated real-time data, anonymized trip level information, in addition to an application programming interface (API) for public sharing of the location data following the specification standards developed by the City of Los Angeles. Also, on a quarterly basis, the city requests for
quarterly reports on aggregated usage, maintenance, rebalancing, customer service, incidents and other key performance indicators. Further, the city asks for a quarterly survey to their users to determine which modes of transportation scooter trips are being replaced. Lastly, on a monthly basis reports detailing rides per scooter shall be submitted for City to determine if Operators' program fleet should increase or decrease based on the 'dynamic cap'. This cap is determined based on if rides are greater than 4 rides per day, and the frequency that complaints/incidents occur (City of Berkely, 2018).

- **Oakland**: The city requires operators to share anonymized real-time origin and destination points in Mobility Data Standard (M.D.S.) format available to the City for purposes of aggregating this data, evaluating Scooter usage or enforcing the requirements in its permit. Any API shall reveal trip starting points, trip endings, or G.P.S. telemetry data showing the trip passing through the city. Anonymized real-time data available via a public API shall be in accordance with the data standard developed by the North American Bikeshare Association, known as the "General Bikeshare Feed Specification (GBFS). A smart phone-based application used to rent dockless vehicles does not qualify as a publicly accessible application program interface. Public GBFS feeds may omit vehicle I.D.s in order to protect user privacy. In addition, to enable OakDOT to impose parking fees, operator shall compile and maintain data showing every instance a scooter is parked or left standing in an official parking meter zone. This data shall be used to calculate total parking fees and submitted to OakDOT quarterly, which OakDOT has the right to audit and make adjustments. Further, operators must make available quarterly reports on key performance measures containing, but not limited to, the following:
  
  - Utilization rates;
  - Total downloads, active users, and repeat user information;
  - Total trips by day of week and time of day;
  - Origins and destinations;
  - Trips per Scooter by day of week, time of day;
  - Average trip distance;
  - Scooter maintenance reports (including but not limited to Scooter identification number and maintenance performed);
  - Incidents of theft and vandalism;
  - Number of complaints;
  - Number of crashes or collisions, including the date and time of the incident, Scooter ID, location of incident (geo coordinates), traveling path of vehicle (sidewalk, bike lane, travel lane), the severity of the incident (fatality, injury, or property damage only), and if Police report was filed;
Payment method information;
Rebalancing to designated service areas;
Outreach activities completed;
Total number of free or discounted helmets distributed;
Number of Customers participating in low-income discount program;
Number of discounted rides taken; and
Total number of times a Scooter was parked or left standing in a meter zone and total parking fees owed to the City.

Lastly, operators must annually dispense an opt-in user survey to all users, that was created by OakDOT or a third-party, and provide input on questions that will be asked (City of Oakland, 2019).

Compliance

- Berkeley: Operators are required to provide a customer service hotline, enabling the public to inform misused or damaged devices, or to receive general customer support. Customer Service shall be available 7am – 10pm, seven days a week, and accommodate multi-lingual translations. City personnel shall also have access to a direct contact at a 24 hour a day Public Safety Hotline to allow operators for emergencies and device relocation, with a response time no greater than 2 hours. Complaints will be tracked via a "ticket number" system, similar to 311, to identify and track each complaint. Lastly, in addition to a unique identification number on each scooter, every scooter shall have clearly visible contact information, including a toll-free phone number and email address (City of Berkely, 2018).

- Oakland: The operator is required to provide a single point-of-contact (phone number and email) available 24x7, as well as listing that contact clearly on each Scooter along with a unique identifying number. The complaints should be answered within 3 hours during business hours and 12 hours during non-business hours. Similarly, complaints received through Oakland's 311 system must be addressed during the same timeframe as above. The operator must also notify the City of Oakland via email to scootershare@oaklandca.gov, as well as notifying the complainant of receipt of the compliant, and when a complaint has been dealt with and is considered closed. Lastly, complaints logged through the Oak311 platform may only be closed after photographic evidence is uploaded confirming compliant has been addressed (City of Oakland, 2019).

Effectiveness of Regulations in Practice
Regulations are only effective if enforcement powers exist and they are exercised. Berkeley, Oakland, and their neighbors are experiencing different outcomes of the respective programs.
Enforcement

- **Berkeley**: In a *Berkeley Side*, by Emilie Raguso titled "Berkeley council says yes, for now, to electric scooters". She states the city of Berkeley intends to plan "to focus enforcement on the scooter companies themselves rather than individual riders" (2018). This becomes evident based on the following examples. Despite the ordinance language "One company … has actively deployed scooters in Berkeley, without permission, … San Francisco-based Skip Scooters" (Bojnansky, 2020). For example, Luman stated, looking at the Skip's smartphone app in August 2018 "revealed at least 20 scooters spread throughout Berkeley, near Ashby BART, south of the Cal campus, downtown, at the Berkeley Marina and in the Elmwood district" (2018). Luman further states "Dave Sorrell, manager of UC Berkeley's Alternative Transportation Program, said Skip scooters started appearing on campus a couple weeks ago without university permission" (2018). Skip did not contact UC Berkeley prior to Sorrell emailing them on July 24, 2018, in which they responded with an apology on July 26 and removing most of their scooters from university property (Bojnansky, 2020).

