UNIVERSITY OF OREGON

NEW MOBILITY IN THE RIGHT-OF-WAY

MARCH 2019

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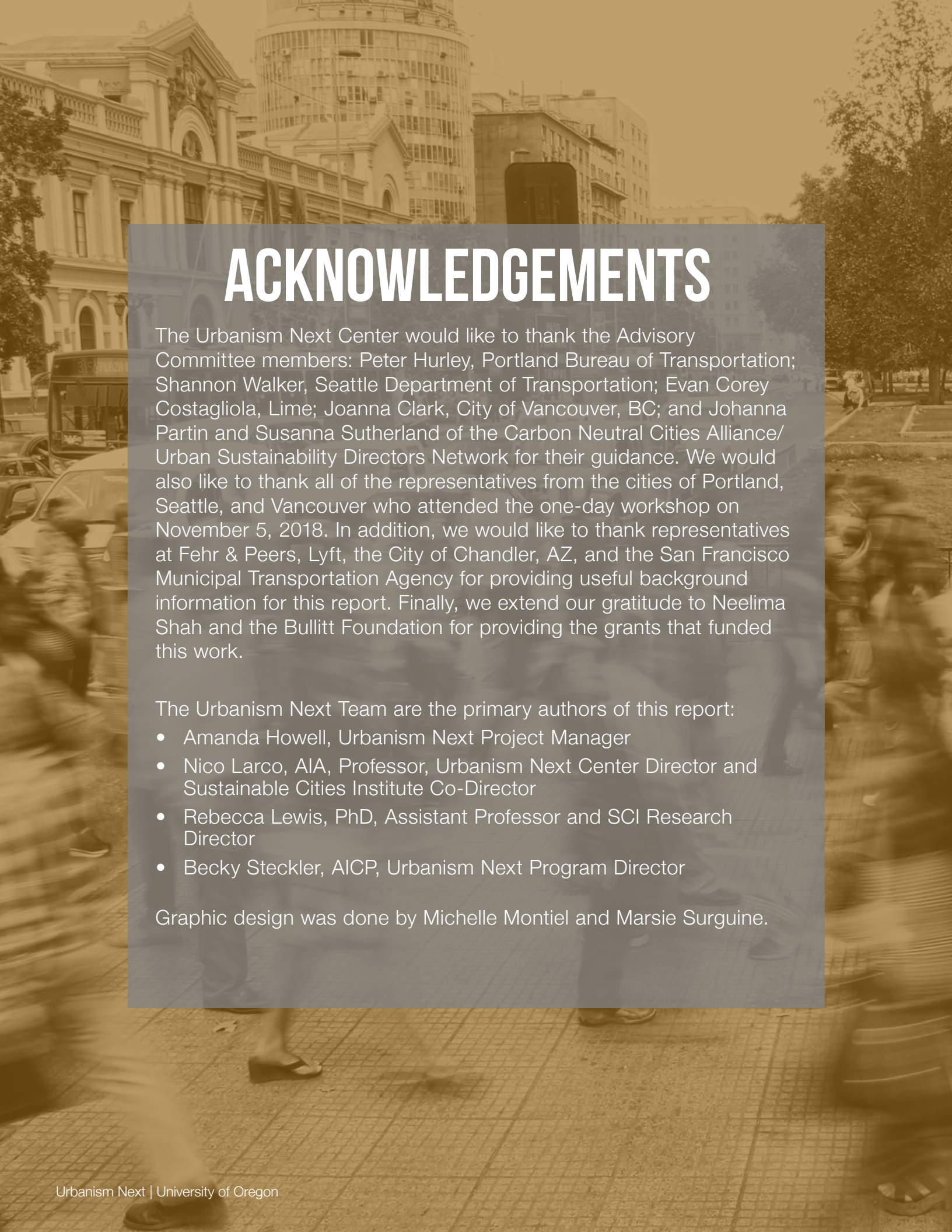

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ABOUT THE URBANISM NEXT CENTER

The Urbanism Next Center is a research center housed within the Sustainable Cities Institute at the University of Oregon. It is a leading source for information about the potential impacts of emerging technologies — autonomous vehicles, new mobility, e-commerce, and the sharing economy — on city development, form, and design and the implications for equity, health, the economy, the environment, and governance.

ABOUT THE SUSTAINABLE CITIES INSTITUTE

The Sustainable Cities Institute (SCI) is a cross-disciplinary organization at the University of Oregon that promotes education, service, public outreach, and research on the design and development of sustainable cities. We are redefining higher education for the public good and catalyzing community change toward sustainability. Our work addresses sustainability at multiple scales and emerges from the conviction that creating the sustainable city cannot happen within any single discipline. SCI is grounded in cross-disciplinary engagement as the key strategy for improving community sustainability. Our work connects student energy, faculty experience, and community needs to produce innovative, tangible solutions for the creation of a sustainable society.


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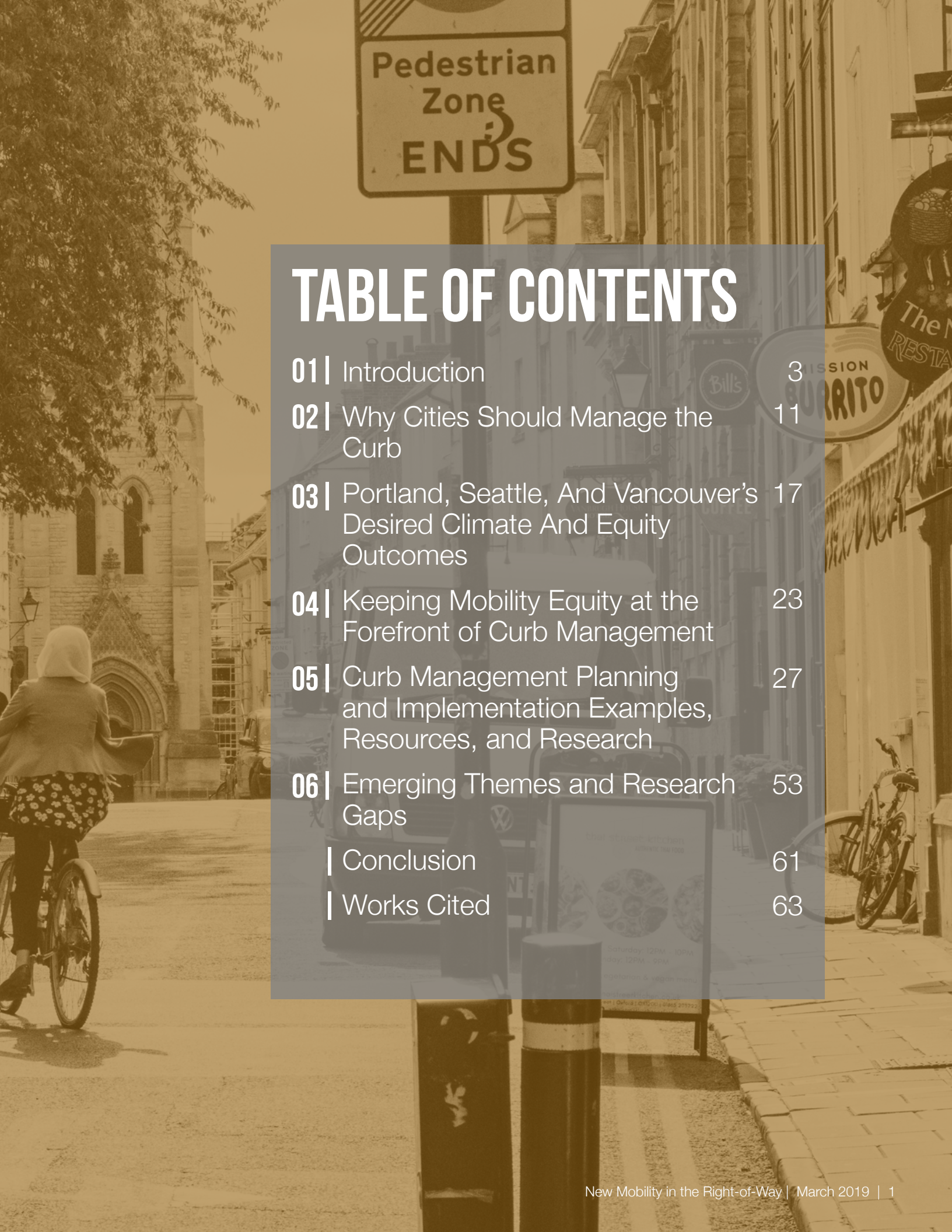

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01 | INTRODUCTION

BACKGROUND

> "THE CURB IS THE NEW URBAN FRONTIER"
>
> *- Donald Shoup at LACoMotion, Nov. 2018*

Streets and sidewalks, together known as the public right-of-way (ROW), are often compared to arteries and veins in a body. They transport people and goods, and just as with arteries, problems can occur when they are clogged. The function of a street is not limited to movement, of course. Streets are places for recreation and entertainment, for commerce, and for some people, it is where they live. Streets are also the workbench for utilities and public works. They host vertical infrastructure and serve as the conduit to underground infrastructure. Streets are the circulatory systems that are critical for livable cities. In short, the functions of the right-of-way can be summarized as the following: movement, access, loading, storage, activation, and greening. (See Figure 1-1 for a description of the primary right-of-way functions as identified by the Seattle Department of Transportation). These activities occur in three different "zones" of the street, which the Seattle Department of Transportation (SDOT) have defined as the pedestrian realm, the "flex" or curb zone, and the travelway (Figure 1-2). The curb zone is where many of these uses intersect and "where movement meets access"(Mitman, Davis, Armet, & Knopf, 2018, p. 4). Traditionally, this zone has been used by private vehicles, taxis, pedestrians, cyclists, high-capacity transit, and freight and delivery vehicles.

Over the past eight years, however, demand for curb access is noticeably changing. This increase in demand is related to the introduction of transportation network services (TNCs) like Uber and Lyft. It is also driven by the growth in docked and dock-less shared mobility, including the introduction of shared electric scooters. It is influenced by a significant rise in e-commerce with the growth of Amazon and other online retailers. Finally, the ease of in-app ordering combined with low-cost or even free delivery, often provided by courier network services like GrubHub and Postmates is impacting demand for the curb. These technological innovations have fueled the growth of the gig economy,[1] enabling many people to use their personal vehicles to ferry passengers—as well as make package and food deliveries.

Cities are only just beginning to understand how these services are impacting the demands placed on the right-of-way, including the curb. For instance, the growth of TNCs and courier services is contributing to an increased demand for short-term loading zones to enable safe and efficient passenger and goods loading. At the same time, demand for parking is decreasing in certain areas, such as nightlife corridors and airports (International Parking Institute, 2018; Walker Consultants, 2018).

Cities are also anticipating the near-future commercial deployment of fleets of autonomous vehicles (AVs), which will likely function similarly to how TNCs do today. AVs will be used to move both passengers

1 The gig economy generally refers to the broad swath of jobs that "use app-based platforms to dole out work in bits and pieces — making deliveries, driving passengers or cleaning homes…" (Kobie, 2018)

FIGURE 1-1. Primary Functions of the Right-of-Way (ROW) as Defined by the Seattle Department of Transportation

FUNCTION	STORAGE	GREENING	ACTIVATION	ACCESS FOR COMMERCE	ACCESS FOR PEOPLE	MOBILITY
DEFINITION	*Provides storage for vehicles or equipment*	*Enhances aesthetics and environmental health*	*Offers vibrant social spaces*	*Goods and services reach their customers and markets*	*People arrive at their destination, or transfer between different ways of getting around*	*Moves people and goods*
USES	*Bus layover* *Long-term parking* *Reserved spaces (e.g. for police or other government use)* *Construction*	*Plantings* *-Boulevards* *-Street trees* *-Planter boxes* *Rain gardens and bio-swales*	*Food trucks* *Parklets and streateries* *Public art* *Street festivals*	*Commercial vehicle load zones* *Truck load zone*	*Bus or rail stops* *Bike parking* *Curb bulbs* *Passenger load zones* *Short-term parking* *Taxi zone*	*Sidewalks* *Bus or streetcar lanes* *Bike lanes* *General purpose travel lanes* *Right or left turn-only lanes*

Source: Seattle Right-of-Way Improvements Manual, Seattle Department of Transportation, 2016. Accessed at http://streetsillustrated.seattle.gov/street-types/row-allocation/

and goods, providing point-to-point service, and placing additional demands on curbside access. While questions remain about how soon fully autonomous vehicles will be commercially deployed, as well as how widespread they will be, AVs are already on streets. For instance, Fry's, which is owned by grocery giant Kroger, recently partnered with the delivery-bot maker Nuro to pilot autonomous grocery delivery in Scottsdale, Arizona (Metz, 2018). These grocery delivery vehicles travel on public roads alongside traditional vehicles.

