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CITY OF PORTLAND BUREAU OF TRANSPORTATION

2019

E-Scooter Findings Report

September 2020

PBOT
PORTLAND BUREAU OF TRANSPORTATION

alta
PLANNING + DESIGN

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A mural in downtown Portland pays tribute to George Floyd, who was killed by police in Minneapolis, spurring a national and global anti-racism movement, including protests in Portland.

00 Preface

June 18, 2020

This report illustrates findings from Portland's 2019-2020 Shared Electric Scooter Pilot. This report was written in early 2020 and focused on data from the 2019 calendar year. However, in early spring 2020, a **global pandemic and resulting disruption in economic systems have significantly impacted how much—and how—we travel. At the same time, recent national unrest over the deaths of Black Americans killed by police has demonstrated that Black and brown Americans are unsafe in the public right-of-way.**

What follows is a synopsis of recent events from both the COVID-19 pandemic and the movement for racial justice that have had a material impact on ridership and the operations of Portland's e-scooter pilot program.

In late 2019, e-scooter companies were already having difficulty reaching profitability, and PBOT saw that market instability and consolidation would shape the micromobility industry in 2020. For example, Bolt had already withdrawn from all its North American markets, including Portland, in December 2019. Lime and Razor tested winter service for the first time in Portland, reducing their service areas significantly to focus on the downtown core, which left much of the city without e-scooter service. In February 2020, Shared Tech closed down operations in Portland—its only market—due to extreme difficulties securing funding to support and grow its venture.

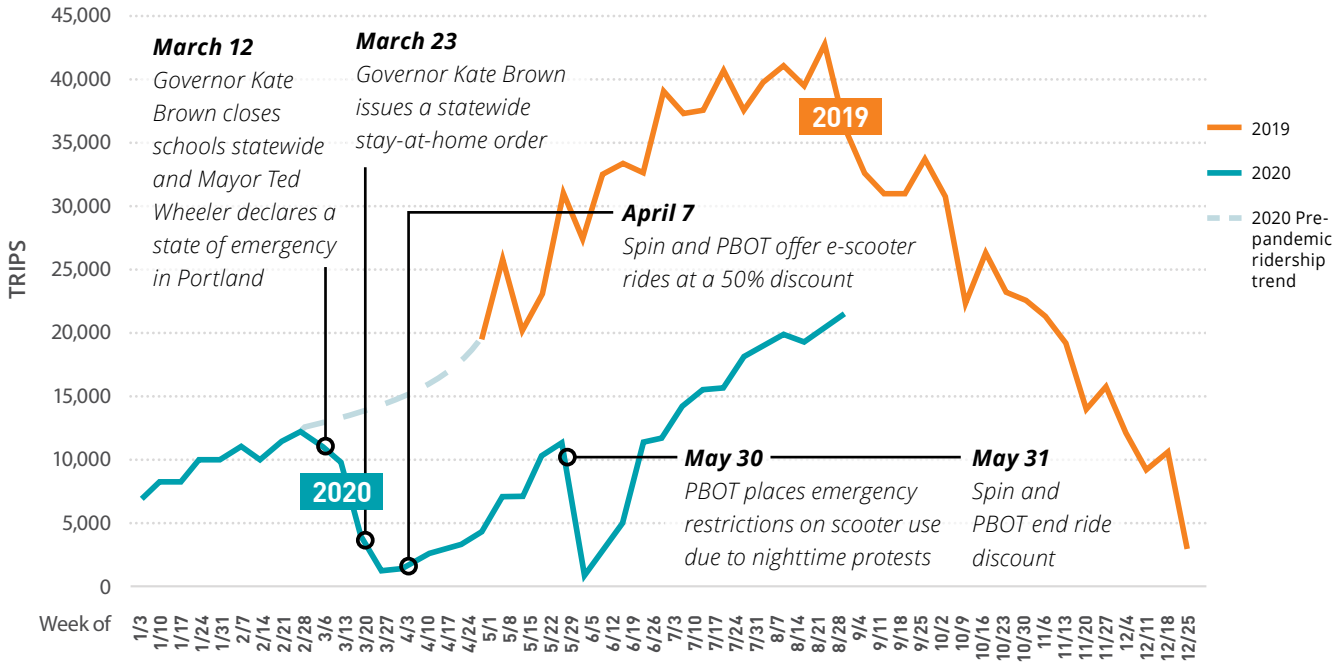
Meanwhile, a novel virus would soon become a global pandemic, reshaping modern life as we know it. In response to COVID-19, travel in Portland ground to a halt in March 2020. On March 12, Governor Kate Brown closed schools statewide and Mayor Ted Wheeler declared a state of emergency in Portland, and e-scooter ridership dropped 67% the following week. On March 23, Governor Brown issued a stay-at-home order, and e-scooter ridership dropped 90% from its pre-pandemic 2020 level as people traveled only to get to essential jobs, grocery stores, medical appointments, or other necessary destinations.

Across the globe, e-scooter ridership plummeted and many e-scooter companies responded to COVID-19 by suspending operations in most markets. In Portland, Lime and Bird suspended service altogether, while Razor significantly reduced its fleet, and Spin slightly reduced its presence.

As the pandemic began to unfold, PBOT recognized that e-scooters—in addition to other forms of micromobility, like Portland's bike-share system, BIKETOWN—could provide a lifeline for essential trips and safe, physically distant outdoor recreation. PBOT determined that micromobility was an essential service and partnered with Spin to reduce e-scooter fares by 50% during COVID-19 from April 7 to May 31, 2020. PBOT also reduced BIKETOWN fares by 50% from April 7 through April 30, 2020.

During this time, e-scooter ridership slowly began to increase. After hitting a low point in March at about 1,200 rides per week, e-scooter ridership has now almost returned to its pre-pandemic level for 2020.

Comparison of 2019 e-scooter activity to 2020



Had the COVID-19 pandemic not occurred, PBOT believes that the true low point for ridership would have occurred in January 2020, and PBOT estimates that e-scooter trip volumes in spring 2020 would have approached a similar number of rides to what Portland saw in spring 2019.

More recently, **national unrest over the deaths of George Floyd, Breonna Taylor, Ahmaud Arbery, and more—the most recent Black Americans to be killed by police and vigilantes in a pattern that has continued for centuries—**has resulted in protests in Portland that have impacted e-scooter use.

On May 30, 2020 PBOT received reports that e-scooters had been used by a small number of actors to vandalize property downtown during nighttime protests. Facing uncertainty from additional protests, PBOT instituted emergency requirements to restrict e-scooter use in downtown Portland, while continuing to allow it elsewhere around the city. Other mobility service providers, including TriMet, Portland Streetcar, and BIKETOWN, also instituted service level reductions. In the weeks following, PBOT tracked the largely peaceful demonstrations for racial justice and gradually eliminated restrictions on e-scooter operations to return to normal service.

Though these peaceful demonstrations have meant temporary reductions to mobility options in downtown Portland, **more importantly, they have shown how fundamentally different the experience of Black and brown Americans in the right-of-way is** compared to that of white Americans.

Black Portlanders have told PBOT in Walking While Black focus groups and in 2018 e-scooter focus groups that they are not safe walking, riding a bike, or waiting for the bus on the streets in their own neighborhoods. **The threat of harassment and violence by police and the public means that active transportation can be or feel like an unsafe option for them.** For example, people of color—particularly trans women of color—face the prospect of verbal and physical abuse from other Portlanders simply for being in public space.

Black Portlanders made up only about 3% of respondents of a summer 2019 e-scooter user survey, though Portland's population is about 6% Black, suggesting that Black Portlanders are less likely to use e-scooters. Even if barriers to e-scooter use like affordability and access can be overcome, others still remain. For example, picking up a shared e-scooter in the right-of-way can lead to assumptions of property theft, and interactions with police can escalate to threaten their lives.

Mobility will look different for the coming months until the threat of COVID-19 dissipates. At the same time, many Black and brown Portlanders will see using a personal vehicle as their safest option until the threat of racism in the right-of-way is removed, which means white supremacy is a key barrier to achieving Portland's ambitious climate action and congestion reduction goals. E-scooter operations and management must continue to evolve in the face of these shifting realities.

01

Background & Context

Shared electric scooters first arrived in the U.S. in 2017. By late 2018, over 100 cities across the country saw over 85,000 e-scooters in use. In 2018 alone, riders took 38.5 million trips on e-scooters, in addition to 36.5 million trips taken in station-based bike share systems.[1]

As Portland's population grows, traffic is increasing, and transportation-related carbon emissions continue to rise. These trends disproportionately impact lower-income Portlanders who must travel longer distances due to gentrification and displacement.

The City of Portland sees both promise and challenge in this new mode. E-scooters have potential to shift trips from single-driver and single-passenger motor vehicles to a smaller, more efficient, less-polluting mode. Realizing this potential would advance city goals to reduce congestion, reduce climate emissions, and advance equity. However, challenges remain, and the city must continue to ensure e-scooters do not exacerbate existing inequities or negatively impact the climate.

By late 2018, over

100 CITIES

85,000 E-SCOOTERS in use

38.5 MILLION TRIPS

BACKGROUND & CONTEXT

E-scooter pilots: 2018 and 2019-20

In 2018, the Portland Bureau of Transportation (PBOT) conducted a four-month e-scooter pilot from July to November. The pilot was intended to assess whether e-scooters can help meet the following city goals:

- **Reduce traffic congestion** by shifting trips away from private motor vehicle use
- **Prevent fatalities and serious injuries** on Portland streets
- **Expand access** to opportunities for underserved Portlanders
- **Reduce air pollution,** including carbon emissions

At the end of the pilot, PBOT evaluated pilot results against those goals and documented the findings in a report that received national press coverage and was emulated by other cities.[2] The report concluded that e-scooters may reduce vehicle miles traveled, provide a safe way to get around Portland, and offer potential for more equitable transportation service. However, sidewalk riding and improper parking remain key concerns, historically underserved Portlanders face barriers to access, and it is not clear whether e-scooters reduce harmful emissions when the full product life cycle and system operations—including charging and rebalancing—are considered.

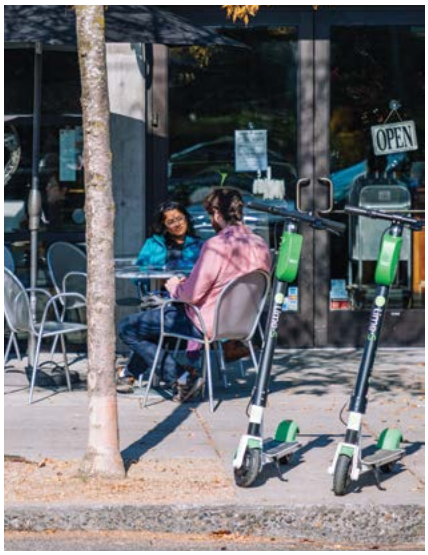
PBOT launched a second pilot in April 2019 to gather additional data about e-scooter operations and test management strategies to address issues identified during the first pilot, as well as to gain a better understanding of e-scooter use and operations over the winter months.

The 2019-20 pilot began with a competitive application process. Five companies—Bolt, Lime, Razor, Shared, and Spin—were awarded e-scooter fleet permits in April 2019. Bird received a permit in August 2019 as part of a second round of permit approvals. The pilot structure enabled individual companies to earn fleet increases through an "incentive" process that evaluates company performance on key metrics, including utilization, citywide deployment, and safety workshops. At the end of 2019, PBOT had permitted 2,865 e-scooters to operate on Portland's streets, though some companies did not deploy the maximum number of e-scooters they were permitted.

In December 2019, PBOT notified companies and the public that the pilot period would be extended through December 2020. This extension enables further testing of management solutions, gives more information about seasonal operations, and allows e-scooter industry trends and market changes to play out before making decisions about a potential permanent e-scooter program in Portland.

This report provides an overview of PBOT's early findings. **Unless otherwise noted, the timespan for the data in this report is April 26 through December 31, 2019.**

Evaluating e-scooter potential to advance city goals

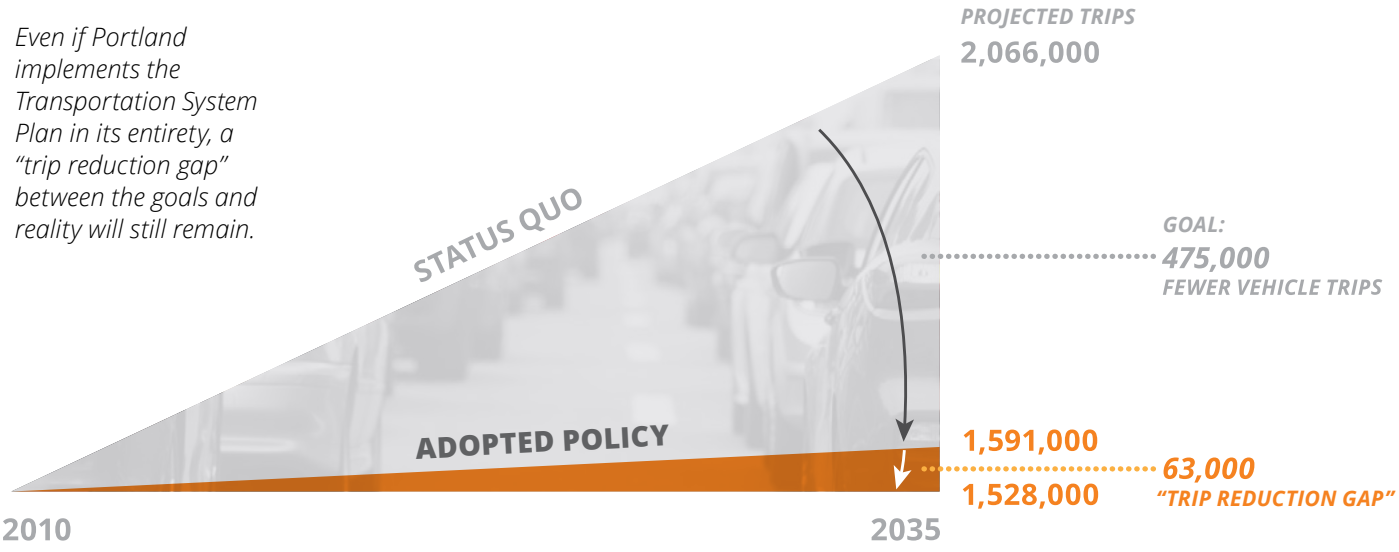


Anyone who travels in Portland knows that traffic is increasing. While our population is expanding, our roadway space is not. In 2010, Portland's population was 580,000; by 2035, it is expected to be about 860,000. With growth in driving comes increasing traffic congestion and the need to shift trips to more efficient modes, such as walking, bicycling, and transit.

Transportation emissions comprise 42% of Portland's overall greenhouse gas emissions, and carbon emissions are increasing.[3] Portland's 2035 Comprehensive Plan and Transportation System Plan set out strategies to address these issues by reducing single-occupancy vehicle trips. However, even if Portland successfully implements all the strategies in these plans, models show a "trip reduction gap" of 63,000 trips would still remain.

If new mobility services like e-scooters can provide an attractive option that reduces car use and car ownership, they may help close this "trip gap" and meet city congestion and climate goals.