- **Oakland**: The article "UC Berkeley study finds electric scooter market divide" published in *The Daily Californian* referenced a UC Berkeley study conducted by the Haas School of Business, exposed that closely half the market may favor owning to renting electric scooters. Part of the rational for this may be due to "community backlash throughout California regarding traffic blockage and safety complaints, prompting regulations and bans" (B. Klein & Barber, 2019). In Oakland, where Lime and Bird are among the chief suppliers of electric scooters, officials applied regulations on electric scooter corporations, requiring distributors to ensure that the scooters are not parked in a manner that blocks sidewalks or traffic and that they are equitably distributed throughout Oakland communities.

According to the *Oakland Magazine* article "Scooters Arrive in Oakland, Like It or Not," Oakland's approach to enforcement of e-scooter regulations is that if a provider "is consistently out of compliance, the city administrator" has the power to "reduce its fleet size or revoke its permit altogether" (Morris, 2018). Morris quotes Bird senior manager Marlo Sandler, who reached out to the Oakland City Council on June 22, 2018 to acknowledge Bird's "small demonstration pilot" of the company's e-scooters (Morris, 2018). The City's response instructed Bird to cease operations in public spaces until the company was "permitted". Despite this, Bird has continued operations in downtown Oakland, sparking “concerns” from residents. Bird’s general approach in launching its service is to test levels of need within the market prior to beginning regulatory compliance measures. A specific example of this occurred when the city of Oakland requested clarification on whether the scooters that were in operation prior to the permit had a minimum of three riders per day, and Bird was able to provide a response based on pilot activities. Bird has also sponsored a bill in the California Assembly to reduce safety regulations on e-scooters in order to avoid things like helmet requirements. Morris, citing a California personal injury law firm, outlined “common” reports of e-scooter-related accidents, which are currently not tracked by the Oakland Police Department. McGee, Lerer & Associates noted that
local e-scooter were often related to “injuries resulting from [a] malfunctioning Lime or Bird scooter,” which have included “issues with brakes, tires, or handlebars” (Morris, 2018). Other incidents included “pedestrians being hit… or scooter riders crashing”.

Inferences

Operator-Level Harmonization

Much of the guidance on e-scooter operation in Berkeley and Oakland is driven by California state law. Oakland adopted state law and developed specific ordinance and permit application. Berkeley began with a pilot, which although provided guidance, was not as clear as Oakland’s application. The two operators which operate in both cities are Bird and Lime. Based upon sources reviewed in this case study, it can be noted that Bird has a less observant orientation towards local regulations. This can be most noted through the company’s deployment of e-scooters prior to permitting. Conversely, Lime appears to follow local ordinance more carefully, as evidenced by the limited citations received by the company following its deployment in Oakland and Berkeley. Interestingly enough, Skip has not received permits in either city, but continues to operate informally. UC Berkeley has stringent restrictions on campus e-scooter use, making it difficult to harmonize regulations and operations across both cities. To facilitate operational harmonization among both cities and multiple operators, it would be prudent for Berkeley to employ regulations and permitting schemes in alignment with those existing in Oakland. To ease cross-border e-scooter use, fleet capacity calculations should take into account the geographic area containing both Oakland and Berkeley, and should maximize scooter deployment in this region. Furthermore, one enforcement body should govern this larger region when operators or users are delinquent. Although the city of Berkeley is not the overseeing authority for UC Berkeley, UC Berkeley should adopt policies in alignment with the larger region. Such harmonization can improve the operational efficiencies and lead to significant cut down on the costs related to maintenance and fleet management.

Decision Making and Scorecards

Decision making process marks one of the key differences between Berkeley and Oakland. Oakland provides a detailed criteria on how each provider’s e-scooter application should be evaluated. Oakland’s permit clearly states that each application shall be evaluated on ten “Shared Mobility Principles,” including “inclusive outreach and engagement, racial equity, traffic safety, equitable access to services, public transit, affordability, healthy communities and environment, employment and economic development, privacy and personal data, and collaboration and accountability. According to Oakland’s criteria, each of these principles are evaluated “on a scale of 1 to 10,” and “a minimum total score of 70 is required to obtain a permit” (City of Oakland, 2019).

Conversely, Berkeley’s pilot and permit applications do not provide guidance on how each operator’s application will be evaluated. As such, this creates less transparency in the operator approval process. This may either persuade or dissuade some operators from applying, limiting the potential for competition and fleet diversity. This may partially explain Bird’s lack of compliance in their deployment approach. Excluding a scorecard or other evaluation technique
may favor larger, more experienced operators, as they have experience launching their services in more markets. Requiring strict state laws that govern e-scooters may also result in limited diversification of operators. Lack of clarification as in the example of Berkeley also creates hardships and possible barriers to entry for operators.