The curb has long been in high demand with multiple users vying for limited space, especially for the purposes of parking personal vehicles. However, TNCs and other services have helped to usher in a new age that involves an increased demand for short-term loading and micromobility[2] device parking. Multiple issues can arise when the curb zone is not well allocated or managed, including increased congestion, double-parking and circling for parking, all of which

2 Micromobility refers to "small, human- and electric-powered transportation solutions such as bikes, scooter, and mopeds"(Populus, 2018.)

Delivery robot Nuro operating in Scottsdale, AZ; Source: Nuro

NEW MOBILITY

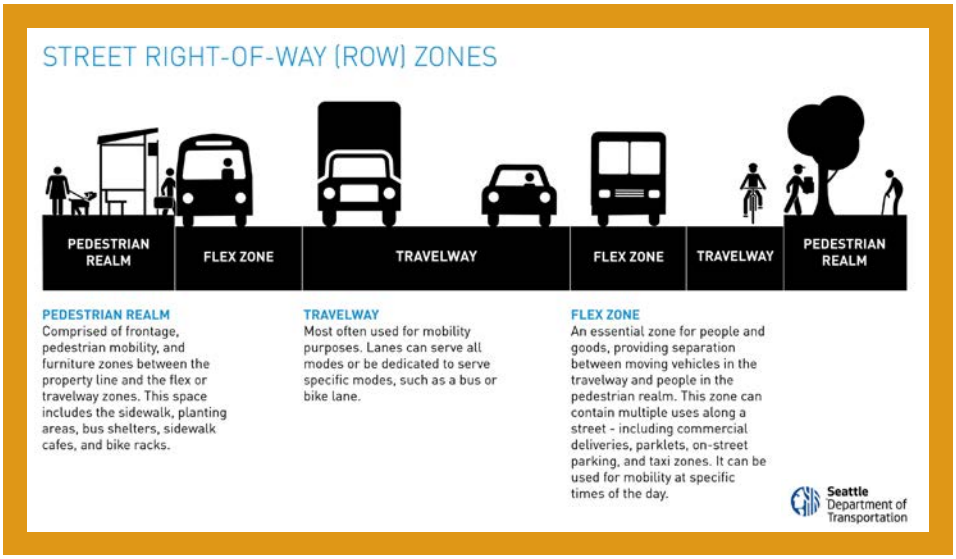
"New mobility is the term favored by many jurisdictions across the country to describe transportation that is newly enabled by technology, primarily the use of smart phones. This technology includes transportation network companies (like Uber and Lyft), micro-transit (like bikeshare, electric scooter share, and potentially other modes of transportation that are enabled by smart phones or other electronic devices. Autonomous vehicles (AVs) are expected to be included in the suite of technologies covered by new mobility when they are deployed in cities."

– AVs in the Pacific Northwest: Reducing Greenhouse Gas Emissions in a Time of Automation (Urbanism Next, Aug. 2018)

result in an increase in GHG emissions. Failure to consider the curb comprehensively has often resulted in the prioritization of parked vehicles over other uses, which not only contributes to mode conflicts, but also has considerable ramifications on mobility equity. For instance, curb space dedicated to the storage of private vehicles might otherwise be used for dedicated transit. In doing so, users who can afford to access a private vehicle are often prioritized over users who are transit-dependent. AVs will likely exacerbate existing issues with the right-of-way and the curb, which is why it is important that cities tackle curb management in new ways.

The cities of Portland, OR; Seattle, WA; and Vancouver, BC recognize the importance of innovative curb management. In 2017, the three cities partnered with the Carbon Neutral Cities Alliance at the Urban Sustainability Directors Network (CNCA/USDN) on a project to better understand how each city is individually addressing policy issues related to AVs. CNCA/USDN, with support from the Bullitt Foundation, provided a grant to the Urbanism Next Center to conduct research and lead three workshops with the cities between June and November 2018. The first two workshops focused on the potential impacts of AVs on GHG emissions, and Urbanism Next produced an associated report, "AVs in the Pacific Northwest: Reducing Greenhouse Gas Emission in a Time of Automation." During the first phase of the project, the cities broadly identified the right-of-way and specified the curb as an area of keen interest. The group collectively decided that the impacts of new mobility on the curb would be the focus of the second phase of research. The final workshop in November 2018 brought together representatives from the three cities for an in-depth discussion about curb management, and this report catalogs the findings from the second phase of the project.

FIGURE 1-2. Street Right-of-Way (ROW) Zones as Designated by the Seattle Department of Transportation



Source: Seattle Right-of-Way Improvements Manual, Seattle Department of Transportation, 2016. Accessed at http://streetsillustrated.seattle.gov/street-types/row-allocation/.

PURPOSE OF THIS REPORT

The purpose of this report is to categorize and summarize efforts that are already underway in cities across the world to rethink curb management, to outline the key takeaways from the one-day workshop that involved city staff from Portland, Seattle, and Vancouver, and to identify major research gaps.

METHODS

The Urbanism Next Center at the University of Oregon used the following methods to complete this report:

LITERATURE REVIEW

Urbanism Next conducted a brief literature review on curb management and how it is directly linked to impacts on climate and mobility equity. The literature review informs Section 2.

POLICY AND PILOT PROJECT ANALYSIS

Urbanism Next reviewed curb management policies and pilot projects in ten cities, including Washington, D.C., San Francisco, CA, Seattle, WA, New York, NY, London, U.K., and others. Additionally, Urbanism Next reviewed research to rethink curb management, especially pertaining to data collection. The policy and pilot project analysis helped identify promising practices, important takeaways, and existing research gaps. The policy and project analysis inform Section 5.

INTERVIEWS

Urbanism Next conducted four interviews with representatives of the San Francisco Municipal Transportation Authority, Lyft, Fehr & Peers, and the City of Chandler, Arizona in order to better understand efforts underway by these agencies and jurisdictions to respond to changes in curbside demand. These discussions provided additional clarity on issues pertaining to curb management and further highlighted research gaps. The interviews inform Section 5.

FACILITATED WORKSHOP

Urbanism Next facilitated a one-day workshop with representatives from the three cities in November 2018 to discuss preliminary research findings and to identify areas of opportunity for the cities work together to advance curb management understanding and policymaking. The workshop discussions inform Section 6.

REPORT SCOPE

Management of the curb is the primary focus of this report. While curb management requires thinking about the interactions between the various zones of the ROW (Figure 1-2), management of the full ROW is not the primary focus of this research effort. This report also does not provide specific guidance or research about the management of the pedestrian realm or the travelway.

Additionally, this report did not conduct data analysis about ROW use. Limited data are available in terms of passenger trips made with transportation network services. Furthermore, no publicly available data about the impacts of courier network services appear to exist.

FIGURE 1-3. Multiple uses of the right-of-way (ROW)

Source: Michelle Montiel

MOVING PEOPLE

BIKESHARE

Services providing fleets of bicycles for short-term rental. Pay at kiosk/ smartphone app. Docked: pick-up/return at fixed stations. Dockless: pick-up/leave anywhere within a defined area.

E-SCOOTER SHARE

Services providing fleets of electric scooters for short-term rental within a defined service area. Pick-up/leave anywhere within a defined area.

MOPED SHARE

Services providing fleets of mopeds for short-term rental. Typically dockless: pick-up/return anywhere within a defined area.

CARSHARING

Services providing access to shared vehicles for trips where users only pay for time used. Stationary: pick-up/return to same parking spot. Free-floating: pick-up/leave anywhere within a defined area. Peer-to-peer: rent from individuals.

RIDE-HAILING

Use of smartphone apps to connect passengers with drivers who provide rides in their personal vehicles. Also known as transportation network companies (TNCs). Can be single or shared occupancy.

MICROTRANSIT

Privately operated passenger vans and shuttle buses offer transit-like service on a smaller scale. Routes may be fixed or dynamic, but typically use predetermined pick-up and drop off points for passengers.

PUBLIC TRANSIT

Use of public transit as it currently exists, but using newer technologies like smartphone apps to look up routes and/or pay for ride.

AUTONOMOUS VEHICLE

Vehicles use sensors and advanced control systems to operate independently from a human driver and may be used to transport passengers as well as freight.

MOVING PEOPLE

MOVING GOODS

COURIER SERVICES

The use of an app to connect people using their personal vehicles to make restaurant, grocery, or other package deliveries.

AUTONOMOUS DELIVERY

The delivery of goods by driverless autonomous vehicles, from larger freight vehicles to smaller passenger vehicles.

SELF-DRIVING ROBOTIC DELIVERY

Fleets of small autonomous delivery vehicles that may be used on sidewalks or on roads depending on size and speed.

AERIAL DRONE DELIVERY

Not a focus of report/or in the scope of Urbanism Next... but a technology on the near horizon.

MOVING GOODS


ZONA
DE
CAUDALES
ZONA
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CAUDALES

02 | WHY CITIES SHOULD MANAGE THE CURB

Source: Ravi Patel on Unsplash

FREE CURBSIDE PARKING IMPACTS TRAVEL BEHAVIOR

For years, curb space has been primarily allocated to the storage of private vehicles through the provision of short- and long-term on-street parking. Many cities, especially in the U.S., have historically not charged for on-street parking. According to Donald Shoup, U.S. drivers park free at the end of 99 percent of their trips (Shoup, Appendix B, 2011). The widespread availability of free and cheap parking impacts travel behavior and induces vehicle travel. Researchers have inferred that a causal relationship exists between parking and citywide automobile use (McCahill, Garrick, Atkinson-Palombo, & Polinski, 2016). However, roadway space is finite and as vehicle use increases, congestion may increase, especially in highly trafficked corridors during peak travel periods. Free on-street parking not only induces vehicle use, it also encourages drivers to circle or "cruise" for parking, contributing to a string of negative externalities. As Shoup writes in Parking and the City, cruising not only wastes the time of the driver, it also "congests traffic, pollutes the air, endangers pedestrians and cyclists, and creates CO2 emissions" (Shoup, 2018, p. 24). Even just a small amount of time spent searching for a parking space can increase traffic and VMT/VKT.

VEHICLE MILES/KILOMETERS TRAVELED AND CONGESTION CAN INCREASE GREENHOUSE GAS EMISSIONS

An increase in VMT/VKT in gasoline-powered vehicles is directly linked to increased GHGs (VMT/VKT is a proxy measurement for GHGs, though fuel efficiency is a factor). Increased congestion results in cars accelerating, decelerating, and idling more frequently, which can in turn result in increased tailpipe emissions. For instance, researchers

at Texas A&M's Transportation Institute attempted to quantify the additional amount of emissions generated by urban congestion in 498 urban areas in the U.S. and found that "56 billion pounds of additional CO2 were produced at the lower speeds under congested conditions" (Eisele, et al., 2014, p. 73).

The presence of free or cheap on-street parking can encourage circling, increasing VMT/VKT and contributing to increased congestion. As a result, comprehensive curb management is an important component in any citywide effort to reduce VMT/VKT and GHGs.