Even if Portland implements the Transportation System Plan in its entirety, a "trip reduction gap" between the goals and reality will still remain.



Closing the "trip reduction gap"

If managed effectively, new mobility services offer tools and innovations that could help close this "trip gap" between our goals and our current trajectory. By creating attractive alternatives to car ownership and shifting trips, these new services could enable people to meet their daily needs in ways other than driving or riding alone.

BACKGROUND & CONTEXT

Managing mobility in the digital age

As managers of the public realm—including the public rights-of-way in which e-scooters operate—cities need information from private-sector companies to determine if these new mobility services comply with local regulations, to evaluate their impacts, and to implement policies that advance city goals.

This report demonstrates how e-scooter use has provided Portland valuable data about travel patterns and our transportation system—a digital picture of our right-of-way. In its second e-scooter pilot, PBOT adopted the Mobility Data Specification (MDS), which is comprised of a set of Application Programming Interfaces (APIs) that create standardized two-way communications for cities and private companies to share information about their operations and allow cities to collect data that can inform real-time traffic management and public policy decisions. **Without MDS data from companies, much of the analysis in this report would not exist, nor would the city be able to enforce regulations that require operators to provide e-scooters in underserved areas of Portland, and to slow down the speed of or prevent the operation of e-scooters in certain areas.**

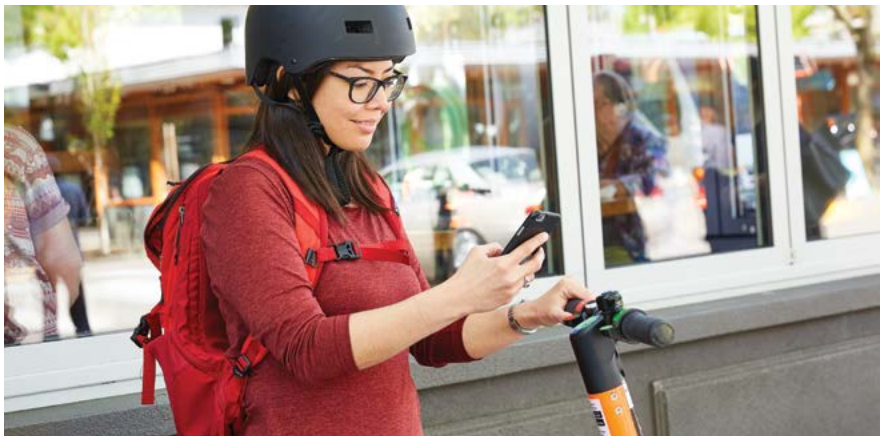
MDS continues to evolve, and cities and companies are still learning to adhere to the standard, resulting in data quality issues that can create challenges during the city's analysis. **Looking to the future, PBOT must balance the data we ask for with our capacity to manage and analyze the data, as well as consider the opportunity cost of increasing our capacity versus hiring third parties to manage our data.** In addition, while mobility data offers cities new opportunities to more efficiently serve the public interest, larger, societal conversations about data privacy raise questions about how private-sector companies and cities should use data.[4]

To ensure the responsible use of mobility data, PBOT undertook several key actions in 2019.

- First, PBOT implemented data aggregation processes to protect the privacy of individual e-scooter users and hired local technology company Ride Report to help manage e-scooter data.
- Second, PBOT engaged in efforts led by the National Association of City Transportation Officials to establish best practices for the responsible use of mobility data and helped create the Open Mobility Foundation, a global organization that brings together the public and private sectors, experts, advocates, and other stakeholders to develop open-source mobility tools and address critical issues like privacy.[5]
- Third, PBOT's e-scooter pilot is one of the first programs to comply with the City of Portland Privacy and Information Protection Principles.[6]

PBOT remains committed to the responsible use and protection of mobility data. Moving forward, PBOT will develop new bureau-wide policies to secure data and protect privacy. PBOT will continue to work closely with technology experts at Ride Report and with cities around the globe to effectively manage our streets—and the services that use them—in the digital age.

For more information, see Appendix A: Managing Mobility Data.



> **Once prices increased I ceased to use the scooters. I have a Transportation Wallet with PBOT and use it to access BIKETOWN all the time as well as the streetcar.**
>
> **—2019 e-scooter user survey respondent**

Stakeholder engagement to inform e-scooter management

Throughout the 2018 and 2019 pilot programs, PBOT engaged a range of stakeholders to inform our management and assess the performance of e-scooters in Portland.

We heard from the public via email, phone, and an online feedback form; from riders via a user survey in 2019 with over 2,000 respondents; and from underserved Portlanders via three focus groups in 2018.

We worked with community-based organizations including Disability Rights Oregon to produce a video promoting safe e-scooter riding and Forth Mobility to coordinate safety workshops with companies.

We are working with the Multnomah County Health Department to study e-scooter related injuries; with Portland State University to research the impact of e-scooter operations; and with the Oregon Department of Environmental Quality to analyze company life cycle analyses.

We worked with affordable housing providers to promote e-scooter ridership among low-income Portlanders through the Transportation Wallet for Residents of Affordable Housing program and incorporated e-scooter incentives into the Transportation Wallet program for parking districts.

Finally, we regularly coordinate with City Council offices to ensure responsiveness to constituent concerns, and we regularly communicate with companies to ensure compliance with regulations and work collaboratively to meet city goals.

The results of these collaborative efforts are detailed throughout this report.

Testing strategies to address community concerns

As detailed in PBOT's forthcoming New Mobility Strategy, new transportation services, like e-scooters, have been launching in cities around the world. Some services offer the potential to help us meet city goals around improving safety, decreasing congestion, reducing harmful carbon emissions, and promoting equity, but we cannot leave innovation to chance. If not managed properly, new services like e-scooters could undermine our goals by jeopardizing the safety of road users, competing with other more efficient options like public transit and bicycling, or reinforcing existing inequities through limited service areas, cultural barriers, and high pricing. As such, PBOT has a fundamental role in shaping how these new services, like e-scooters, advance—rather than undermine—Portland's transportation system goals. In addition, Portlanders know best how e-scooters can work well in Portland. With this philosophy in mind, **PBOT took feedback from the public during the 2018 pilot and made several changes for the second pilot.**

2018 e-scooter pilot concern

SIDEWALK RIDING POSES A DANGER
to pedestrians and people with disabilities

IMPROPER PARKING BLOCKS ACCESS
for pedestrians and people with disabilities

USERS RIDE IN PARKS
and other prohibited areas

NOT EVERYONE IS PHYSICALLY ABLE
to ride an e-scooter

CLIMATE IMPACTS OF E-SCOOTER OPERATIONS
are unknown

PBOT response

EDUCATION
During the first pilot, PBOT learned that most riders are introduced to Portland's e-scooter rules through the e-scooter apps. For the 2019 pilot, PBOT required companies to provide Portland-specific laws in their app at the time of registration and at rental. The city also installed signage and pavement markings in key locations to help educate riders.

CITATIONS
PBOT staff issues fines for illegal riding ($50) and parking ($15) to companies, and companies pass them on to users when possible. During this pilot, PBOT issued 921 penalties and 60 warnings.

REPORTING ISSUES
PBOT implemented changes in the reporting process because companies are best suited to respond and are required to quickly move improperly parked e-scooters. Members of the public can contact e-scooter companies directly. Contact information is on the e-scooter itself and at www.portland.gov/transportation/escooterpdx/e-scooter-reporting-and-feedback.

GEOFENCING TECHNOLOGY
PBOT requires companies to geofence "no riding" and "no parking" zones defined by the city, including Waterfront Park and other parks. Users receive warnings when they ride or attempt to end their trips in these zones. PBOT also works with companies to test technology that slows or stops e-scooters in prohibited areas.

SEATED E-SCOOTERS
PBOT prioritized companies in the permitting process that offer seated e-scooters and has heard positive feedback from folks with certain types of mobility-related disabilities—as well as other people—that the seated e-scooters are more stable and comfortable than other models, making it easier and more accessible to get around.

INCENTIVES
PBOT created an incentive system to reward companies that made efforts to meet city goals. By the end of 2019, PBOT had awarded an additional 890 e-scooters to companies, increasing the permitted scooter fleet from 1,975, to 2,865 (though some companies did not deploy the maximum number of e-scooters they were permitted).

DEDICATED E-SCOOTER PARKING
PBOT installed 24 dedicated e-scooter parking corrals in high-use areas across the city. In the future, corrals could be shown in companies' apps, and riders could be required or ncentivized to return e-scooters to corrals, like BIKETOWN users are. See Appendix B: E-Scooter Parking Solutions.

LIFE CYCLE ANALYSIS
Transportation Commissioner Chloe Eudaly spearheaded the effort to improve PBOT's analysis of the environmental impact of e-scooters. She directed the bureau to issue a first-in-the-industry requirement that e-scooter companies operating in our city conduct a life cycle analysis according to international standards. These analyses will help PBOT understand the full environmental impact of e-scooters across all stages of their lifetime, from raw material extraction through manufacturing, use, repair, and disposal. Companies have noted that these reports are already helping the industry improve its practices.

OPERATIONAL VEHICLE MILES TRAVELED
PBOT also requires e-scooter companies to provide data on how many miles are driven by the companies and their contractors when deploying, rebalancing, and charging e-scooters. This information will be used to evaluate which e-scooter business models offer the greatest opportunity to reduce climate, congestion, and safety impacts.

02

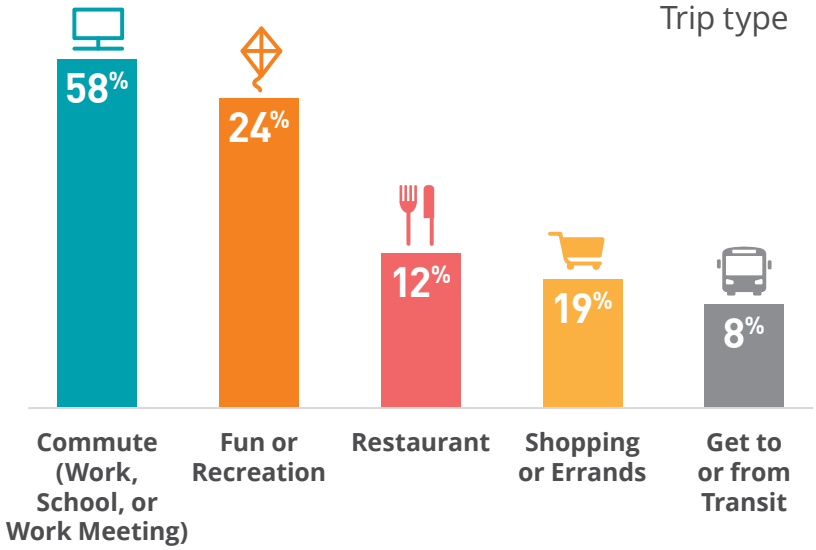
Congestion & Climate

Can e-scooters move people efficiently in a climate-friendly way?

To determine whether e-scooters are replacing car trips—helping meet Portland's goals to reduce congestion and climate emissions—it is important to understand why, when, where, and how people are using e-scooters. The climate impact of e-scooter operations depends on how many trips are shifted to and from other modes and the quantity of climate emissions from e-scooter life cycles.

People ride e-scooters for many types of trips

According to a **survey PBOT conducted among riders in summer 2019 with over 2,000 respondents,** Portlanders are using e-scooters for all types of trips, from commuting to recreation.



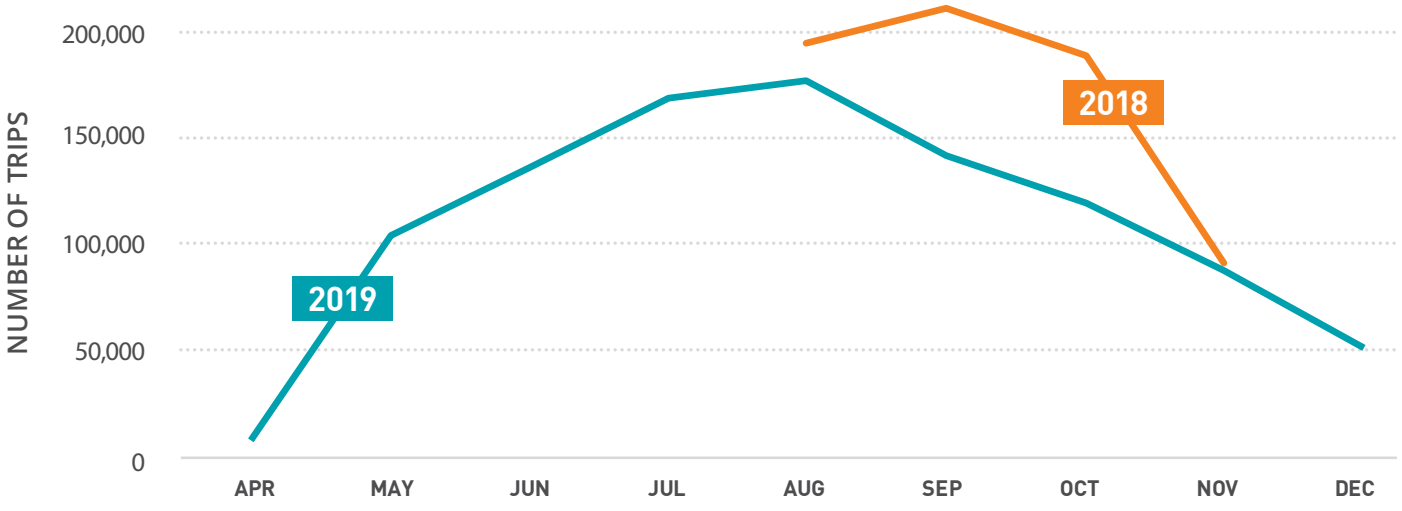
CONGESTION & CLIMATE

E-scooters are popular in afternoons, evenings, and good weather

Consistent with ridership in other cities, as well as BIKETOWN, people tend to mostly ride e-scooters most in the warm, dry summer months. Though Portland had a record dry fall, ridership still dropped off after peaking in August.

Compared to the first pilot in 2018, summer saw **fewer e-scooter rides in 2019**—potentially due to a number of factors including **increased prices, fewer available e-scooters, and a lower level of novelty.**

Total trips by month (2018 and 2019)



When do people ride e-scooters?

People ride e-scooters most often on **weekend afternoons and evenings, as well as around the weekday evening commute time.** This reflects greater availability of e-scooters downtown in the city's primary center of employment, making after-work trips home or to other destinations easier than morning commute trips, as e-scooters may not always be available where people live.