COMPREHENSIVE CURB MANAGEMENT CAN ENCOURAGE MODE SHIFTS

Just as the presence of free or cheap on-street parking can induce driving, allocating curb space to other modes can help promote mode shifts. Price, safety, and reliability are all important factors in mode choice, and the prioritization of private vehicles at the curb can impact both the reliability and safety of other modes. For instance, drivers searching for parking may increase congestion, thereby slowing transit and reducing its reliability. Vehicles entering and exiting the travel lane can pose safety risks to cyclists and other non-motorized users. However, making space at the curb for other users can impact mode choice. Research has shown that there is a clear correlation between bike lanes, increased rates of cycling, and reduced risk for riders (NACTO, 2016). People who do not feel safe riding in the street due to a lack of infrastructure may choose to ride on the sidewalk, or not to ride at all as is the case of the "interested but concerned" cyclist (Dill & McNeil, 2013). Both are problematic since sidewalk riding can endanger pedestrians, but choosing not to ride may mean that the trip is made by private vehicle instead.

In terms of transit usage, "speed, reliability and frequency are critical dimensions of service quality that discretionary riders value" (Chakrabarti, 2017, p. 87). Congested streets can greatly reduce the speed and reliability of transit, thereby impacting mode choice.

Amazon Prime Fleet; Source: Daimler Mercedes Benz

However, dedicated bus lanes can increase the speed of travel, making it more predictable and reliable. Seattle, for instance, has seen transit ridership increase after giving buses priority on some heavily trafficked corridors (Small, 2017), among other improvements. Using curb lanes for dedicated transit, bike lanes, and uses other than the storage of private vehicles can encourage important mode shifts.

DEMAND FOR CURBSIDE ACCESS IS INCREASING

The number of multiple and competing curb demands is increasing with the introduction of new mobility technologies such as TNCs and e-scooters, and the continued growth of e-commerce. TNCs offer passengers door-to-door service with the ability to be picked up and dropped off at their desired destinations. This is increasing the demand for short-term curbside uses like passenger loading zones, especially in areas with concentrated nightlife. Multiple reports have also linked TNCs to increased congestion (Gehrke, Felix, & Reardon, 2018; San Francisco County Transportation Authority, 2018; Schaller, 2018). Though congestion is certainly not a new phenomenon, TNCs may be exacerbating it in part by spending time circling and idling while waiting for passengers.

Package deliveries are also on the rise. According to José Holguín-Veras, a researcher at Rensselaer Polytechnic Institute, "the number of freight deliveries per person in America has doubled over the last decade…with almost all of that growth attributable to internet buying" (Humes, 2018). If current growth continues, that number could double again by 2023 (Humes, 2018). The growth in goods delivery is putting additional pressure on demand for short-term loading zones.

The growth of the shared micromobility market with the introduction of e-scooters is also placing increased demands on the curb. The shared devices are meant to be ridden in the street, but many cities are struggling to keep riders off the sidewalk. The City of Portland received 1,622 reports of sidewalk riding during the city's four-month e-scooter pilot program (Portland Bureau of Transportation, 2019, p. 24). However, instances of sidewalk riding were also directly related to the posted speed of traffic and/or the lack of bike infrastructure, according to the Portland Bureau of Transportation's report findings. This supports research findings that allocating curb space for nonmotorized modes could impact mode shift. Additionally, questions about where shared micromobility devices should be stored when not in use are spurring conversations about the curb. Some cities like Santa Monica, CA are experimenting with replacing parking spaces with e-scooter corrals (Linton, 2018).

Finally, the growth of the electric vehicle market is also placing increasing demands on the curb. EV charging infrastructure is another important consideration in the discussion about curb space allocation. The right-of-way may become increasingly electrified through EV charging stations, as well as, eventually, inductive charging.

A NOTE ON GOODS DELIVERY

There are a variety of terms being used to refer to local goods delivery, including urban delivery, goods delivery, and urban freight. Some cities are also referring to services like UberEats, Grubhub, Postmates, Amazon Flex and others, which primarily use couriers to make food and package deliveries, as courier network services (CNS). This report uses urban goods delivery to refer to deliveries made by carriers directly to consumers. The term courier network services refers specifically to services that enable app-based ordering and delivery via couriers.

POTENTIAL CURBSIDE IMPACTS OF AUTONOMOUS VEHICLES

Early research findings about the potential transportation impacts of AVs suggest that they may increase VMT/VKT (Fagnant & Kockelman, 2014; Greenblatt & Shaheen, 2015) as it is anticipated that AVs will function similarly to TNCs. New research also suggests that AVs could exacerbate congestion by circling endlessly while waiting for a passenger in order to avoid parking charges even during periods of lower demand (Millard-Ball, 2019). TNC drivers, on the other hand, are more likely to pull over and park during slow periods. However, unlike human drivers who may choose to pull up in front of a bus stop or stop in a travel lane, AVs are expected to be programmed to follow all laws and regulations. This means AVs will need to access designated passenger zones in order to pick up and drop off passengers. Anticipating and planning for the commercial deployment of AVs requires comprehensive curb management and a consideration about how curb space is currently allocated and priced.

MOBILITY EQUITY AND THE CURB

The prioritization of curb space for the storage of private vehicles privileges those who can afford to drive. Lower income communities are less likely to own a private vehicle and are more reliant on transit (Blumenberg & Pierce, 2012; Giuliano, 2005). Prioritizing space for parking over transit, for instance, can reduce reliability, frequency, and efficiency of transit. This in turn can diminish both mobility and access to opportunity. Rates of cycling are also linked to income, as well as race and ethnicity. In 2014, PeopleForBikes reported that people making less than $20,000 per year are twice as likely to rely on bicycles for to meet their daily transportation needs, and people of color are more likely to be regular riders (Andersen, 2015). Allocation of curb space is an important factor in mobility equity that should not be overlooked.

Source: Zach Inglis for Unsplash

03 | PORTLAND, SEATTLE, AND VANCOUVER'S DESIRED CLIMATE AND EQUITY OUTCOMES

Source: Aditya Chinchure on Unsplash

Focusing on desired outcomes is an important starting point for any project. In the case of curb management, Portland, OR; Seattle, WA and Vancouver, BC are interested in the ways that effective curb management can help them achieve the desired outcomes of reducing greenhouse gas emissions and advancing equity. The three cities' goals related to greenhouse gas emissions and equity are outlined in plans that have been adopted by the cities, as well as city-led initiatives, which are described here.

REDUCE GREENHOUSE GAS EMISSIONS

Each of the three cities have ambitious goals to significantly reduce GHG emissions from the transportation sector. According to the U.S. Environmental Protection Agency, the transportation sector accounts for the largest portion of GHG emissions compared to all other sectors: 28% in 2016 (United States Environmental Protection Agency, 2018). In Canada, the transportation sector accounted for 25% of total GHG emissions in 2016 (Government of Canada, 2018). Total vehicle miles or kilometers traveled (VMT/VKT) is directly related to GHG emissions, as gasoline-powered vehicles emit carbon, and all three cities have established goals to reduce total VMT/VKT. Effective curb management policies can help reduce total VMT/VKT, which in turn reduces GHG emissions.

TABLE 3-1. Overview of Climate Action Plans for Portland, Seattle, and Vancouver

		2020	2030	2050
PORTLAND	*City of Portland and Multnomah County Climate Action Plan* *Adoption Date: 2015*		40% FROM 1990 LEVELS 30% FROM 2008 LEVELS	80% FROM 1990 LEVELS
SEATTLE	*Seattle Climate Action Plan* *Adoption Date: 2013*		58% FROM 1990 LEVELS 20% FROM 2008 LEVELS	100% CARBON NEUTRAL
VANCOUVER	*Greenest City 2020 Action Plan* *Adoption Date: 2015*	20% FROM 2007 LEVELS		100% ENERGY FROM RENEWABLE SOURCES 80% FROM 2007 LEVELS

	REDUCTION IN GHG	REDUCTION IN DAILY PER CAPITA VMT	REDUCTION IN VMT	REDUCTION IN VKT PER RESIDENT
PORTLAND	✓	✓		
SEATTLE	✓		✓	
VANCOUVER	✓			✓

ADVANCE EQUITY INITIATIVES

Each of the three cities have adopted important equity initiatives with the aim of mitigating historic disparities in access and opportunity. Effective curb management policies that prioritize the needs of underserved users can help advance these important equity initiatives.

PORTLAND

Source: Andrey Yachmenov for Unsplash

The City of Portland adopted the 2035 Comprehensive Plan in 2018 and it explicitly outlines equity as one of its five guiding principles:

> Promote equity and environmental justice by reducing disparities, minimizing burdens, extending community benefits, increasing the amount of affordable housing, affirmatively furthering fair housing, proactively fighting displacement, and improving socio-economic opportunities for under-served and under-represented populations. Intentionally engage under-served and underrepresented populations in decisions that affect them. Specifically recognize, address and prevent repetition of the injustices suffered by communities of color throughout Portland's history (City of Portland, 2018, p. 17).

The Bureau of Transportation also adopted a 5-Year Racial Equity Plan 2017-2021 and the first long-term goal it lists is to "provide equitable City services to all residents" (City of Portland, Bureau of Transportation, 2016, p. 1).

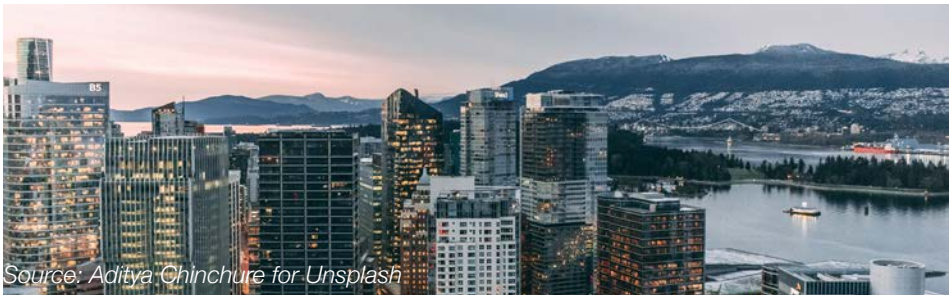
SEATTLE

Source: Milkovi for Unsplash

The City of Seattle has established several equity initiatives to guide city policymaking and planning efforts, including the Equity and Environment Initiative, and the Race and Social Justice Initiative. Seattle also adopted race and social equity as one of its four core values in the Comprehensive Plan: "Limited resources and opportunities must be shared and the inclusion of under-represented communities in decision-making processes is necessary" (Office of Planning & Community Development, 2018, online).

There are also several equity initiatives specifically housed under the Seattle Department of Transportation. In January 2018, Seattle's City Council adopted a Transportation Equity Resolution to establish the Transportation Equity Program, managed by SDOT. The Transportation Equity Program "provides safe, environmentally sustainable, accessible, and affordable transportation options that support communities of color, low-income communities, immigrant and refugee communities, people with disabilities, people experiencing homelessness or housing insecurity, LGTBQ people, women and girls, youth, and seniors to thrive in place in vibrant and healthy communities, and mitigate racial disparities and the effects of displacement" (Seattle Department of Transportation, 2018, online). Additionally, one of the key principles of the New Mobility Playbook, published by SDOT in 2017, is to "Advance Race and Social Justice" (Seattle Department of Transportation, 2017, p. 32).

VANCOUVER



Source: Aditya Chinchure for Unsplash

In 2014 Council approved the City of Vancouver's Healthy City Strategy, which recognizes that the social determinants of health and well-being are interconnected and that "a 'for all' lens will help ensure that the city pursues initiatives that are both universal for all citizens and focused on specific populations most vulnerable to health inequities" (City of Vancouver, 2015, p. 6). One of the goals outlined in the strategy is that "Vancouverites enjoy safe, active, and accessible ways of getting around the city" (City of Vancouver, 2015, p. 11). This policy direction is also reflected in Vancouver's Transportation 2040 Plan, adopted in 2012, which is underlined by traditional sustainability goals of Economy, People (Society) and Environment (City of Vancouver, 2012). The plan's "people" goal leads to numerous equity-related policies and strategies throughout the plan and focuses on mobility for all.


B.B.Q
TAILORS

04 | KEEPING MOBILITY EQUITY AT THE FOREFRONT OF CURB MANAGEMENT

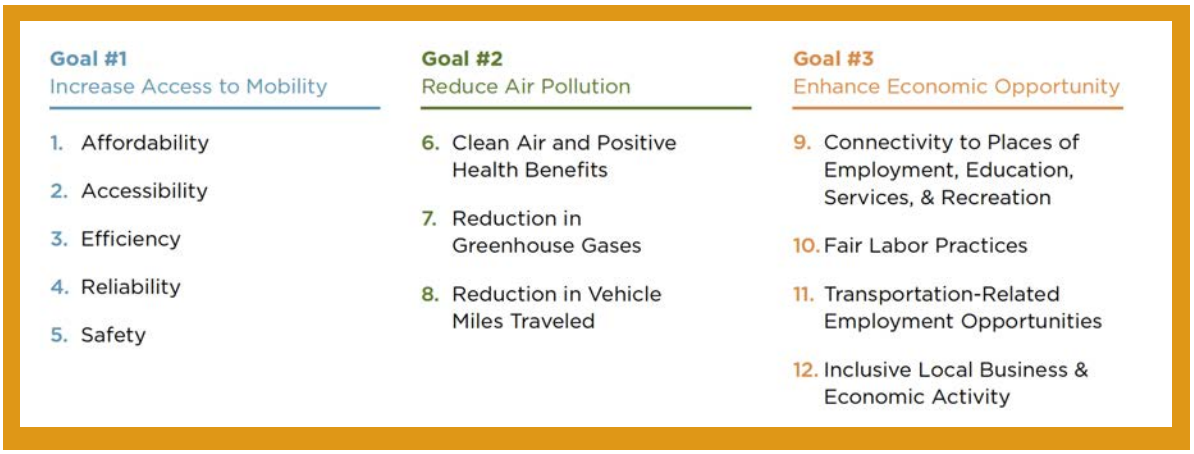
MOBILITY EQUITY

Understanding the needs of the community is an important first step in any pilot project or planning process. A robust community needs assessment should inform decision-making and guide policy development. For instance, in 2018, Portland State University partnered with OPAL Environmental Justice Oregon to conduct a "Community-Based Assessment of Smart Transportation Needs in the City of Portland." One research question they set out to answer on behalf of the City of Portland was: "How can smart mobility technologies address the current and future needs of transportation disadvantaged communities?" (Golub, Serritella, Satterfield, & Singh, 2018, p. 1). The research team found that "by lowering costs and improving service for public transit, ridesharing and active transportation, smart mobility technologies could potentially address many of the transportation needs of transportation disadvantaged communities" (Ibid, p. 1). Information like this should be used to inform decision-making related to the right-of-way and curb management.

Researchers at the Greenlining Institute have outlined twelve mobility equity indicators that can be used to conduct a mobility equity analysis (Figure 4-1). As they suggest, "Decision-makers and communities can use these indicators and their metrics to assess the equity outcomes of individual transportation projects or entire transportation modes or plans" (Creger, Espino, & Sanchez, 2018, p 11).

This framework provides three examples of how a mobility equity analysis can inform prioritization of various of transportation modes (Figure 4-2). In their analysis they assume that all mobility equity indicators are weighted equally, and that all modes are available in each hypothetical place type (urban, suburban, and rural). In urban and suburban settings, for instance, their analysis suggests that active transportation should be the first priority in a mode hierarchy. Rural areas, however, may prioritize rideshare given the longer distances between destinations[1].

FIGURE 4-1. Mobility Equity Indicators from the Greenlining Institute's Mobility Equity Framework



Source: Mobility Equity Framework, The Greenling Institute, 2018, p. 5.

1 Note that the Greenlining Institute differentiates rideshare from ridehail, which encompasses TNC services like Uber and Lyft.

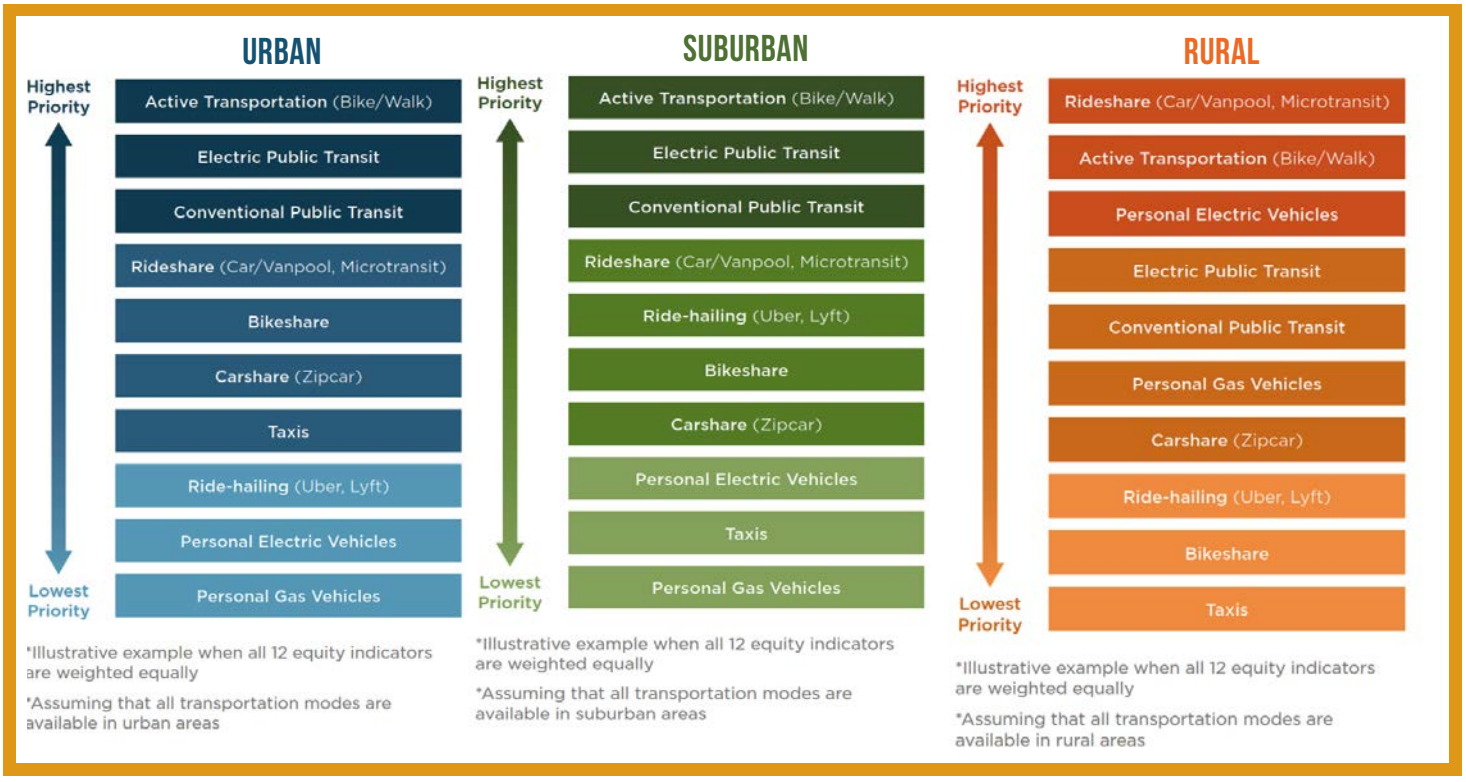
This type of analysis is applicable to curb prioritization, as it helps guide decision-making about which pilot projects to implement and how to allocate limited space. Using Greenlining's example, if a city wants to prioritize active transportation and electric public transit first and foremost, then curb space and related policies should support that prioritization by making room for pedestrian, cyclists, and transit. Implemented, this could be bus-only lanes in the flex (or curb) zones, as opposed to parking—since personal vehicles appear at the bottom of the prioritization scheme (Figure 4-2). A different jurisdiction could also choose to weight some factors more heavily than others, depending on the goals or outcomes desired. While resources like the Greenlining Institute's Mobility Equity Framework can provide guidance, there is no one size-fits-all approach. Each community should conduct its own transportation needs assessment.

The next section highlights research, pilot projects, and other efforts pertaining to curb management, though equity outcomes were not necessarily the impetus of these projects. Some pilot projects simply respond to existing conditions. However, this report strongly recommends that mobility equity be a prioritization factor for cities as they choose what pilots to implement, as well as a key consideration in pilot project design and other efforts undertaken related to curb management.

SAN FRANCISCO'S GUIDING PRINCIPLES FOR EMERGING MOBILITY SERVICES AND TECHNOLOGIES

The San Francisco Municipal Transportation Agency (SFMTA) and San Francisco County Transportation Authority (SFCTA) established the Guiding Principles for Emerging Mobility Services and Technologies to "provide a consistent policy framework to evaluate new mobility services" (SFMTA, p. 1). The 10 Guiding Principles were crafted to support the City of San Francisco's goals of "providing for safe, reliable, sustainable, and equitable transportation choices now and in the future" (p. 1). This framework is a useful resource that can be used in evaluation processes of new mobility services.

FIGURE 4-2. Transportation Mode Breakdown Applied to Urban, Suburban, and Rural Areas Using the Mobility Equity Indicators (The Greenlining Institute, 2018)



Source: Mobility Equity Framework, The Greenling Institute, 2018, p. 15-17.

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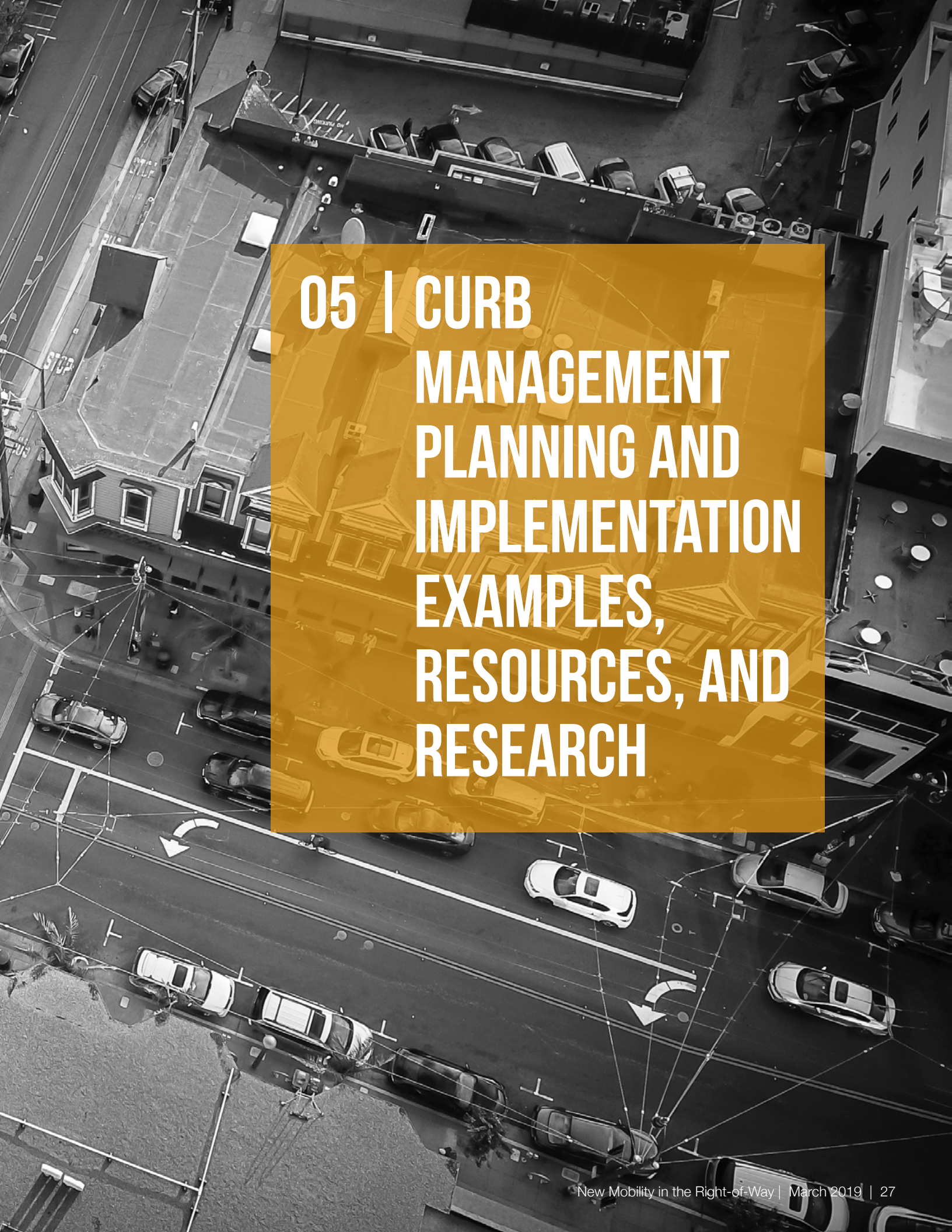