> "They're fun to ride but I'm usually riding with friends socially and it costs way more in total for each of us to use a scooter than if we shared a Lyft/Uber. Since this is the only time I really use scooters, I can't justify it unless one of my friends insists."
>
> —2019 e-scooter user survey respondent

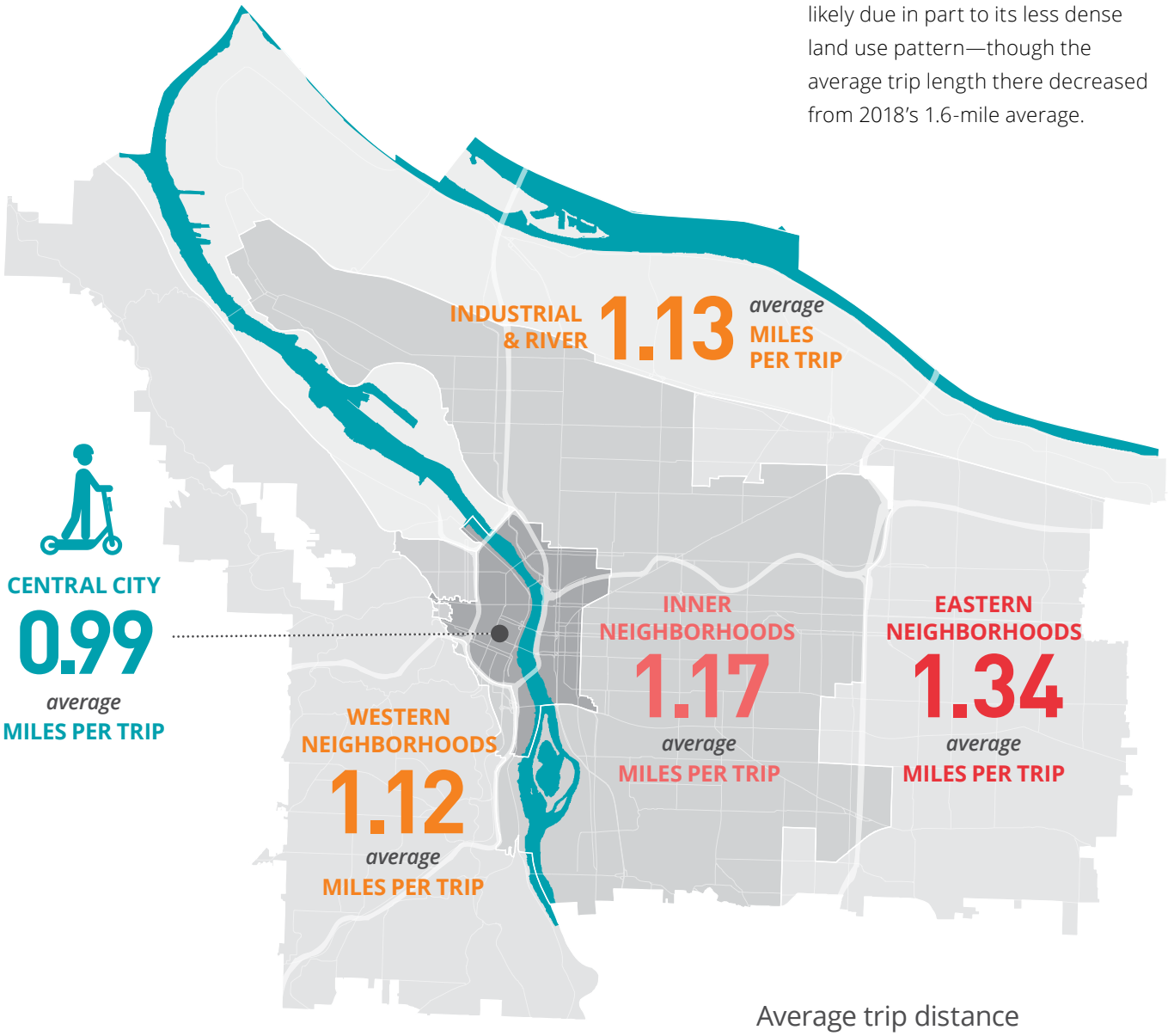
E-scooter use by time of day in 2019 (total number of trips)

HOUR	SUN	MON	TUE	WED	THU	FRI	SAT	GRAND TOTAL
12AM	4,447	2472	2235	2149	2151	2699	4,096	20,249
1AM	3,662	1674	1471	1508	1625	1971	3,156	15,067
2AM	2,982	1337	1013	1112	1237	1544	2,582	11,807
3AM	1,536	818	686	716	726	878	1,561	6,921
4AM	1,133	754	649	683	641	735	1,152	5,747
5AM	932	856	901	956	975	980	986	6,586
6AM	1,125	1,486	1,636	1,690	1,588	1,563	1,159	10,247
7AM	1,356	2,730	2,965	3,205	3,146	2,963	1,579	17,944
8AM	2,105	4,028	4,167	4,433	4,295	4,512	2,660	26,200
9AM	3,759	3,755	3,786	3,719	4,079	4,286	4,172	27,556
10AM	5,705	4,209	3,951	3,872	3,933	4,889	6,571	33,130
11AM	7,885	6,146	5,534	5,688	5,790	7,339	8,827	47,209
12PM	9,660	7,579	6,874	6,876	7,374	8,890	11,431	58,684
1PM	11,392	7,835	7,164	7,173	7,625	9,310	13,311	63,810
2PM	12,892	8,554	7,406	7,496	8,347	10,284	14,545	69,524
3PM	13,192	9,929	8,438	8,665	9,718	11,750	15,246	76,938
4PM	12,423	10,647	9,964	10,344	11,208	13,408	14,374	82,368
5PM	11,636	11,475	11,139	11,540	12,461	14,042	13,423	85,716
6PM	10,338	10,000	9,759	10,171	10,986	13,386	13,167	77,807
7PM	9,404	8,905	8,619	8,784	9,787	11,896	12,297	69,692
8PM	8,168	8,207	7,845	7,570	9,112	11,430	10,564	62,896
9PM	6,985	6,470	6,405	7,111	7,988	10,382	10,309	55,650
10PM	5,363	4,693	4,984	5,303	6,057	8,586	8,437	43,423
11PM	4,007	3,573	3,543	3,608	4,373	6,757	6,579	32,440
	152,087	128,132	121,134	124,372	135,222	164,480	182,184	1,007,611

CONGESTION & CLIMATE

People take e-scooters for short, quick trips

Trip distance and duration are often longer when they begin farther away from the Central City, where many destinations are located close together. East Portland saw the longest average trip distance, likely due in part to its less dense land use pattern—though the average trip length there decreased from 2018's 1.6-mile average.



Average trip distance by pattern area

Average trip distance and duration

People tend to use e-scooters for short trips, with an average trip distance of 1.06 miles and average duration of 14 minutes. During the winter (November and December 2019), trip distances and duration were slightly shorter.

PBOT's 2019 New Mobility Snapshot has more information about average trip distances and durations for bike-share and transportation network company trips.

Average Trip Duration: Overall

1.06 MILES

Average Trip Distance: Overall

Average Trip Duration: Winter

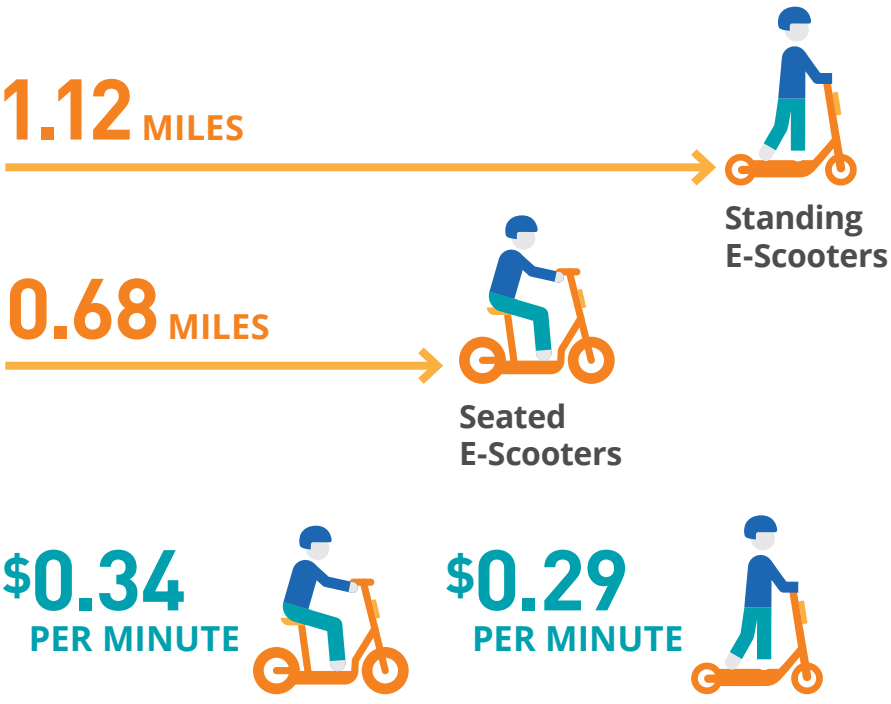
0.96 MILES

Average Trip Distance: Winter

Average trip distance and price for standing vs. seated e-scooters

This year, Portland permitted two companies that offer seated e-scooter models. Trips on seated e-scooters were notably shorter than on standing e-scooters, which could result from a number of factors, including higher prices.

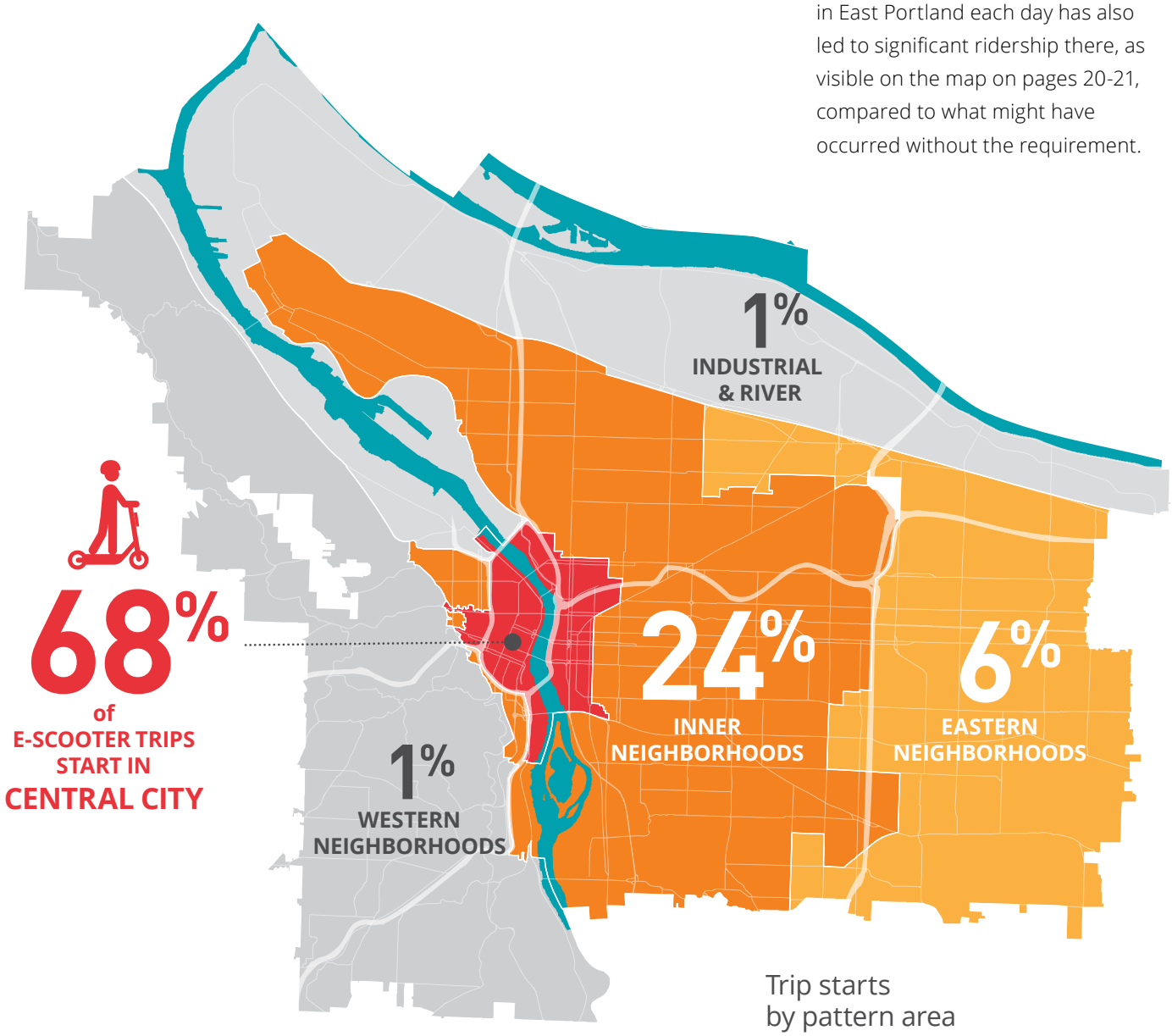
While trip lengths may be shorter, PBOT sees value in having different types of scooter models because of the access and safety benefits provided by seated scooters.



CONGESTION & CLIMATE

Riders travel in the Central City and other parts of Portland

Consistent with 2018, **a majority of trips start in the Central City,** where many destinations are close together. A requirement that companies deploy 15% of their fleets in East Portland each day has also led to significant ridership there, as visible on the map on pages 20-21, compared to what might have occurred without the requirement.



Service area boundaries

Aside from deployment requirements in East Portland, PBOT does not regulate companies' service areas. Companies create their own service area boundaries and can change them at any time without approval from PBOT. This leads to confusion among riders when different companies' e-scooters stop functioning at different geographical borders. For example, two companies significantly reduced their service areas during winter, which made traveling outside downtown via e-scooter difficult and created an obstacle to relying on e-scooters as a year-round mode of transportation. **In the future, PBOT may regulate service areas to ensure companies better serve the entire city of Portland.**

> **"Living in North Portland, it seems like there are plenty of scooters downtown, but barely any in my neighborhood. I think of scooters as an alternative when I don't want to wait for the bus/MAX or need to get to a different bus/MAX stop."**
>
> **—2019 e-scooter user survey respondent**

The relationship between e-scooters and transit

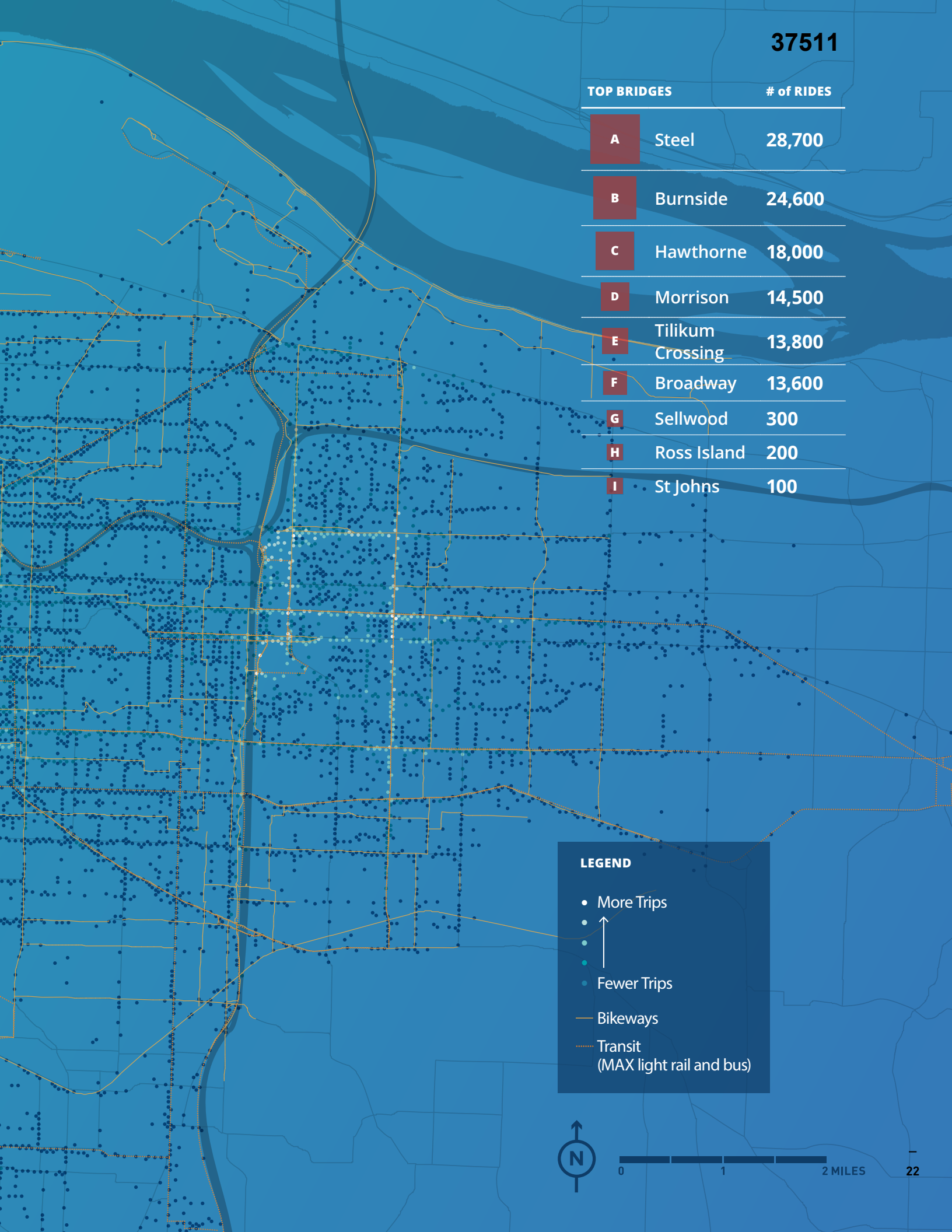
E-scooters have been billed as a solution to the "last-mile problem" and offer opportunities to connect more people to transit. However, only 8% of Portland riders report using e-scooters to get to transit. Additionally, 21% of Portlanders reported using transit less due to e-scooters, while only 6% reported using transit more. A small percentage of e-scooter activity occurred along transit lines—0.5% along frequent bus lines, 1% on non-frequent bus lines, and 1.9% on MAX lines. Management decisions, such as where to require e-scooter deployment or place dedicated e-scooter parking or charging stations, **may increase the likelihood that e-scooters complement transit, not detract from it.**

8% OF PORTLAND RIDERS REPORT USING E-SCOOTERS TO GET TO OR FROM TRANSIT

CONGESTION & CLIMATE

Where do riders travel?

This map shows where e-scooter users rode in 2019. Lighter dots show street segments that saw more rides, and darker dots show segments with fewer rides. The Central City saw the most rides, with some commercial corridors in inner Portland as well as streets in East Portland with bike infrastructure seeing more rides. In addition, the City of Milwaukie allowed e-scooters to operate in 2019, and rides in Milwaukie can be seen at the bottom of the page. The map also shows which bridges saw the most rides, with those leading into downtown seeing more than those further away.


37511
TOP BRIDGES
# of RIDES
A Steel 28,700
B Burnside 24,600
C Hawthorne 18,000
D Morrison 14,500
E Tilikum Crossing 13,800
F Broadway 13,600
G Sellwood 300
H Ross Island 200
I St Johns 100
LEGEND
More Trips
Fewer Trips
Bikeways
Transit
(MAX light rail and bus)
N
0
1
2 MILES

CONGESTION & CLIMATE

Infrastructure matters to e-scooter ridership

Anecdotal observations suggest that when people have safe places to ride, like protected bike lanes, they are more likely to do so—and less likely to ride on the sidewalk. New mobility services, like e-scooters, thrive with infrastructure that not only benefits e-scooter riders, but people biking and walking too.

We know from user survey results and observations that, like people who ride bikes, e-scooter riders feel more comfortable when there is safe infrastructure to ride separate from cars—and trip data from 2019 confirms that. **As shown on the map on pages 20-21, a significant portion of e-scooter riding occurred on Portland's bike network.**

Percentage of e-scooter activity that occurred on Portland's bike network

32%
Bike Infrastructure: Total

TYPES OF BIKE INFRASTRUCTURE

11%
Protected Bike Lane

7%
Neighborhood Greenways

10%
Bike Lane

4%
Other

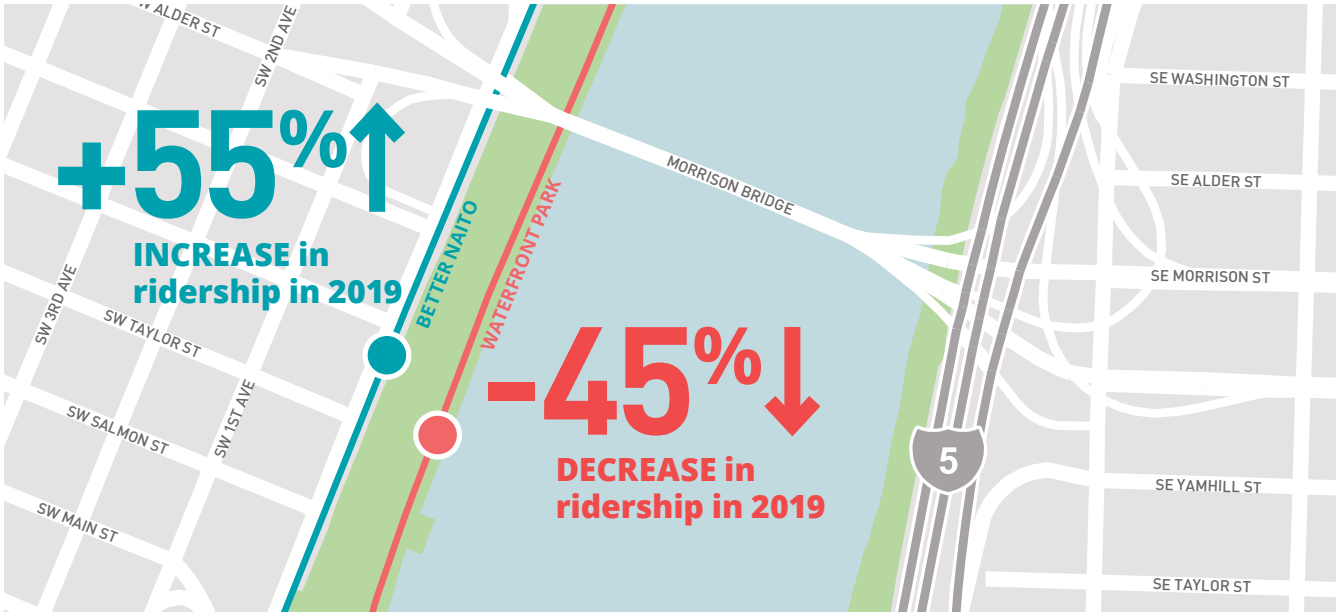
Infrastructure on Naito Parkway and Waterfront Park

Improved bicycling infrastructure along Naito Parkway led to greater compliance with rules prohibiting riding on Portland's waterfront. In 2018, the multi-use path in Tom McCall Waterfront Park was the most frequently ridden place in the city, but e-scooters are not allowed under rules from Portland Parks and Recreation. In 2019, the construction of "Better Naito," a two-way bike lane running parallel to the waterfront —in addition to geofencing and educational signage— led to a significant decrease in ridership along the prohibited waterfront path and a significant increase in ridership along Naito Parkway.

Naito Parkway

Waterfront Park
Source: TriMet

2018 vs. 2019 ridership on Better Naito and Waterfront Park



Better Naito saw about 148,600 rides in 2018 and about 231,000 rides in 2019. Waterfront Park saw about 55,900 rides in 2018 and about 30,500 rides in 2019.

CONGESTION & CLIMATE

East Portland ridership grows with safe infrastructure

East Portland has less bike infrastructure than the rest of Portland. Formerly unincorporated land with a less-dense, more automobile-oriented land use pattern was annexed into the city in recent decades. New investments by the City of Portland have increased the amount of bike infrastructure and sidewalks in East Portland, but disparities still remain due to a long history of underinvestment in transportation.

This poses challenges to increasing e-scooter ridership, even as companies are required to deploy 15% of their fleets in East Portland.

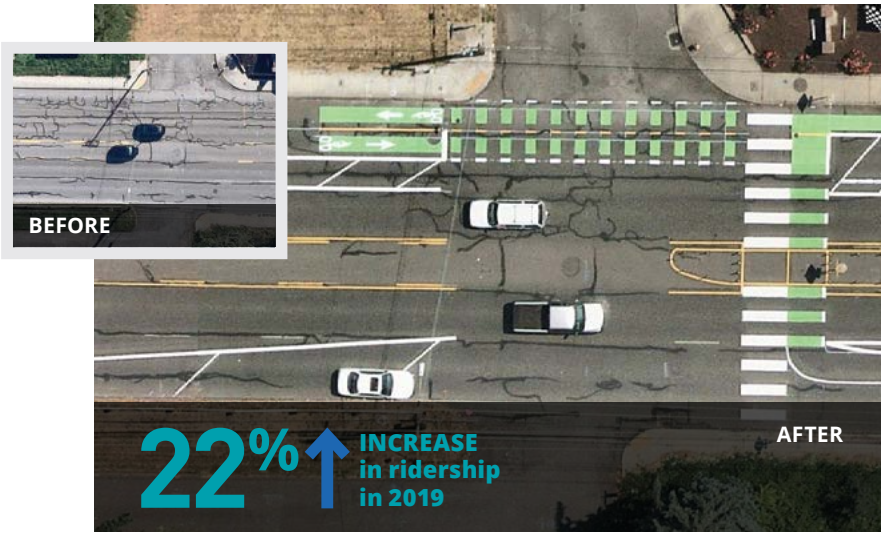
However, **recent transportation investments by PBOT in 2018 and 2019 are helping increase e-scooter ridership in East Portland. These increases occurred even though overall e-scooter ridership was down from 2018**.

Between the first and second pilots, 102nd Avenue and the Halsey-Weidler couplet saw major street redesigns that include protected bike lanes, which are most effective at inviting new bike and e-scooter riders into the bike lane. Mobility data shows that e-scooter use increased dramatically on these streets between 2018 and 2019, demonstrating that East Portland ridership grows with safe infrastructure.

2018 vs. 2019 ridership on Halsey-Weidler couplet (total trips)

The Halsey-Weidler couplet saw about 11,400 rides in 2018 and about 14,000 rides in 2019.

2018 vs. 2019 ridership on 102nd Avenue (total trips from NE Weidler St to Sandy Blvd)



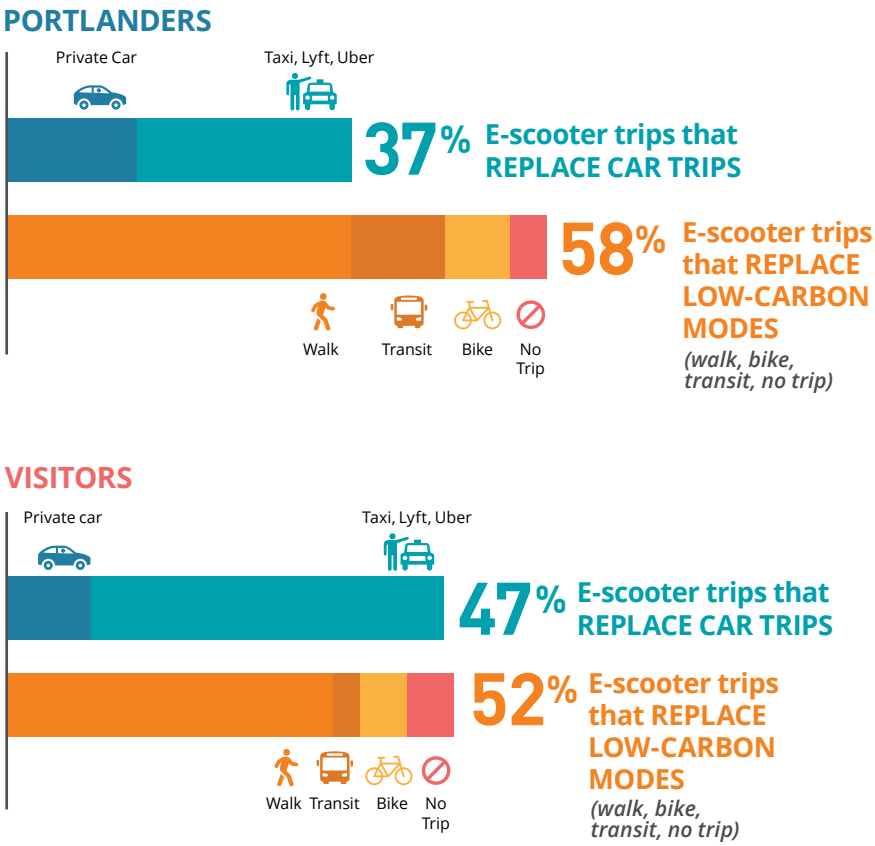
This stretch of 102nd Avenue saw about 4,500 rides in 2018 and about 10,000 rides in 2019.

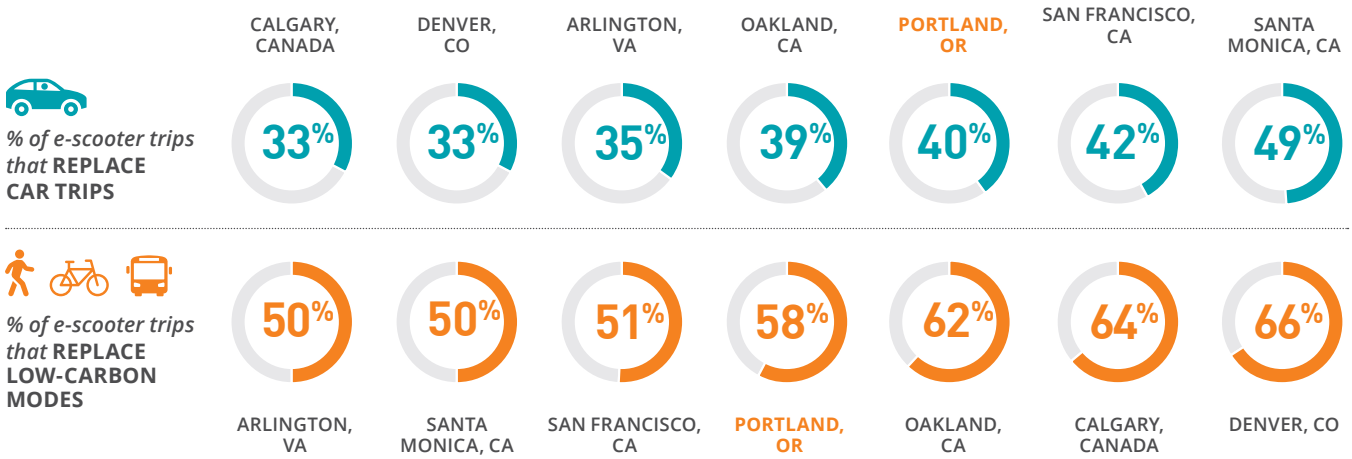
People use e-scooters instead of other modes of travel

One of the promises of e-scooters is the possibility that **they can be used to replace car trips,** which add to congestion and greenhouse gas emissions. However, a risk is that e-scooter rides may **replace low-carbon modes like walking, bicycling, or transit.**

Based on a 2019 e-scooter user survey, the types of trips Portlanders replace with e-scooters are similar to the travel behavior of riders in other cities. Many cities across North America see e-scooters replacing a significant number of both trips that would have been made by car and trips that would have been made by low- or no-carbon modes like biking, walking, and transit. Some cities have more tourism than others, which may explain some differences in trip replacement patterns.