05 | CURB MANAGEMENT PLANNING AND IMPLEMENTATION EXAMPLES, RESOURCES, AND RESEARCH

URBANISM NEXT reviewed policies, plans, and pilot projects related to curb management from the following cities: Seattle, WA; London, U.K.; Washington, D.C.; Ft. Lauderdale, FL; Los Angeles, CA; West Hollywood, CA; San Francisco, CA; Portland, OR; New York, NY; and Chandler, AZ. Additionally, Urbanism Next reviewed research conducted by the International Transport Forum, the transportation consulting firm Fehr & Peers, and the University of Washington's Urban Freight Lab, as well as resources published by the Institute of Transportation Engineers (ITE) and the National Association of City Transportation Officials (NACTO). Finally, Urbanism Next reviewed services provided by Coord, a private sector curb mapping resource, and the data sharing platform SharedStreets. This section presents brief introductions to all of the reviewed policies, plans, pilot projects, research, and resources. They are organized according to four primary categories:

VISIONING AND PLANNING

This covers how cities are connecting management of the right-of-way to larger goals. Visioning includes efforts to think comprehensively about the ROW and its primary purposes. Planning covers efforts to develop actions that will help achieve city goals.

DATA COLLECTION

This covers gathering baseline data about the right-of-way, including efforts to map and inventory the curb. Data collection also entails efforts to understand ROW usage to inform decision-making and regulations.

SPACE ALLOCATION

This covers different ways of allocating the right-of-way depending on desired outcomes. It includes information about how to prioritize transit and different ways of implementing passenger and goods loading zone pilot projects.

REGULATION AND POLICY

This covers different ways that pricing and zoning mechanisms can be used for right-of-way management.

Each reference is classified as either a planning example, an implementation example, a resource, or relevant research. The planning and implementation examples highlight jurisdictions that have adopted plans and policies and/or have implemented a pilot project. The resources are briefly described and included for reference, and research efforts are summarized with important findings highlighted. Key takeaways as identified by Urbanism Next are presented for each category. The takeaways are informed by interviews conducted with representatives from Fehr & Peers, Lyft, the San Francisco Municipal Transportation Agency, and the City of Chandler, AZ, as applicable.

Source: Fred Joe for Urbanism Next

VISIONING AND PLANNING

An important step in any planning process is to establish a vision of the future that reflects community values. Using the visioning document as a guide, cities develop goals that pertain to the vision and then develop actions that will help achieve those goals in the form of city plans.

STRATEGIC VISION

Not every street can serve every function, so it can be helpful to engage in a visioning process about the various functions that should be prioritized on different streets—and how those functions connect to overarching goals and other adopted plans. Thinking about the different functions of the curb also helps break away from the notion that the curb lane is primarily a space for on-street parking. A parking lane automatically defines the use and is limiting in scope, but re-framing the curb as a flex zone shifts the conversation and connotes far more opportunity for how that space can be used. A strategic vision can also help guide decision-making across the various departments that manage the curb.

VISIONING
ESTABLISHING A STRATEGIC VISION FOR THE FUNCTION OF LONDON'S STREETS

London adopted a "Street Types" matrix in 2014, resulting from a 2-year project launched in 2012 and involved more than 400 experts from Transport for London, Greater London Authority, and London's boroughs. "The Street Types matrix serves as planning input for street interventions…" and balances the **movement** and **place** functions of the street (International Transport Forum, 2018, p. 32). Core/Arterial Roads, for instance, prioritize movement whereas City Places prioritize place (Figure 5-2). According to Transport for London (TfL), "The aim of Street Types is to help planners work together to ensure customers get a consistent level of service on TfL and borough roads, whether they are travelling by foot, bicycle, bus or car." "It [Street Types] recognizes the role of the street network in civic life but also highlights where areas are under intense pressure to help people move." (Transport for London, n.d., online).

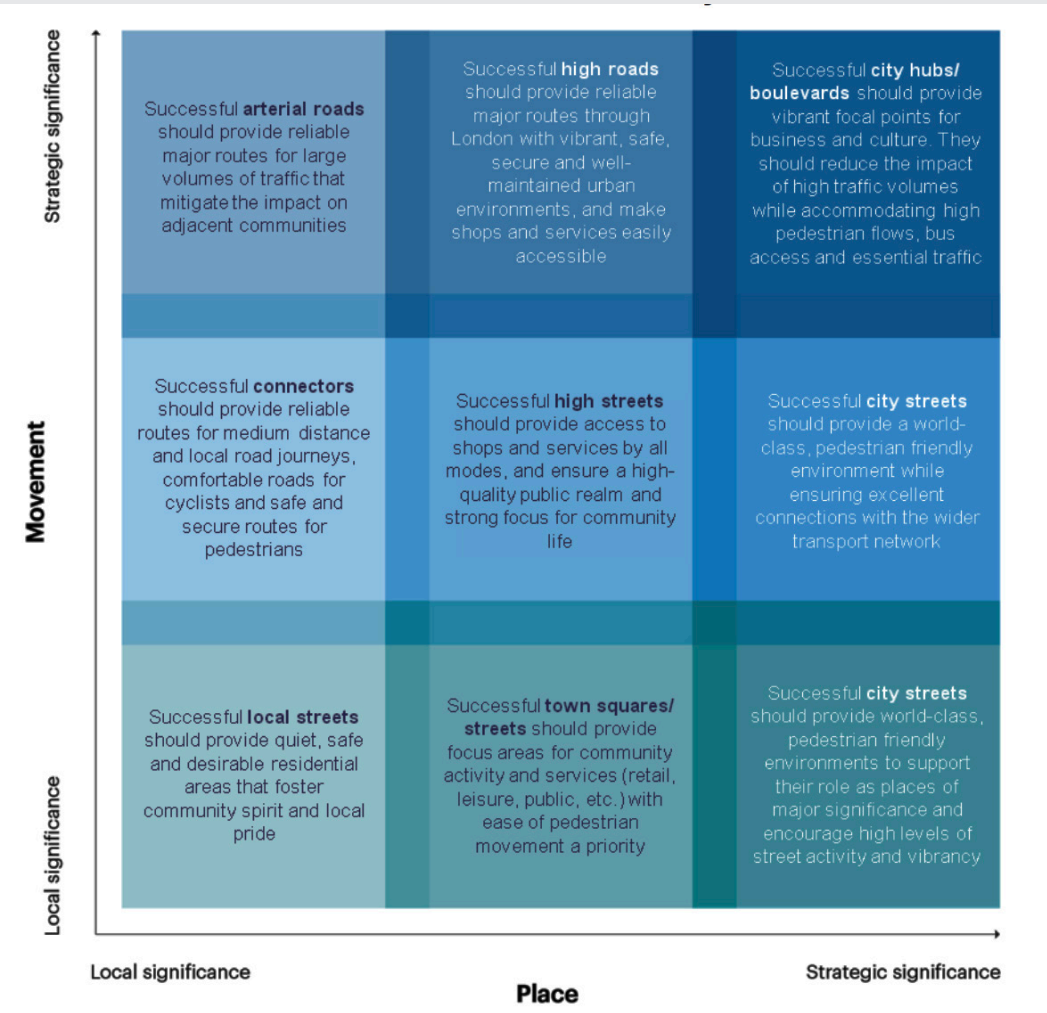
> "[STREET TYPES] RECOGNIZES THE ROLE OF THE STREET NETWORK IN CIVIC LIFE BUT ALSO HIGHLIGHTS WHERE AREAS ARE UNDER INTENSE PRESSURE TO HELP PEOPLE MOVE."
> *- Transport for London*

Source: Mavis for Unsplash

FIGURE 5-1. Street Types for London Matrix (Transport for London)

Source: Transport for London

FIGURE 5-2. Aims of London's Street Types Matrix



Source: London's Street family: Theory and Case Studies (Chapters 1-2), Transport for London

VISIONING

IDENTIFYING AND PRIORITIZING THE FUNCTIONS OF THE "FLEX ZONE" IN SEATTLE

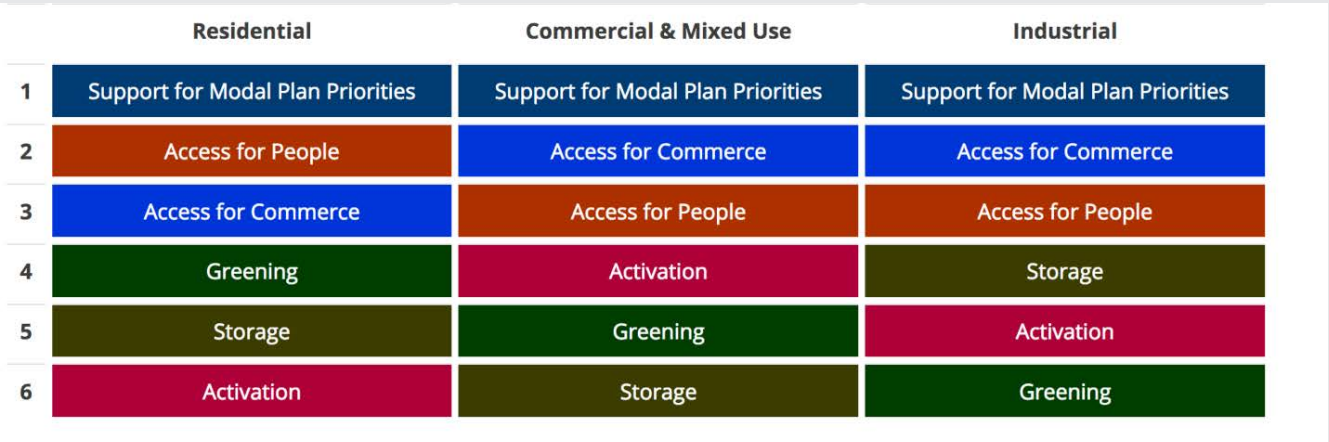
In 2017, as part of their Comprehensive Plan, Seattle adopted the term "flex zone" to refer to the curb space component of the right-of-way. They also defined the six overarching functions of the right-of-way: mobility, access for people, access for commerce, activation, greening, and storage (Figure 5-3). From there, they determined how they would prioritize the various functions of streets based on the surrounding land use (Figure 5-4). Mobility is identified as the primary function for all street types, but it is important to note that the framing is "support for modal plan priorities." This helps to connect the prioritization scheme to other existing plans and acknowledges that different street types have different modal priorities.