To better advance Portland's climate and congestion goals, e-scooters should replace more car trips, while minimizing replacement of low-carbon trips.



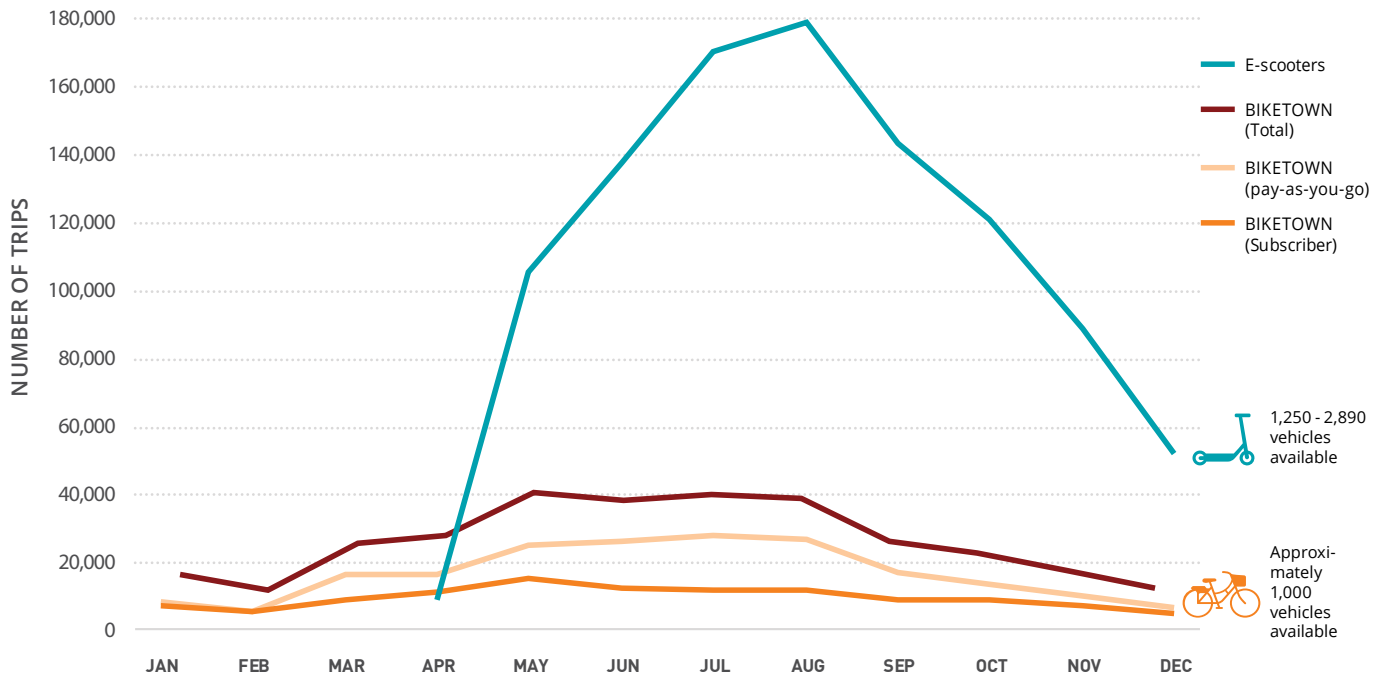


CONGESTION & CLIMATE

E-scooters and BIKETOWN

Portland's bike-share system, BIKETOWN, saw fewer trips in 2019 than in previous years. While this is likely due in part to the introduction of e-scooters into Portland's transportation landscape, it also reflects the aging of the system. In the coming years, BIKETOWN will replace its fleet with electric-assist bikes and begin an expansion of service throughout Portland. The conversion of BIKETOWN to an e-bike fleet, as well as possible future micromobility modes in Portland, like mopeds, may influence e-scooter ridership in the future.

E-scooter and BIKETOWN ridership over time (2019)



Car miles replaced

Overall, e-scooter riders replaced enough miles that would otherwise have been driven in a car to ride around the Earth almost 17 times (415,286 miles), save 167 metric tons of carbon emissions, and remove the greenhouse gas equivalent of 27 passenger vehicles from the streets over the course of the pilot in 2019.[7]

167 METRIC TONS of CO2 EMISSIONS SAVED

EQUIVALENT OF A CAR DRIVING AROUND THE EARTH ALMOST

17

TIMES *over the course of the pilot in 2019*

E-SCOOTER RIDERS REPLACED

415,286

MILES OTHERWISE DRIVEN BY CARS

Miles shifted per mode

WALK	↓ 393,989 MILES
TAXI/TNC	↓ 276,857 MILES
PERSONAL CAR	↓ 138,429 MILES
TRANSIT	↓ 85,169 MILES
BIKE/ BIKETOWN	↓ 63,890 MILES
NEW TRIPS TAKEN	↑ 42,593 MILES

CONGESTION & CLIMATE

E-scooters support lower car ownership

The average car sits idle for 96% of the day, and the average annual cost of owning that car is $9,282/year.[8] When people have greater access to a number of reliable transportation options, they are more likely to be able to live conveniently without a personal vehicle, which reduces the likelihood of driving alone, reduces cost of living, and frees up space used to store cars for more productive activities like housing, offices, retail, and green space.

Shared e-scooters can make living in Portland without a car easier. E-scooters can supplement transit, walking, BIKETOWN, and personal bikes for everyday trips. In addition, they can provide "redundancy," or a backup option, when a person takes a trip without a car. For example, if someone plans on taking a BIKETOWN but no bikes are present at the nearest station, the traveler may be able to find an e-scooter.

In Portland, 14% of e-scooter riders report that they do not own a car. Ninety-eight people, or 7% of user survey respondents, said they have reduced the number of cars they or their family owns because of e-scooters, and another 184 people (13%) considered it. While these figures may be small, it is important to note that without attractive and reliable options that can reduce car ownership and driving, it will be hard to reach our emissions reduction goals.

Studying the climate impacts of e-scooters

E-scooter trips and other shared micromobility trips that replace car trips offer an opportunity to reduce vehicle miles traveled (VMT), which improves safety and reduces carbon emissions and air pollution. However, if e-scooter operations create more motor vehicle miles to deploy, charge, and rebalance e-scooters than the trips riders replace, then the overall environmental impact could be negative. E-scooter manufacturing and disposal could also create significant climate and air pollution.

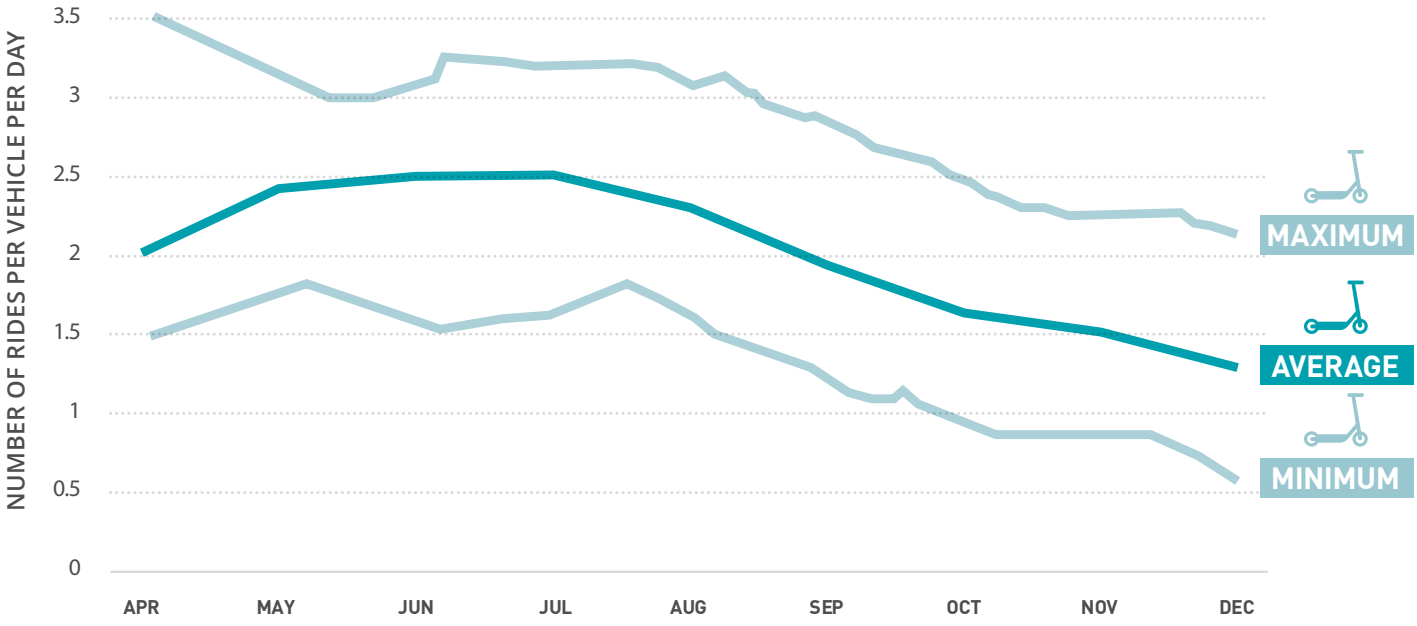
To better understand the environmental costs and benefits of shared e-scooters, Portland's second e-scooter pilot program includes a first-in-the-industry requirement that e-scooter companies conduct a life cycle analysis (LCA) according to international standards (ISO 14040/14044). **The LCAs will help PBOT understand the full environmental impact of this new mode across all stages of an e-scooter's lifetime, from raw material extraction through manufacturing, use, repair, and disposal.**

Early academic research suggests that the greatest opportunity to reduce an e-scooter's overall life cycle impact lies in the e-scooter production process and materials, in extending the life of e-scooters, and in the vehicle miles driven by car, van, or truck to deploy, charge, and rebalance e-scooters.[9]

For this reason, PBOT incentivizes companies to right-size their fleet in a way that ensures enough scooters are available to provide a reliable transportation option while optimizing the number of e-scooters in operation—measured as utilization, or number of trips per vehicle per day—to minimize negative environmental impacts from production and operational VMT. Companies that achieved high utilization rates received increases in their fleet allotments. Across companies, the average utilization rate in 2019 was 1.9 rides per e-scooter per day.

At the time of publication, PBOT had received LCAs from several companies and is conducting analysis with the Oregon Department of Environmental Quality to better understand emissions associated with e-scooters.

Utilization: Trips per vehicle per day, over time



Preliminary takeaways include:

- Aluminum and battery production have a relatively high environmental impact;
- Disposal and recycling practices have a relatively low environmental impact; and
- Transitioning fleets to low- or no-emission vehicles used for deployment, rebalancing, and charging operations will be important to reduce environmental impact.

As with all modeling exercises, the assumptions made in the analysis are important determinants of the study's results. For example, company assumptions about staff and contractor travel patterns to charge, deploy, and rebalance e-scooters influence the carbon impact of operations in the model.

Based on our preliminary analysis of the company life cycle analyses, existing research, and what cities know about bike-share operations, **cities hoping to minimize environmental impact of e-scooter operations should prioritize:**

- Models made of recycled materials;
- More durable models that last longer;
- Efficient deployment and rebalancing of e-scooters with electric vehicles, including e-bikes; and
- Charging models that reduce the need to transport e-scooters via use of swappable batteries or on-street charging stations.

In addition, PBOT and Portland State University are working with e-scooter companies to research the amount of vehicle miles traveled in operations and identify potential ways to reduce operational VMT.

03

Equity

Can e-scooters meet the needs of historically underserved Portlanders?

As more Portlanders are priced out of close-in parts of the city to areas farther out with poorer transit service, e-scooters could offer an opportunity for underserved Portlanders to more easily get around. When Portlanders become burdened by growing housing and transportation costs, it becomes more difficult and takes more time to get to school, work, the grocery store, places of worship, and community centers.

Barriers to e-scooter use exist, but if they are managed properly and promoted in partnership with the community, e-scooters could help address barriers to mobility.

What we heard from historically underserved Portlanders

During the 2018 pilot, PBOT held three focus groups with Black Portlanders, East Portlanders, and Portlanders with disabilities.

While some East Portlanders and Black Portlanders expressed enthusiasm for e-scooters, others noted a number of barriers: a concern for **traffic safety,** the risk that Black e-scooter riders would be **targeted for racial profiling and harassment, cost** of renting, needing to **transport children,** not having a **helmet,** not having a **safe place to learn to ride, age restrictions,** and **fear of being overcharged.**

In addition, some residents do not have **access to a bank account or smartphone** or do not wish to submit their account information over a smartphone application. A **lack of safe bike infrastructure** often makes bike and e-scooter use uncomfortable or unsafe. Despite significant bike ridership among people of color, bicycling is often associated with **white-dominant culture,** and e-scooters may or may not share that association.

Among people with disabilities, some expressed concerns about **safety,** enforcing **user behavior, balance and vision challenges,** fear of being hit by **people driving**, and **parking issues** when e-scooters block sidewalks, ADA ramps, and transit stops. However, others saw e-scooters as an accommodation that could offer more independence.

In a 2018 citywide representative poll,

74% **OF PEOPLE OF COLOR**

and

66% **OF PEOPLE LIVING ON LOW INCOMES**

VIEWED E-SCOOTERS POSITIVELY

> **As a person without the money for a car and a knee injury which prevents biking, e-scooters have opened a whole new world to me.**
>
> **—2019 e-scooter user survey respondent**

Who rides e-scooters?

Across the country, a gender gap exists among e-scooter riders, and it exists in Portland, too—60% of rider survey respondents identified as men compared to 33% as women.[10] Men were more likely than women to ride regularly and use e-scooters as transportation rather than recreation.

Lower-income Portlanders and Portlanders of color were more likely to have ridden an e-scooter only once rather than regularly. The types of trips e-scooter rides replaced varied with income, with lower-income Portlanders more likely to say they would have walked or taken transit had an e-scooter not been available and higher-income Portlanders saying they would have driven or taken a taxi, Uber, or Lyft.

People of color were more likely than white people to choose to ride an e-scooter because they do not have a car or because the ride was just for fun. People of color were also more likely to say they would ride e-scooters more if the cost was lower and if there were more available near transit. People of color were slightly less likely to replace walking trips with e-scooter rides than white people were, perhaps due to cost. However, people of color were slightly more likely to replace a transit trip or car trip.