FIGURE 5-3. Primary Functions of the Right-of-Way (ROW) as Defined by the Seattle Department of Transportation

FUNCTION	STORAGE	GREENING	ACTIVATION	ACCESS FOR COMMERCE	ACCESS FOR PEOPLE	MOBILITY
DEFINITION	*Provides storage for vehicles or equipment*	*Enhances aesthetics and environmental health*	*Offers vibrant social spaces*	*Goods and services reach their customers and markets*	*People arrive at their destination, or transfer between different ways of getting around*	*Moves people and goods*
USES	*Bus layover* *Long-term parking* *Reserved spaces (e.g. for police or other government use)* *Construction*	*Plantings* *-Boulevards* *-Street trees* *-Planter boxes* *Rain gardens and bio-swales*	*Food trucks* *Parklets and streateries* *Public art* *Street festivals*	*Commercial vehicle load zones* *Truck load zone*	*Bus or rail stops* *Bike parking* *Curb bulbs* *Passenger load zones* *Short-term parking* *Taxi zone*	*Sidewalks* *Bus or streetcar lanes* *Bike lanes* *General purpose travel lanes* *Right or left turn-only lanes*

Source: Seattle Right-of-Way Improvements Manual, Seattle Department of Transportation, 2016. Accessed at http://streetsillustrated.seattle.gov/street-types/row-allocation/

FIGURE 5-4. Flex Zone Prioritization Based on Surrounding Land Use (SDOT)



Source: Seattle Department of Transportation

PLANNING

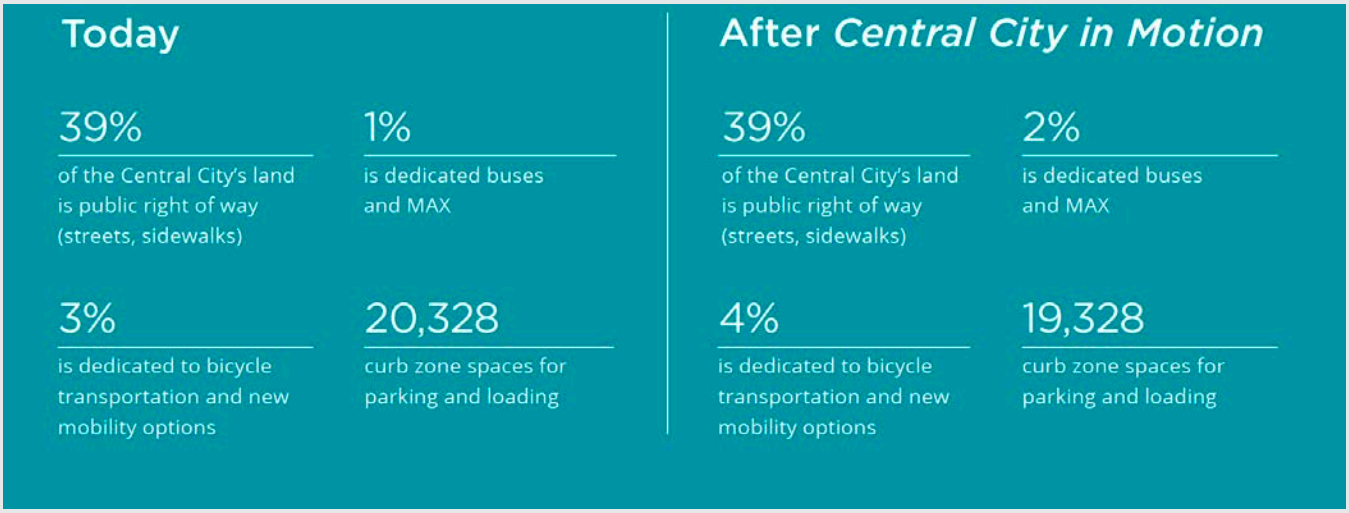
Once a city has a vision, the next step is to incorporate it into policies and implementation measures. They should also identify actions that will be taken to achieve goals. If a city has adopted a people-first vision of mobility, the plans for streets and curb need to support that vision.

PLANNING
INCREASING PEOPLE-MOVING CAPACITY ON STREETS IN CENTRAL PORTLAND

In 2018 the Portland Bureau of Transportation drafted "Transportation for Everyone: Central City in Motion Implementation Plan," which recommends 18 key projects that are designed to "increase the people moving capacity…by an average of over 60%" (Portland Bureau of Transportation, 2018, p. 5). Two years of community engagement preceded the final draft of Central City in Motion, which is intended to help the City of Portland achieve goals outlined in two other plans—Central City 2035 Plan and the Transportation System Plan. Both of those plans call for transit, walking, and bicycling to account for 85% of all Central City trips in 20 years (Ibid, p. 10).

The main idea that serves as the backbone of Central City in Motion is that the amount of land devoted to the right-of-way is constant, but how that space is allocated will shift. Currently, only 1% of the ROW is dedicated to transit and 3% is dedicated to bicycle and new mobility infrastructure (Figure 5-5). Implementation of the 18 key projects is designed to increase space for transit, and space for bicycles and new mobility by 1% each. In order to accomplish this, some curb space will be reallocated from parking and loading to other use designations. Portland's City Council unanimously approved the plan in November 2018 (Portland City Council Resolution 37395).

FIGURE 5-5. Portland's Central City in Motion Implementation Outcomes



Source: Transportation for Everyone: Central City in Motion Implementation Plan, Portland Bureau of Transportation, 2018, p. 4.

TAKEAWAYS FOR VISIONING AND PLANNING

- Adopting a strategic vision about the street is a good way to connect the street back to larger goals. Prioritizing the "place" function of the street over "movement" on some streets can help reinforce goals of creating walkable communities.
- Thinking of the curb as a flex zone is gaining traction and Seattle in particular is regularly being cited for their work in this regard. (Seattle's functions of the right-of-way have been cited in the Institute of Transportation Engineers' Curbside Management Practitioner's Guide, the International Transport Forum's report on the Shared Use City, as well as in the curb studies completed by consulting firm Fehr & Peers.)
- The two years of community engagement that contributed to the formulation of the Central City in Motion Plan in Portland provided residents with multiple opportunities to weigh in on the future of streets downtown. This may have contributed to why the plan was unanimously passed by City Council.

Source: Aditya Chinchure on Unsplash

DATA COLLECTION

In order to manage and regulate the curb, it is necessary to have a complete picture about it—how much space there is, where it is, where regulations are applied currently, and how the space is actually being used.

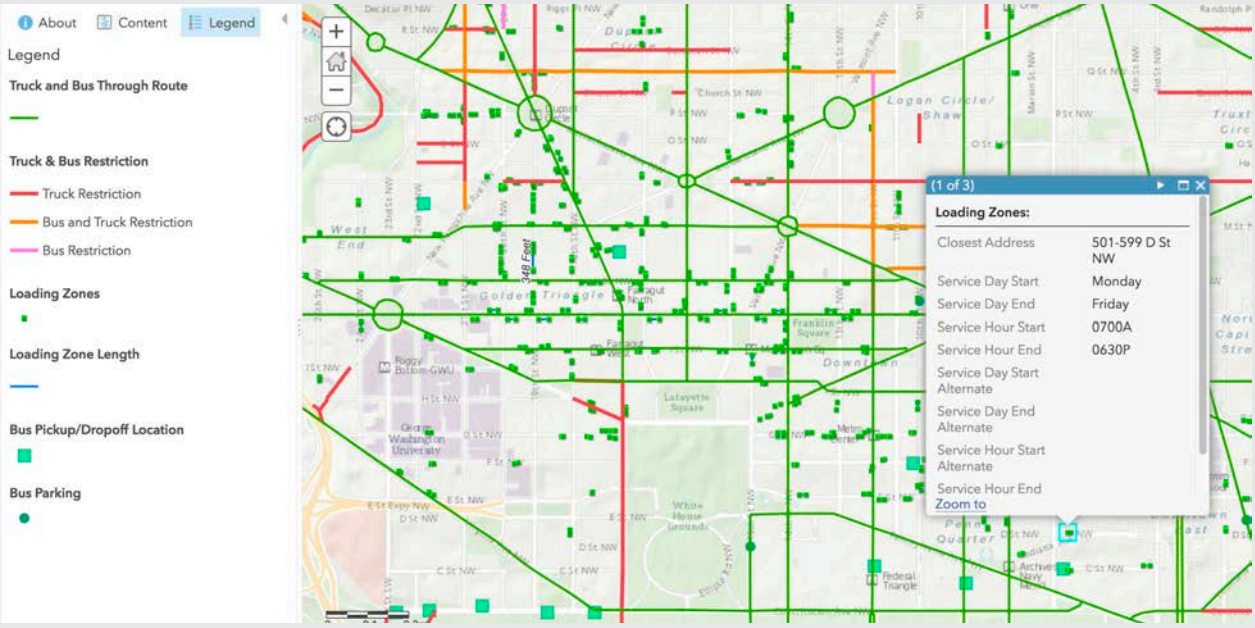
GATHERING BASELINE DATA

Many cities do not have comprehensive information about the curb outside of metered locations. Many cities are recognizing that this is an important gap and are working to gather baseline data through mapping, coding, and inventorying efforts. Private companies also recognize the value of this information, and several companies have started mapping curbs in order to meet the demand for data.

GATHERING BASELINE DATA
IMPLEMENTATION: COMMERCIAL LOADING ZONES IN WASHINGTON, D.C.

In an effort to ease congestion stemming from double-parked trucks on busy commercial corridors, the District of Columbia's Department of Transportation (DDOT) undertook a project to inventory and map all of its Commercial Loading Zones (CLZs). They used ArcGIS Collector to gather data and worked with the Golden Triangle Business Improvement District, carriers, and downtown receivers on the project. In 2015 they launched a pilot that involved installing parking meters in a designated commercial loading zone lane on a busy commercial thoroughfare. The pilot was considered a success and DDOT subsequently implemented the citywide Commercial Loading Zone Management Program. The end result of their inventorying efforts was the creation of interactive map that displays different loading zones where users can access information about what address each loading zone is closest to, what the operating hours are, etc. (Figure 5-6).

FIGURE 5-6. Snapshot of District Department of Transportation's Interactive Truck and Bus Map



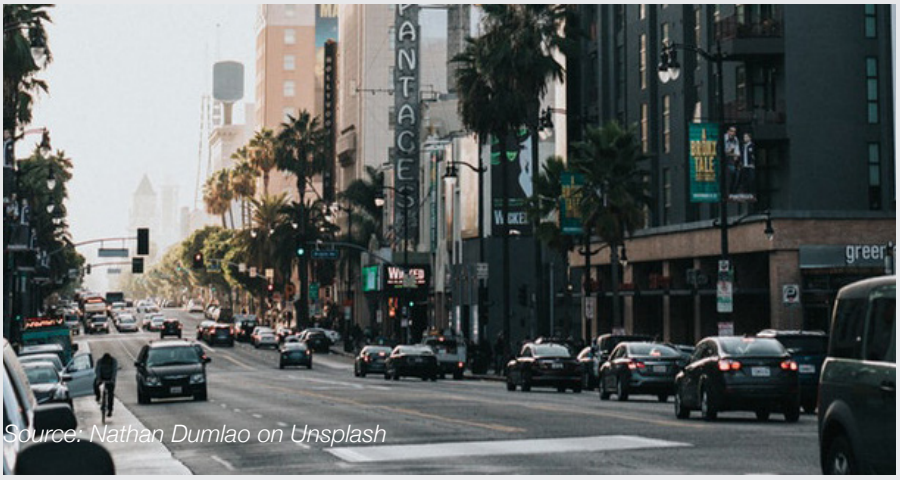
Source: DC Truck and Bus Map, District Department of Transportation, 2018. Accessed at http://godcgo.com/dc-truck-and-bus-map/ on 11/1/2018.

GATHERING BASELINE DATA

IMPLEMENTATION: GATHERING BASELINE DATA ABOUT CURB IN LOS ANGELES, CA

The Los Angeles Department of Transportation (LADOT) announced an initiative in 2016 to map more than 7,500 miles of streets. "Code the Curb" is "a digital undertaking to inventory more than 1 million signs, curb paint, and other regulatory tools along the 7,500 miles of Los Angeles streets. When complete, the digital inventory will make parking regulations easier to understand and will help LADOT improve sign design and policy" (Los Angeles Department of Transportation, 2018, p. 7). Initially, the data collection plan was to have city workers manually record information about curbside signage, but the city moved towards digital data collection methods soon thereafter.

A subsequent attempt to digitally code the curb relying solely on video footage "generated too many errors to be reliable enough as a source of data for traffic enforcement and third-party app development" (Goldsmith, 2018). However, as Stephen Goldsmith noted in Governing, "In the spirit of rapid iteration, the city is already undertaking a new approach utilizing promising technologies" (Goldsmith, 2018). The project is ongoing.

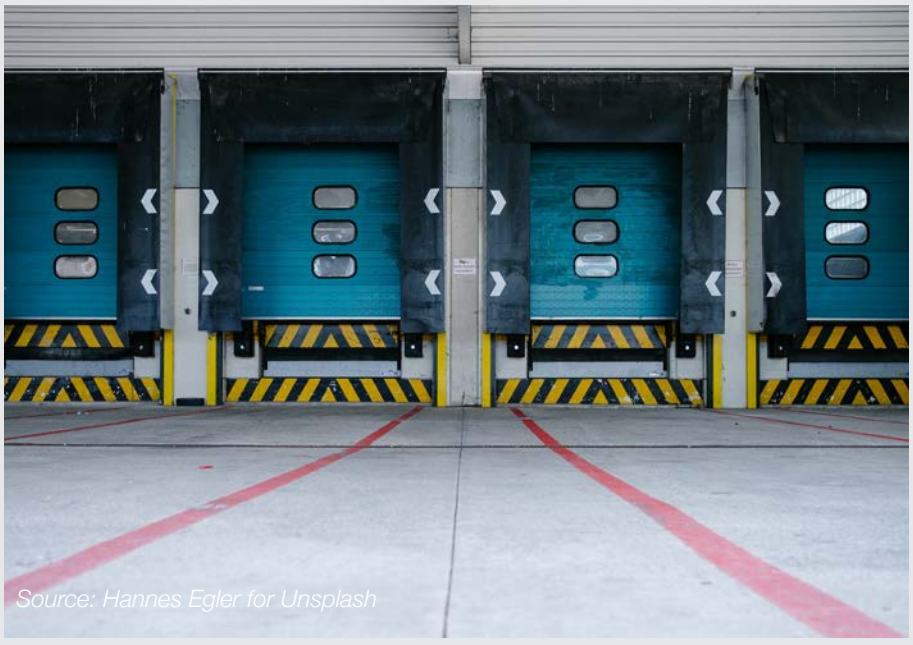


Source: Nathan Dumlao on Unsplash

GATHERING BASELINE DATA

RESEARCH: GATHERING BASELINE DATA PRIVATE LOADING BAYS AND DOCKS IN SEATTLE, WA

The University of Washington's Urban Freight Lab launched a research initiative called the "Final 50 Feet" with two goals related to goods delivery: reduce dwell time and reduce failed first deliveries. The Urban Freight Lab is working with the Seattle Department of Transportation to geocode the locations and features of all private truck load/unload bays and loading docks in Seattle's Center City, not just city curbs. This is the first time that a major U.S. city has had this kind of information (Urban Freight Lab, 2018).


Source: Hannes Egler for Unsplash

GATHERING BASELINE DATA

RESOURCE: PRIVATE SECTOR TOOL FOR GATHERING BASELINE DATA

The need for highly detailed maps of the curb has created a marketplace for third-party vendors to fill the gap, and Coord is one company doing this work. Coord is a part of Sidewalk Labs, which is under the umbrella of Alphabet, Google's parent company. Coord has undertaken pilot projects in San Francisco and Toronto with the goal of documenting all curbside uses and parking restrictions (Mitman et al., 2018, p. 33). Coord employs surveyors who use cell phone video technology to inventory parking signs, curb colors, and other regulated uses. They also measure the length of loading zones, no parking zones, etc. to create as complete a picture as possible of how curb space is currently designated.

Source: COORD, Curb Explorer. Accessed at https://coord.co/explorer/sf#37.79307263237486,-122.40564174272345@15.

UNDERSTANDING USAGE

While gathering baseline data about the curb is an important first step, that information alone does not tell cities how the curb is actually being used. For instance, cities need to know if no-parking zones are routinely being used for passenger loading or unloading or if bus stops are being block by non-designated users. They need to know where double-parking occurs most frequently, contributing to congestion and possible safety conflicts. Some of this information can be gathered by manual counts and other forms of municipal observational data collection. Getting a full picture of how the curb is used requires cooperation between public and private entities, however. For instance, transportation networks companies and courier service networks have important data about hotspots, occupancy, average dwell times, and other useful data points that help cities gain needed information.

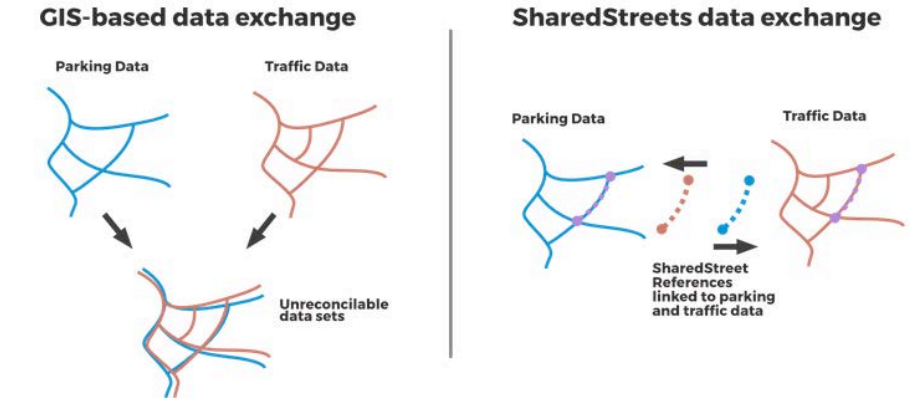
UNDERSTANDING USAGE
IMPLEMENTATION: CREATING A PLATFORM TO FACILITATE DATA COLLECTION IN LOS ANGELES

The Los Angeles Department of Transportation has created a Mobility Data Specification (MDS), which is a "data standard and API specification for mobility as a service providers, such as dockless bikeshare, e-scooters, and shared ride providers who work within the public right of way" (Los Angeles Department of Transportation, 2018, online). It is intended to facilitate "real-time data sharing, measurement and regulation for municipalities and mobility as a service providers" and "to ensure that governments have the ability to enforce, evaluate and manage providers" (Los Angeles Department of Transportation, 2018). Mobility service providers who receive permits to operate in the City of Los Angeles must agree to create a data sharing API that is compatible with MDS (Los Angeles Department of Transportation, 2018a, online).

UNDERSTANDING USAGE
RESOURCE: CREATING A SHARED DATA STANDARD WITH OPEN PLATFORM SOFTWARE

The Open Transport Partnership and the National Association of City Transportation Officials (NACTO) have created a shared data standard using open platform software, which they have called SharedStreets. It is designed to facilitate collaboration between public and private entities by using a linear referencing system that enables different datasets to be shared while also being anonymized. As it is described in a report by the International Transport Forum, "SharedStreets addresses a confounding issue that has limited the willingness of commercial operators to provide curb- and street-use data they collect—namely, the necessity to share proprietary base map information and...privacy-sensitive un-anonymised data" (International Transport Forum, 2018, p. 35). In a sign that SharedStreets may indeed help to facilitate greater data sharing, Ford, Uber, and Lyft announced an agreement to share data via the platform in September 2018 (National Association of City Transportation Officials, 2018). However, some questions remain about whether or not the data is granular enough to be helpful to cities.

FIGURE 5-7. How SharedStreets Data Exchange Compares to GIS-Based Data Exchange



Source: SharedStreets, 2018. Accessed at https://github.com/sharedstreets/sharedstreets-ref-system.

UNDERSTANDING USAGE
RESEARCH: MEASURING CURB PRODUCTIVITY IN SAN FRANCISCO

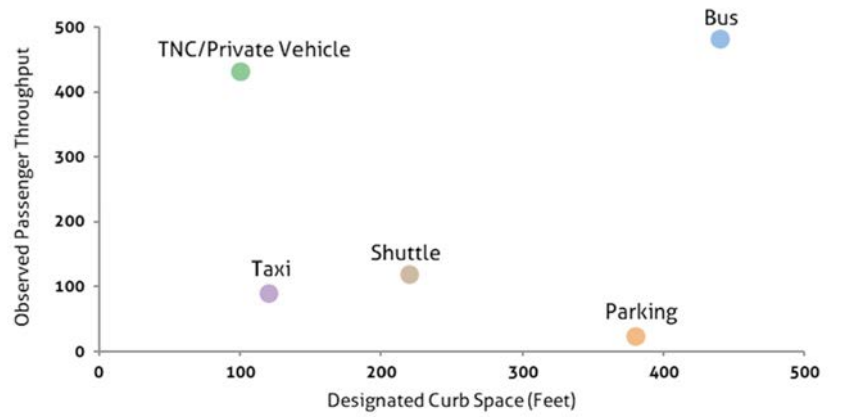
The transportation consulting firm Fehr & Peers worked with Uber Technologies on a curb usage study in San Francisco, published in 2018. In this study, curb productivity is defined in relation to passenger throughput, or "the efficiency with which a given section of the curb facilitates the arrival and departure of people, including those arriving by TNC, taxi, transit, private car drop-off, parked car, or another mode that requires curbside access (e.g., bikeshare, motorcycle, etc.) (Fehr & Peers, 2018). Fehr & Peers quantified passenger loading demand by mode for five study locations in San Francisco that were identified by Uber as passenger loading hotspots[1]. They developed a "Curb Productivity Index, which represents the productivity of a specific curbside designation based on its primary use" (Fehr & Peers, 2018, p. 15)[2]. The CPI is calculated based on the "amount of activity (i.e., number of people using the curb) observed per unit of time over the total amount of space dedicated to that use" (Ibid, p. 15).

FIGURE 5-8. Fehr & Peers Curb Productivity Index (CPI) Equation

$$\frac{Activity}{Time \times Space}$$

Source: San Francisco Curb Study, Fehr & Peers, 2018. p. 16

FIGURE 5-8. Observed Passenger Throughput Compared to Designated Curb Space on Townsend Avenue (San Francisco) from Fehr & Peers Study



Source: San Francisco Curb Study, Fehr & Peers, 2018, p. 32.