A small number of survey respondents identified as having a mobility-related disability. Portlanders with mobility-related disabilities were less likely to own a car and more likely to be interested in low-income pricing plans, cash payment options, and renting without a smartphone but to not know how to access these options.

For more information, see Appendix C: Summer 2019 E-Scooter User Survey Findings.

East Portland e-scooter use starts with deployment

In the 2019-2020 pilot, PBOT requires companies to deploy 15% of their fleet in East Portland each day. Adherence to this requirement varies by company. Some companies attempt to meet the requirement but falter at times, while others appear to ignore the requirement. However, compliance generally increased from 2018.

Several other cities have deployment requirements, as well as deployment caps, in defined geographic areas. For example, Minneapolis requires 30% fleet deployment in areas of concentrated poverty across the city, coupled with a 40% fleet cap in their downtown—meaning that if a company is allotted 500 e-scooters, 150 would need to be deployed in areas of concentrated poverty, while no more than 200 could be deployed downtown.

Poor infrastructure in historically underserved parts of Portland and other cities can create challenges for e-scooter use even when deployment requirements are in place. For example, many parts of East Portland lack sidewalks, and the sidewalks that do exist may be narrow or poorly maintained, making it difficult to find a place to deploy or park scooters legally.

Deployment—making sure scooters are available to ride—in East Portland is an important first step to increasing scooter use, but it is not sufficient. Deeper engagement with communities to tailor e-scooter services to meet their needs will be necessary. For this reason, in addition to deployment, PBOT also examines how much scooters are actually used in East Portland.

PBOT measured the East Portland trip ratio, or the number of trips taken in East Portland as a percentage of the total number of trips taken in Portland. A high East Portland trip ratio suggests that companies are successfully promoting scooter ridership as a transportation option in East Portland. PBOT awarded additional scooters to companies with high East Portland trip ratios through its incentive process. **Across all companies, the average percentage of trips that started in East Portland was 6%.**

> **“My bus stop is about .8 miles from my house, which I can walk but I would prefer to ride a scooter. I always check if there is one nearby my house but there rarely is, maybe once a month.”**
>
> **—2019 e-scooter user survey respondent**

EQUITY

E-scooters are not the most affordable way to travel

At the time of publication, the price of a typical e-scooter trip was $5.55 for an average 14-minute trip. This is **more than twice the cost of a transit trip** ($2.50 for a 2.5-hour adult pass) and **more than three times the cost of a typical BIKETOWN trip** ($1.68 for an average 21-minute ride).

Companies operating e-scooters in Portland were required to submit a low-income pricing plan, options for people to use the service without a smartphone, and multiple languages for printed materials. In selecting which companies to permit, PBOT prioritized companies that provided apps in multiple languages and options to pay with cash.

Low-income pricing plans vary by company, but people enrolled in most federal, state, and local assistance programs are eligible. Some companies also give discounts for U.S. veterans. For low-income users, most companies discount or waive unlock fees and discount per-minute fees, while one company offers a certain number of free rides each month.

Cash payment options vary widely. Some companies allow users to use prepaid credit or debit cards, while others offer on-site rentals from their warehouses for an agreed-upon length of time. **Most companies offer text-message-based service to those without smartphones.**

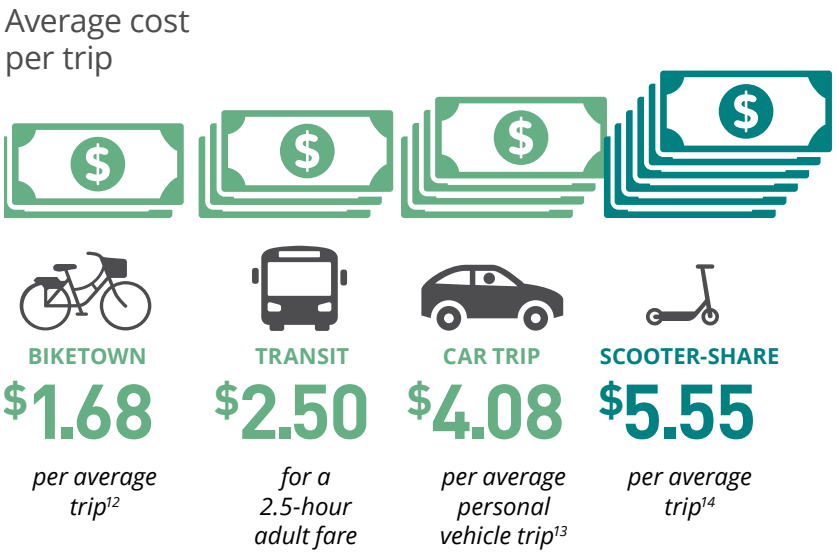
A PBOT audit of low-income, cash, and non-smartphone options found that information about these options on company websites is generally difficult to find, and ease of the signup process varies by company.

PBOT incentivizes companies—in the form of additional allotted e-scooters—to clearly and readily list the options on their websites and/or apps. PBOT also created a webpage to list the options for each company.[11]

The average percentage of users on low-income plans across all companies was 0.9%, with a range of 0.4 to 1.6%. One company told PBOT that Portland has the highest low-income signup rate in the country—an obvious sign of room for growth locally and nationally.

According to company data submitted to PBOT, only a handful of people use cash and non-smartphone options.

However, summer 2019 user survey responses show that 59% of low-income respondents did not know about low-income payment plans. Thirty-eight percent of low-income respondents said they were not aware of cash payment options but interested, and 25% of low-income respondents said the same regarding non-smartphone rental options.



Making the shared mobility economy more inclusive

From maintenance technicians to community outreach teams, **the shared mobility economy can offer career paths for underserved Portlanders** if companies embrace equitable hiring practices and provide living-wage jobs with good working conditions.

During the pilot, PBOT is offering an incentive—in the form of additional allotted e-scooters—to reward companies that create partnerships with workforce development organizations to hire traditionally underserved people, including people of color, low-income people, immigrants and refugees, veterans, people with disabilities, women, LGBTQIA+ people, and formerly incarcerated people.

One company worked with Central City Concern, a local social service agency with workforce development programs, to hire from its pool of constituents. Several applicants passed a phone screen and interviewed for warehouse positions, but ultimately, none of the candidates were hired.

> **"I used to use e-scooters for my work commute quite a lot. I noticed costs slowly increasing on both apps I use for the same route to work every day. Once the costs became more than that of a bus ride, I switched back to riding my bike and only using e-scooters for one-off occasions."**
>
> **—2019 e-scooter user survey respondent**

Transportation Wallet for Residents of Affordable Housing

In summer 2019, PBOT partnered with seven affordable housing providers to launch a pilot program tailoring its existing Transportation Wallet incentive program to their residents. This pilot offered free and reduced-price transportation options including TriMet passes, BIKETOWN memberships, and credits for e-scooters, car-share, and accessible private for-hire rides, like Uber, Lyft, and taxis. At fairs held at each site, staff from PBOT, transportation providers, and property managers helped residents sign up for these options.

The program reached over

500

LOW-INCOME RESIDENTS IN TEN LANGUAGES AND WAS THE PRIMARY SOURCE OF LOW-INCOME PLAN SIGN-UPS FOR E-SCOOTERS

04

Safety

Can e-scooters move people safely and help us realize Vision Zero?

> **I wish I could be safer by using a helmet, but oftentimes I do not have one on hand.**
>
> **—2019 e-scooter user survey respondent**

E-scooter crashes and injuries in Portland

The entrance of a new mode onto city streets across the U.S. marks an opportunity to monitor safety from the beginning. When assessing crashes and injuries from e-scooters, it is critical to contextualize e-scooters within the broader transportation system.

The strongest predictor of transportation-related injuries is total vehicle miles traveled. PBOT designed the 2018 and 2019 -20 E-Scooter Pilot Programs to understand whether e-scooters can increase safety on our streets by replacing car trips and reducing vehicle miles traveled. Due to the significant percentage of e-scooter trips that riders would have otherwise made by car, it is possible that e-scooter use may contribute to a reduction in serious injuries and fatalities.

Directly comparing e-scooter collision and injury rates to automobile—or even bicycle—collision and injury rates is challenging because comprehensive data has not been collected for these other modes. For example, although PBOT requires e-scooter companies to submit data on the number of trips and distance of each trip taken by e-scooter, no such dataset exists for any other modes, including automobiles. Instead, cities have historically relied on sampling and modeling for automobile and bicycle trips, but those methods are not nearly as accurate as the data PBOT receives from e-scooter providers.

Likewise, injury data are collected differently across modes, making comparisons difficult. Only fatalities and serious injuries are tracked for automobile collisions over time. Minor injuries resulting from car crashes are generally not tracked.

In addition, **fundamental differences between e-scooter and automobile travel make comparing safety across modes difficult.** Urban trips of all types are inherently more dangerous with more people sharing the street and using it in different ways. Suburban and rural trips—where e-scooters generally do not travel—are typically safer on a per-mile basis.

Finally, it is important to keep in mind that the majority of e-scooter-related deaths that have occurred nationally resulted from an e-scooter rider being hit by a car involved high-speed driving and lack of safe bicycle infrastructure.[15] **In the over 1.7 million e-scooter trips people have taken during Portland's two e-scooter pilots through 2019, there have been no fatalities.**

Since the 2018 e-scooter pilot, PBOT has partnered with the Multnomah County Health Department to track probable injuries related to e-scooters. Arrival by ambulance is used as a proxy for injury severity. Similar to 2018, the rate of injuries related to e-scooters in 2019 was 2.5 per 10,000 trips or 2.3 per 10,000

miles. Injury rates in Portland are consistent with those observed in other cities. For more information, see Appendix D: Multnomah County Health Department Injury Data 2019.

In addition, to improve reporting and analysis of e-scooter injuries in the future, PBOT submitted a letter to the National Center for Health Statistics to support the creation of a code that medical professionals can use to report injuries related to micromobility devices, and the code was successfully created.

In over

1.7 MILLION E-SCOOTER TRIPS

taken during Portland's two e-scooter pilots through 2019, there have been no fatalities.

Injuries related to e-scooters in 2019 was

2.5 PER 10,000 TRIPS

or

2.3 PER 10,000 MILES

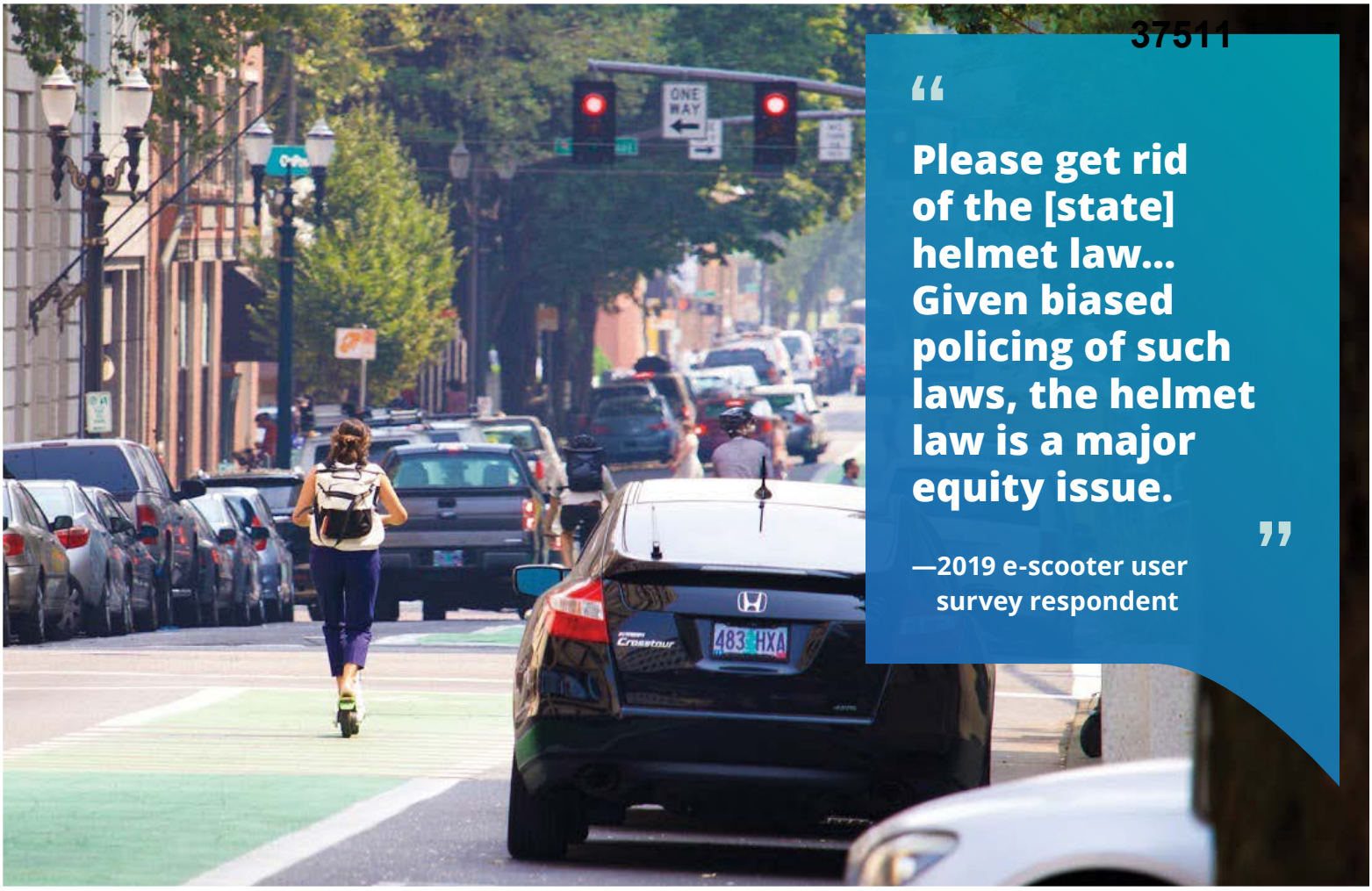
Vision Zero in Portland

The City of Portland has committed to the Vision Zero goal of eliminating traffic deaths and serious injuries. Achieving this goal requires a systemic approach that starts from a basic assumption: human life and health should not be compromised by the need to travel.

The "Safe Systems" approach undergirds Portland's Vision Zero work and has four principles:

- **People are vulnerable:** Simple physics dictates that the human body cannot withstand impact from a vehicle moving faster than 20 miles per hour without significant risk of serious injury or death. People walking and bicycling are at the greatest risk in the event of a crash.
- **People make mistakes:** Even when they are not deliberately taking risks, people make mistakes that result in crashes. This is true whether they are driving, walking, or traveling by other means. Deadly crashes will not be eliminated unless we design streets to help reduce the frequency and severity of crashes resulting from human error.
- **People share responsibility:** Traditionally, individual road users have borne much of the responsibility for their own safety while traveling. Under the Safe Systems approach, that responsibility is shared among those who design, build, operate and use the street system.
- **Built-in protections minimize the deadly consequences of mistakes:** The street system must be designed with multiple protective elements so that if one element fails, others still offer protection. For example, a system to protect pedestrians includes frequent safe crossings, street lighting, a cultural acceptance of slower speeds and people who are educated about how to interact safely on the streets.

PBOT uses crash data from the Oregon Department of Transportation to inform street design changes, education efforts, and other aspects of Vision Zero and traffic safety. This data indicates that more than 11,000 automobile crashes are reported in Portland in a typical year, with additional crashes likely unreported.



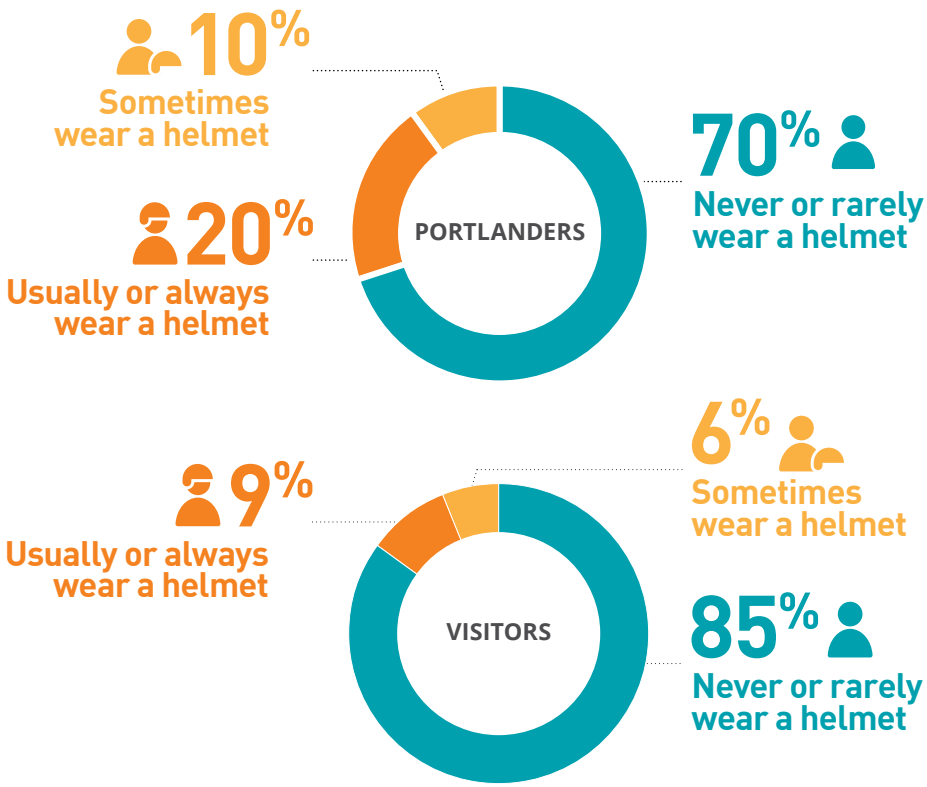
> **Please get rid of the [state] helmet law... Given biased policing of such laws, the helmet law is a major equity issue.**
>
> —2019 e-scooter user survey respondent

Helmet use remains low

PBOT's summer 2019 e-scooter user survey found that **Portlanders and visitors wear helmets at different rates, but helmet use generally remains low.** Helmets are required by state law, but PBOT lacks the ability to enforce helmet requirements, because only the police have the authority to make traffic stops.

Staff observations suggest that people who own personal e-scooters tend to wear helmets more often than people riding shared e-scooters, similar to the trend seen with bike-share.

Self-reported helmet use



SAFETY

Sidewalk riding is decreasing but is still a concern

Oregon state law prohibits riding e-scooters on sidewalks. Sidewalk riding can pose danger to and intimidate pedestrians, particularly to seniors and those with limited mobility or vision-, hearing-, and mobility-related disabilities. These challenges can be compounded at night and when riders use sidewalks carelessly.

Based on our research, PBOT sees sidewalk riding as an indicator that e-scooter users do not feel safe riding in the street. For example, anecdotal observations show that riders were up to twice as likely to ride on the sidewalk when no bike infrastructure was present. To entice e-scooter riders to join bike riders in the bike lane, new infrastructure will need to be built. **Better riding infrastructure for bikes and e-scooters—particularly protected lanes separated from cars—can make micromobility attractive for more types of people.**

Anecdotally, seated e-scooter models tend to deter riders from using the sidewalk because their "form factor" is relatively similar to a bicycle or moped. In 2019, 11 of 172 sidewalk riding citations, or 6%, were issued to the two companies with seated e-scooter models; the remaining 94% were issued to the four companies with standing models.[16]

Safety summit brings companies together

In response to concerns about safety, PBOT held a "safety summit" with all the companies operating in Portland in November 2019. The purpose of the summit was to **collaboratively discuss safety concerns and identify areas where industry could voluntarily provide solutions.** Attendees discussed initiatives undertaken in other markets that could be replicated in Portland, such as a shared marketing campaign about safe riding, offering helmet giveaways at hotels and large employers, working with a third party on parking enforcement, in-app messaging campaigns, and involving customers in advocating for better bike and e-scooter infrastructure. In addition to these primary concerns, other concerns discussed included underage riders, tandem riding, and rain and wet weather that create slippery surfaces.

Parking behavior is improving as more people learn the rules

E-scooter parking remains a primary concern for Portlanders, though rates of improper parking have decreased from 2018, possibly due to a better understanding among the riding public of the rules for parking e-scooters and the negative impact improper parking can have.

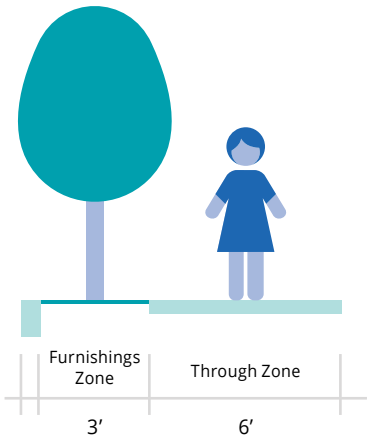
User survey results show that Portlanders understand how to properly park e-scooters more often than visitors. **Eighty-five percent of all question respondents correctly identified a photo showing proper e-scooter parking** in the "furnishings" zone of the sidewalk.

During the pilot, PBOT installed 24 designated e-scooter parking corrals and developed a permitting process to allow companies to test e-scooter parking and charging stations in the right-of-way.

Other cities are taking different approaches to e-scooter parking. For example, for its permanent e-scooter program, **San Francisco created a "lock-to" system** in which e-scooters must come equipped with a lock and users must lock them to a bike rack. Washington, D.C. and Chicago are implementing a similar locking system.

Implementing a lock-to system in Portland may require significant expansion of bike parking spaces. San Francisco is using e-scooter fees to double its rate of bike rack installation, and Seattle pledged to add 1,500 bike parking spaces in 2019 using fees from its dockless bike share program.[17]

For more information on parking, see Appendix B: E-Scooter Parking Solutions.



User education through various channels

During the 2018 pilot, PBOT heard that most e-scooter riders learned about laws and rules directly in the e-scooter company apps. For the second pilot, **PBOT strengthened requirements for companies to include Portland-specific laws in their app at the time of registration and at rental.**

In addition to the baseline requirements, **some companies undertook additional education efforts,** such as launching weekly in-app messaging campaigns, hosting safety workshops and demonstrations with community-based organizations and at events like Sunday Parkways, and offering helmet giveaways to riders.

PBOT also partnered with Disability Rights Oregon; Lime; and Rooted in Rights, a Washington-based disability advocacy organization, to produce "Scoot Smart," a safety video that raises awareness of the importance of sidewalk access for people with disabilities.[18] The video seeks to create empathy among e-scooter riders by showing them how people with disabilities are impacted when they ride on the sidewalk and park improperly. The video had been viewed over 2,400 times by July 2020, and Lime publicized a version of it nationally.

SAFETY

Citations by PBOT

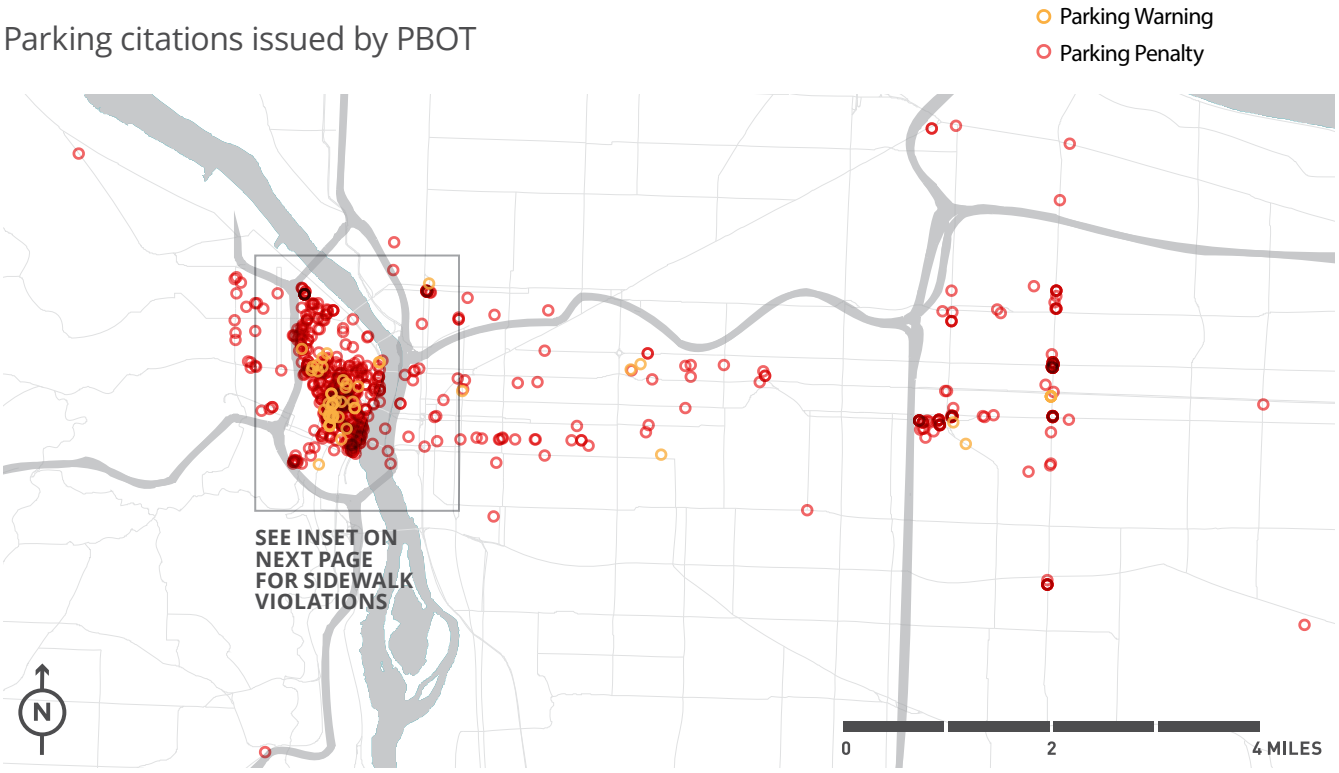
In the first pilot, PBOT heard clear concerns from the community about safety regarding sidewalk riding and improper parking. To address those concerns, **PBOT developed citation mechanisms in the second pilot to dissuade unacceptable behavior from users and companies.**

Throughout the second pilot, PBOT staff has been issuing citations for illegal riding and parking. Improper parking warrants a $15 fine per e-scooter, and illegal riding, including sidewalk riding or riding in prohibited areas, warrants a $50 fine per instance.

PBOT does not have the authority to make traffic stops; this authority lies with the Portland Police Bureau. This means PBOT staff cannot stop riders who are violating the rules. PBOT Regulatory staff documents instances of illegal activity and charges companies accordingly. This is the same process used for ticketing car-share users for traffic and parking violations.

In 2019, PBOT staff issued 921 penalties and 60 warnings, costing companies over $20,000. Of these citations, 82% were for improper parking and 18% were for sidewalk riding. Most citations occurred in the Central City, where e-scooter ridership was highest.

Parking citations issued by PBOT



Geofencing and speed governing in prohibited areas

"Geofencing" refers to GPS technology that changes the behavior of an e-scooter when it crosses a pre-determined geographic boundary. "Speed governing" is one example in which e-scooters are slowed down or stopped in certain areas.

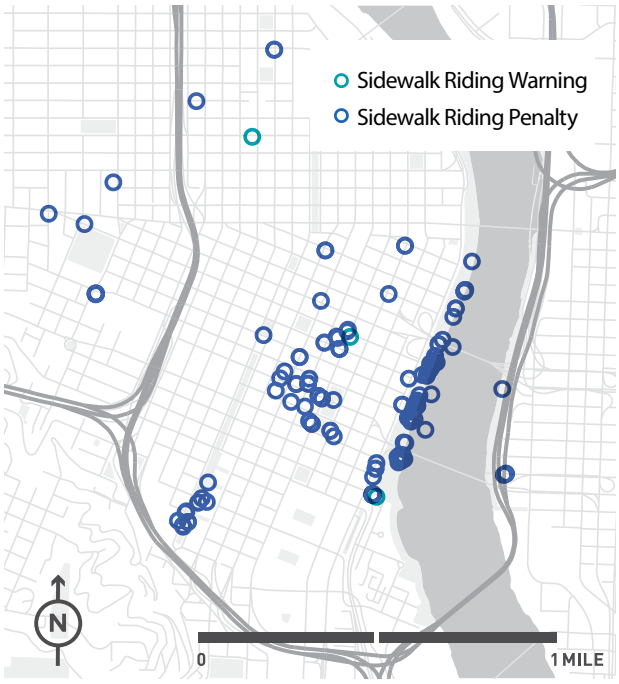
During the second pilot, PBOT has required companies to **geofence "no ride" and "no parking" zones in the city with GPS,** including Waterfront Park and other Portland parks. Users receive warnings when they ride into these areas and are prohibited from ending a trip in the app.

PBOT is also working with companies to implement **speed-governing technology.** Effective November 1, 2019, PBOT required companies to slow e-scooters from 15 mph to 12 mph in Waterfront Park, the Eastbank Esplanade, and the Springwater Corridor; slow e-scooters to 3 mph in the North and South Park Blocks; and slow e-scooters to a stop in natural areas like Forest Park, parks with playgrounds, and other areas of concern. PBOT audits companies to ensure compliance with this requirement.

Cities including Santa Monica, Detroit, San Diego, and others require speed governing ranging from 0 to 8 mph in key locations. Additionally, companies self-impose speed governing when riders exit their company's service area.

Despite the opportunity to regulate vehicle speeds remotely, speed governing needs to prove safe for users, meaning scooter speeds must slow down at a reasonable rate. Shortcomings in GPS accuracy sometimes present challenges to effective geofencing, but PBOT hopes that advances in GPS and sidewalk detection technology can open more opportunities for cities to require that companies use technology to address rider behavior.[19]

Sidewalk riding citations issued by PBOT



Geofencing requirements around Portland's waterfront were reinforced with on-street stickers.

05

What's Next

How will e-scooters fit into Portland's transportation landscape?

Based on the two e-scooter pilots in 2018 and 2019-2020, PBOT believes e-scooters hold promise to fill gaps in Portland's transportation system, especially if we can continue to reduce remaining climate, equity, and safety concerns. After extending the second pilot through 2020 to allow time for the industry to evolve, **PBOT recommends moving forward with developing a permanent e-scooter program** to help make e-scooters a viable way for Portlanders to get around.

> **"I love these options for getting around Portland. I use them very often and would use them more but they have raised their prices, so I have cut back on them. Our family has been carless in PDX for 2.5+ years and this helps us maintain that lifestyle."**
>
> **—2019 e-scooter user survey respondent**

A learning organization

Throughout our first and second e-scooter pilots, PBOT has learned several important lessons about what it means for an organization to manage the introduction of new mobility services in ways that can advance city goals and policies. Key lessons include:

Staff capacity and coordinating decision-making

As many cities have discovered, managing a fleet of several thousand e-scooters across several different companies requires dedicated staffing to effectively run a program and solve problems. While PBOT has leveraged existing staff from several teams across the bureau, **PBOT has experienced challenges dedicating enough staff capacity** to manage day-to-day operations and relationships with the companies, conduct regular compliance efforts, and effectively engage with other bureaus. In addition, PBOT is a large, complex organization and **coordinating decision-making across various teams and management lines has been challenging at times.**

It is important to recognize, though, that the e-scooter program is **testing out new organizational approaches in local government** and, despite some challenges, generally proving successful.

To further improve our practice in the future, PBOT will need to **create a fee structure that allows the agency to appropriately increase its staff capacity.** PBOT will also need to further streamline how cross-functional teams coordinate and make decisions.

Data management

While mobility data unlocks exciting opportunities for cities to inform city planning activities and to evaluate the impact of new services on the transportation system, it also requires a thoughtful approach. Managing mobility data for thousands of trips each day is an undertaking that requires city investment in staffing, technical infrastructure, policy development, and ongoing staff training and peer learning. Although PBOT has made some of these investments during its first and second e-scooter pilots, we have also questioned the **opportunity costs associated with those commitments** and the fact that those resources may be better spent elsewhere.

Additionally, at times we have found it hard to use mobility data to regulate e-scooter companies because companies use MDS differently and **there are no industry standards for measuring performance against technical terms** that cities define, like deployment or compliance with equity goals. These factors leave room for alternative interpretations of the data, which has complicated the city's ability to hold companies accountable. To address these challenges, PBOT has recently begun to rely on a third-party data aggregator, Ride Report, for their technical expertise and assistance, while simultaneously managing data in-house. In the future, PBOT will need to **determine whether it wants to continue this hybrid approach or rely solely on a vendor like Ride Report to help the city manage its mobility data.**

Having clear expectations and an eye for implementation

PBOT outlined regulations and programmatic requirements to test whether e-scooters could help advance those goals around safety, equity, climate, and congestion. However, **some of these requirements could have been clearer or simpler.** For example, we adopted most of our e-scooter parking regulations from our requirements for locating bike racks, which meant we ended up with rules that were inapplicable or ineffective. In the future, regulations like this should be rethought and streamlined.

Additionally, **it has been challenging at times to implement some of the requirements around our climate and equity goals.** For example, our cutting-edge requirement for companies to submit life cycle analyses (LCAs) was hard to apply consistently across companies ranging from a small start-up with Portland as their first market to large tech companies with valuations in excess of a billion dollars. Furthermore, developing partnerships with experts who could evaluate the LCAs on our behalf was time intensive. In addition, PBOT instituted a requirement that companies deploy 15% of their e-scooters each day in East Portland in order to promote access for historically underserved communities living there. However, deployment alone is not enough for meaningful access, and companies must work in deeper partnership with community-based organizations to better meet the needs of community.

Additionally, in the future PBOT should be clearer about how we will implement some of these policies before instituting them as requirements.

Need to be dynamic

In cities around the world, the introduction of e-scooters has pressed transportation agencies to become more flexible and adaptable than ever before. For organizations that develop and deliver multi-year plans and capital projects, e-scooters demand a highly dynamic response from the city to conditions that can literally change from day to day. At times, this can constrain limited staff capacity even more.

This is further complicated by the high number of companies currently in our market and the fact that static regulations are hard to adapt in response to changing forces. This highlights the advantage of having fewer companies operating in our city and the need to reorient our relationship with e-scooter providers. In the future, PBOT should seek out companies that are committed to our goals and act as partners who can help respond to dynamic changes.

Defining the operating model for a permanent program

Contract/license to operate

During the pilot programs, PBOT used a competitive permitting process to select six companies to test these new technologies within a set of rules established by the city. However real-time monitoring, compliance, and enforcement were sometimes a challenge because of staff capacity and because a regulatory permit fosters a "regulator-regulated entity" relationship with the companies that cannot always be collaborative.

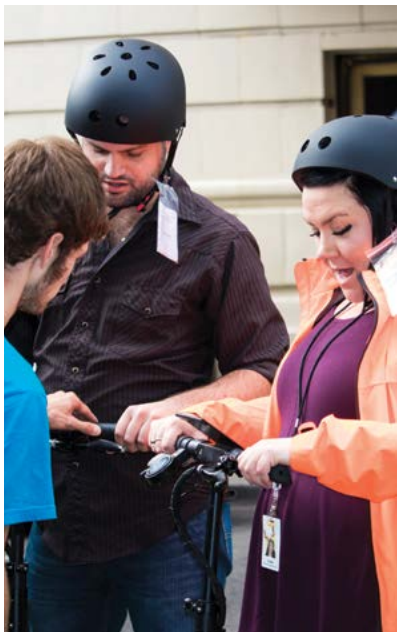
In contrast, PBOT oversees BIKETOWN using a different model—an exclusive contract—to provide bike-share services in Portland. This public-private partnership establishes a stronger basis for collaboration and proactive problem-solving with less need for regulations. Moving forward, PBOT recommends applying the lessons learned from this model to e-scooters, which means using **a contract or license to establish a partnership(s) to operate e-scooters in Portland.**

Number of operators

During the second pilot, six companies operated in Portland, while other cities have selected as few as one. More companies operating in Portland means the city needs more staff capacity to administer and regulate the program. More companies can also mean poor user experiences for Portlanders who need to download multiple apps on their phone and navigate different price structures. More companies also makes successful integration with other modes, like transit, more difficult. Moving forward, **PBOT recommends selecting one to three companies for Portland,** which could strike **the right balance between user choice and the city's management capacity** while allowing for more collaborative, productive relationships.

Duration of agreement

The duration of the operating agreement will need to **balance the creation of a stable working environment for companies and fostering optimal conditions for Portland's riders with the potential risks inherent in a young industry and volatile market.** In our city alone, we have seen e-scooter companies go out of business and shared e-scooter and bike companies merge since the start of 2020. At the same time, just as riders need to know where e-scooters will be available on a regular basis, companies also need the stability of longer-term contracts with cities to justify investments towards city goals. Portland's first pilot was 120 days and its second is 19 months; meanwhile, some cities have recently structured operating agreements with e-scooter companies for as many as five years. Moving forward, **PBOT recommends pursuing two- to three-year operating agreements with e-scooter providers.**



Partnership criteria for a permanent program

In addition to meeting basic requirements in service of city goals for mobility, climate, equity, and safety, PBOT will consider other factors when selecting one to three companies to operate in our city.

Good partners

For a permanent e-scooter program, PBOT will select companies that will be good partners in meeting city goals and are **independently motivated to exceed minimum requirements and make e-scooters work across the city for all Portlanders.** PBOT will prioritize companies that are enthusiastic about and able to adhere to all program requirements.

Past pilot performance

In assessing whether companies can be good partners, PBOT should assess **performance of companies in other markets and in Portland,** when applicable. For example, in Washington, D.C.'s evaluation of applicants, historical behavior in the District accounts for 25% of the company's score.

E-scooter models

PBOT will be looking for micromobility companies that offer vehicles to support **a range of body types and abilities** and an ability to cover different distances. During the second pilot, PBOT heard that seated e-scooters provided more stability, better balance, and access for people certain types of mobility-related disabilities, as well as reduced sidewalk riding due to their similarity to a bicycle in form.

Integration with other services

New mobility services like shared micromobility, ride-hailing, and carshare do not operate in isolation from one another. Rather, as PBOT's 2019 New Mobility Snapshot shows, these services form a dynamic ecosystem that supports getting around without a car—whether by choice or by necessity—and where user choice is informed by factors like price, availability, and convenience. However, users are increasingly frustrated by the need to engage with multiple apps in order to meet their mobility needs, especially due to the personal privacy and financial risks that result from having personal information on multiple platforms. Moving forward, PBOT will look for creative solutions that reduce the need for multiple apps and aim to **ensure e-scooters are interoperable with other transportation systems,** including BIKETOWN and transit, in order to foster synergy between services and help advance city policies and goals.

A vision for e-scooter operations in Portland

The e-scooter pilot programs served to identify challenges in e-scooter management before the creation of a permanent program. In an ideal e-scooter program, the industry would work collaboratively with PBOT to achieve the following:

Congestion and Climate

- **Relationship to transit and driving trips:** E-scooters should support and complement, not detract from, transit and increase the percentage of trips shifted from driving.
- **Environmental impacts**: E-scooter companies should minimize operational vehicle miles traveled and use electric vehicles and electric tricycles in operations. E-scooter companies should maximize the lifespan of their e-scooters and reduce the life cycle impact of e-scooter manufacturing and disposal.
- **Service area boundaries:** Companies should provide service across the city of Portland.

Safety

- **Education:** The public should know Portland's e-scooter rules and laws.
- **Geofencing and speed governing:** E-scooters should slow down and stop in prohibited areas.
- **Parking:** E-scooters should not impede access for people walking and rolling.
- **Infrastructure:** E-scooter companies should support city efforts to increase infrastructure for micromobility.
- **Customer service and reporting:** E-scooter companies should be accountable to the public and ensure data PBOT receives is useful.

Equity

- **Access across the city:** Enough e-scooters should be deployed in East Portland and across the city to make them viable and reliable travel options for all Portlanders.
- **Pricing:** Pricing should be transparent and affordable; subscription models or loyalty programs should encourage affordability.
- **Low-income plans:** Companies should work with community-based organizations to increase use of low-income pricing plans, cash payment options, and non-smartphone options.
- **Increasing use by underserved communities:** E-scooters should help community members meet their travel needs.
- **Equitable hiring:** Historically underserved communities should be able to participate in the new mobility economy.
- **Employment:** E-scooter companies should provide supportive wages and working conditions for employees.

Resolving challenges through successful partnership

Portland's strong culture of active transportation has created conditions that welcome e-scooters as a new mode. Its bicycle culture, bicycle activism, and well-developed bicycle infrastructure have laid the groundwork for e-scooter riding to become a feasible way to get around Portland. E-scooters largely do not yet function as a true "last-mile" connection to transit—but transit, e-scooters, and BIKETOWN reinforce each other as transportation options that help people reliably travel without a personal vehicle.

Many questions and challenges remain before the promise of e-scooters can be fulfilled. As the e-scooter industry evolves and can better meet Portland's transportation goals, **the relationship between PBOT and e-scooter providers can shift from regulation to partnership**—and to do that, PBOT will need focus its attention to create deeper relationships with one to three providers.

The e-scooter landscape is rapidly evolving. A permanent e-scooter program in Portland with one to three providers will help address the challenges and provide reliability for Portlanders who want climate-friendly choices. It will also help create a more predictable climate for company investment so they can make long-term decisions about strategy, staffing, operations, and programming. In addition to meeting baseline requirements, companies must partner with PBOT **to ensure that e-scooters help Portlanders travel in safe, convenient, equitable, and environmentally friendly ways.**

Endnotes

1 *Shared Micromobility in the U.S.: 2018." National Association of City Transportation Officials, 2019. https://nacto.org/shared-micromobility-2018/*

2 *2018 E-Scooter Findings Report. Portland Bureau of Transportation, 2019. https://www.portland.gov/sites/default/files/2020-04/pbot_e-scooter_01152019.pdf*

3 *Multnomah County 2017 Carbon Emissions and Trends. Bureau of Planning and Sustainability, September 18, 2019. https://beta.portland.gov/sites/default/files/2019-09/climate-data-report-final.pdf*

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6 *"The Privacy Project." The New York Times. https://www.nytimes.com/series/new-york-times-privacy-project*

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8 *Edmonds, Ellen. "Your Driving Costs."AAA, September 12, 2019. https://newsroom.aaa.com/auto/your-driving-costs/*

9 *Hollingsworth, Joseph; Brenna Copeland, and Jeremiah X Johnson. "Are e-scooters polluters? The environmental impacts of shared dockless electric scooters." Environmental Research Letters, August 2, 2019. https://iopscience.iop.org/article/10.1088/1748-9326/ab2da8*

10 *Krizek, Kevin J. and Nancy McGuckin. "Shedding NHTS Light on the Use of 'Little Vehicles' in Urban Areas." Transport Findings, November 18, 2019. https://transportfindings.org/article/10777-shedding-nhts-light-on-the-use-of-little-vehicles-in-urban-areas*

11 *"Low-Income Pricing Plans." Portland Bureau of Transportation, 2020. https://www.portland.gov/transportation/escooterpdx/low-income-pricing-plans*

12 *Average BIKETOWN trip cost calculation is based on the average trip duration of 21 minutes at a cost of $0.08 per minute for pay-as-you-go users.*

13 *Average car trip cost calculation is based on average annual car ownership cost divided by the average number of car trips taken per year. AAA estimates average annual car ownership costs to be $9,282 (https://newsroom.aaa.*

*com/auto/your-driving-costs). Average number of trips per year is derived from the Oregon Household Activity Survey conducted in Portland in 2011 (via Roger Geller, https://www.portlandoregon.gov/transportation/article/452524). The survey found an average of 9.2 total trips per day and a 72.4% drive mode split for an average of 6.66 drive trips per day. To reach an annual number of trips, 6.66 was multiplied by 342 travel days per year (instead of 365) to adjust average weekday travel data to account for different travel patterns on weekends and holidays. This resulted in an average of 2,278 trips per year, otherwise noted as $9,282 / (6.66 * 342) = $4.08/trip.*

14 *Average e-scooter trip cost calculation is based on an average trip duration of 14 minutes applied to the cost plans for each company at the time of publication. An average across each scooter company was taken to reach $5.55.*

- *Bird: $1 + $0.29/minute + $0.25 street use fee = $5.31*
- *Lime: $1 + $0.33/minute + $0.25 street use fee = $5.87*
- *Razor: $1 + $0.34/minute + $0.25 street use fee = $6.01*
- *Spin = $1 +$0.27/minute + $0.25 street use fee = $5.03*

15 *Griswold, Alison. "At least 29 people have died in electric scooter crashes since 2018." Quartz, February 7, 2020. https://qz.com/1793164/at-least-29-people-have-died-in-electric-scooter-crashes/*

16 *One of the two seated scooter companies did not begin full operations in Portland until September 2019, and the same company ceased operations in February 2020.*

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2019 Quarter 3 Bike Share Summary Report. Seattle Department of Transportation. https://www.seattle.gov/Documents/Departments/SDOT/BikeProgram/2019Q3_BikeShare_Summary_Report.pdf

18 *"Scoot Smart." Portland Bureau of Transportation, December 3, 2019. https://www.youtube.com/watch?v=jX3rIcFIZZU*

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