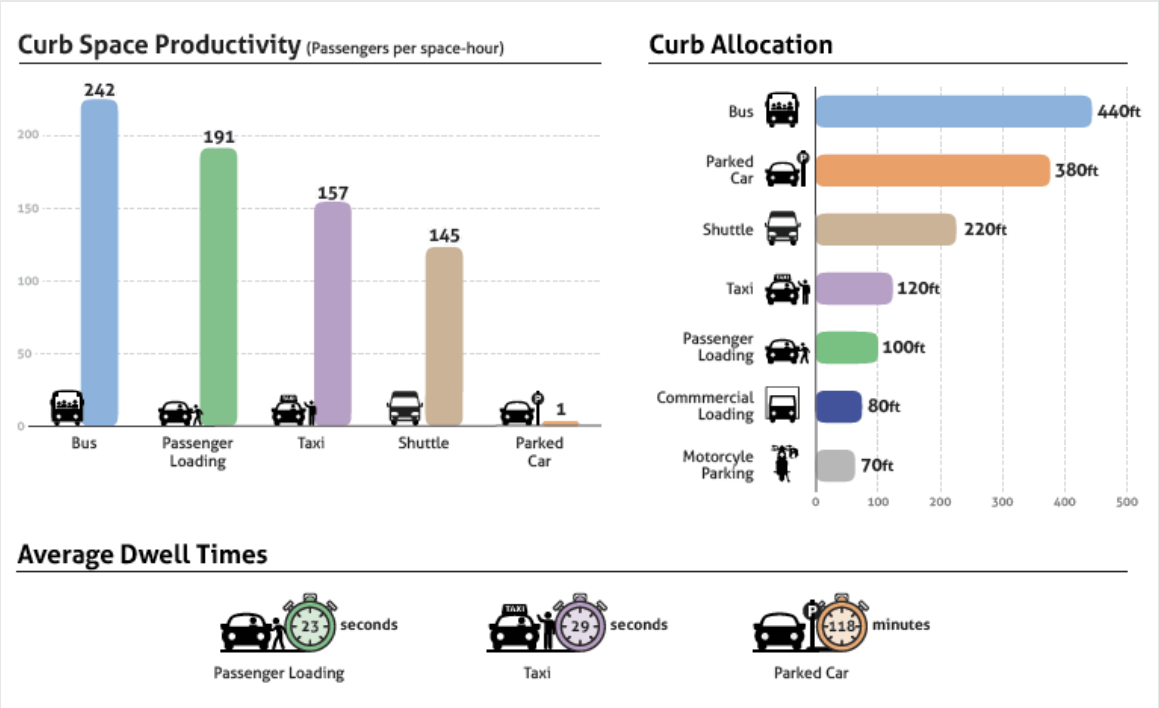
In four of its five study locations Fehr & Peers observed parking mismatches, meaning that parking accounts for a significant amount of designated curb space while having lower rates of productivity when compared to transit and TNCs. The only location without a parking mismatch has no designated parking. Figure 5-8 shows the observed passenger throughput at the Townsend Street case study location compared to designated curb space with passenger throughput on the Y axis and designated curb space on the X axis. There is 400 feet of curb space designated for parking but an observed passenger throughput of less than 50—this is a parking mismatch. Transit, on the other hand, has more than 400 feet of designated curb space with a passenger throughput of nearly 500, indicating that the space devoted to that use is well matched to the demand. TNCs have a passenger throughput of over 400 but only approximately 100 feet of designated passenger loading space, indicating that more space may be needed.

Fehr & Peers suggests three strategies to increase curb productivity at these case study locations, including relocation, conversion, and flexibility. Relocation involves relocating a designated use elsewhere on the block while keeping the overall amount of space designated to various uses the same. Conversion involves adjusting the amount of curb space to designated uses, and they note that this often includes some reduction in the amount of space dedicated to on-street parking. Flexibility allows for designated uses to change throughout the day based on changes in demand for various uses (Fehr & Peers, 2018, p. 21-22).

1 The study was limited to passenger loading and did not include courier services or goods loading information.

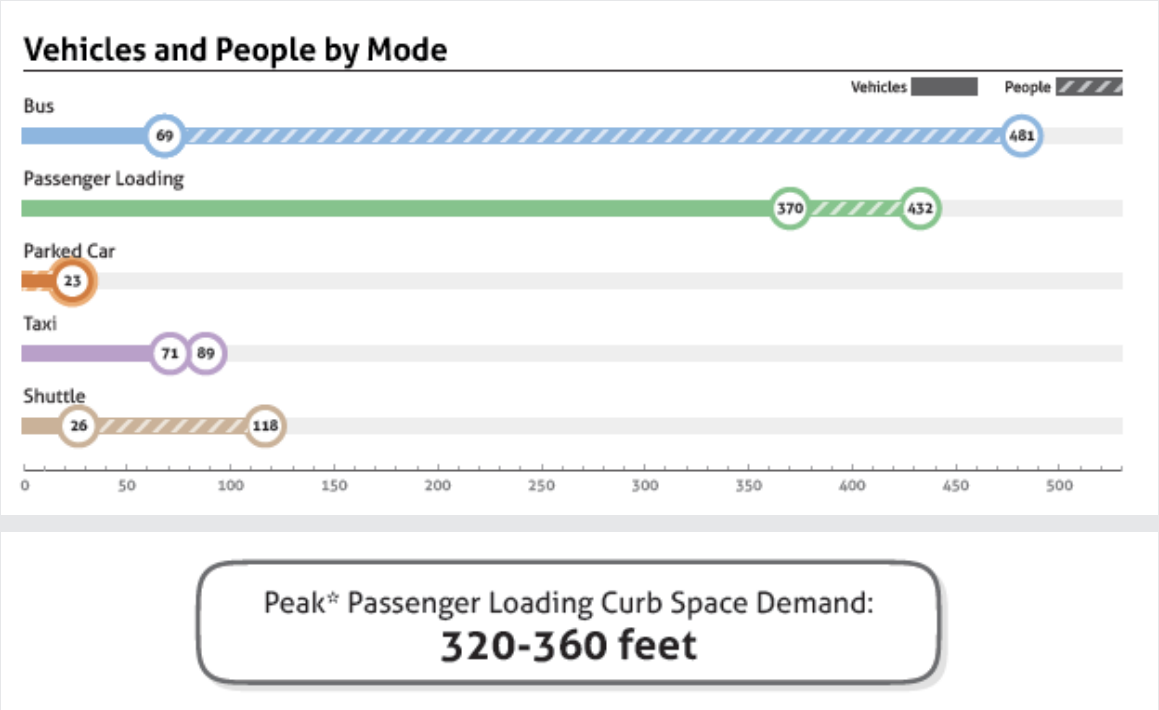
2 Passenger loading/unloading events that blocked lanes of travel were identified and the impacts of those events were measured in this study. However, loading/unloading events that did not occur in a travel lane were not measured in terms of their impact on the travelway (e.g., vehicles entering and exiting the flow of traffic).

FIGURE 5-9. Curb Space Productivity and Curb Allocation on Townsend Street (San Francisco)



Source: San Francisco Curb Study, Fehr & Peers, 2018, p. 36

FIGURE 5-10. Number of Vehicles and People by Mode Observed on Townsend Street (San Francisco)



Source: San Francisco Curb Study, Fehr & Peers, 2018, p. 36

TAKEAWAYS FOR DATA COLLECTION

- Forming partnerships and engaging with stakeholders from the very beginning can provide worthwhile results. DDOT was successful in its commercial loading zone initiative and considered the partnerships with stakeholders to be a key accomplishment (Federal Highway Administration, 2017). The partnership between Urban Freight Lab and Seattle Department of Transportation also seems to be producing promising results thus far.
- Being able to adapt in a timely way is important when challenges with data collection arise.
- It is not only challenging to collect accurate data, but also to able to keep it up to date. Coord recently mapped San Francisco's curbs, but representatives from the San Francisco Municipal Transportation Agency noted that some information is already out of date. Establishing public-private partnerships that enable data sharing could help mitigate this issue.
- Shared data standards are critical to facilitating private-public collaborations. Both the Mobility Data Specification and SharedStreets open-source platforms appear to be producing promising results thus far in facilitating greater collaboration and data sharing between private and public entities.
- Curb space is not often maximized and the amount of space designated for parking even in high-density urban environments like in San Francisco suggests that private vehicles are still prioritized. However, parking has the lowest curb productivity index in terms of passenger throughput.
- Transit has the highest curb productivity index due to its ability to move the highest number of people in the least amount of space.
- Fehr & Peers' study provides valuable information about TNC usage at five study locations in San Francisco, but there is no information about the usage rates of courier services for urban delivery. This information would be useful to incorporate in future studies in order to better understand the demand for goods loading zones, in addition to passenger loading.
- Using passenger throughput to determine curb productivity is valuable, but it is limited in scope. There may be other ways to measure curb productivity that a city may find equally valuable especially when considering the multiple functions that the curb serves. Additionally, productivity may not always be the best measure to use depending on the desired outcomes. More productivity that leads to more vehicle trips could be detrimental to GHG reduction goals. (For instance, if expanding passenger loading zones encourages a mode shift from transit to TNCs, that could result in an increase in total vehicle trips.)

SPACE ALLOCATION

The amount of land devoted to the right-of-way may remain constant, but how the space is allocated can shift. Cities are experimenting with allocating curbside space differently based on new information about demand and are managing it more dynamically. This entails allowing different uses based on time of day. Space can also be allocated in ways that prioritize certain modes, such as transit.

PRIORITIZING TRANSIT

Prioritizing transit through lane and curb management can help cities achieve desired goals related to greenhouse gas emissions since timely, efficient, and reliable transit can encourage mode shifts away from private vehicles. In addition, prioritizing transit can help reduce idling and congestion.

PRIORITIZING TRANSIT
RESOURCE: NACTO'S CURB APPEAL REPORT OUTLINES WAYS TO PRIORITIZE TRANSIT

NACTO issued a report in November 2017 that focuses on curbside management strategies for improving transit reliability. They make the following suggestions to improve transit through curb management:

- **"Shift from a parking lane to flex zone."** This suggestion gets at the importance of adopting a strategic vision and reframing the discussion about the curb. (NACTO, 2017, p. 2).
- **"Clear the way for transit"** through the use of right-turn pockets, transit signal priority, road diets, and prioritizing transit at peak periods with time-limited bus only lanes. (NACTO, 2017, p. 4).
- **"Move loading and access to nearby streets."** This involves designing wider bikeways to encourage delivery by bike; creating reservable loading zones that allow freight companies to "park and walk" instead of driving door-to-door; exploring off-peak freight delivery; allowing longer loading zones on nearby streets and shorter loading zones on busy streets to provide more options; instituting progressive parking rates, demand-based pricing or dynamic pricing; set occupancy targets; and using automated enforcement (NACTO, 2017, p. 6).
- **"Look beyond the corridor."** This involves contextualizing parking options by looking at an area rather than just one street; when proposing projects that include reassignment of on-street parking, include a larger radius to contextualize parking available within the area (NACTO, 2017, p. 10).

LOADING

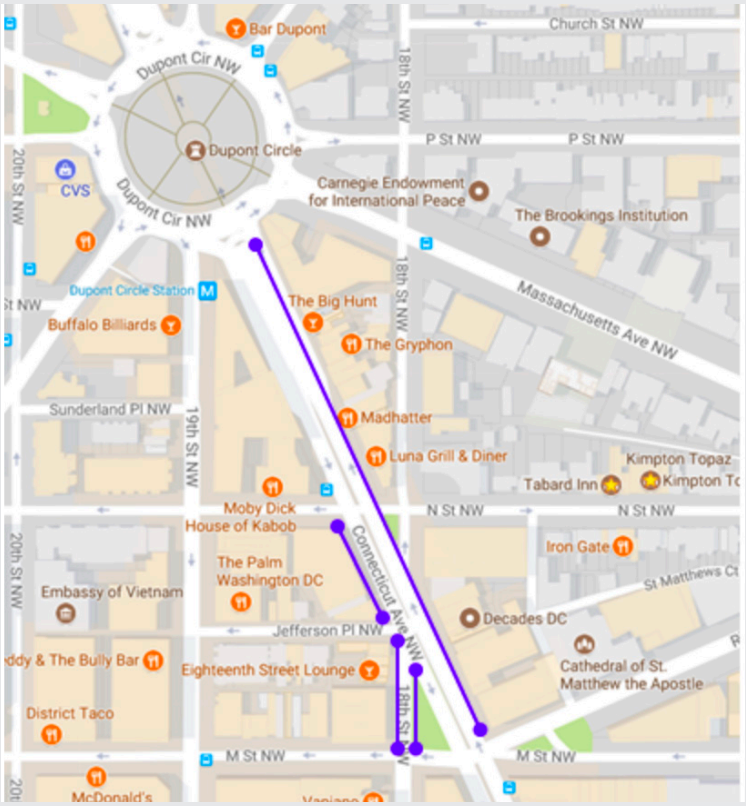
There are a number of pilot projects underway to experiment with: space allocation with the goals of reducing double-parking; improving safety; decreasing congestion and VMT/VKT; and meeting new demand for passenger and goods loading. Most of these pilots are geared towards passenger loading, though some are specific to goods loading. All of the identified goods loading pilots are focused on designated commercial carriers, and so do not address courier services and deliveries that are made by private vehicles—such as via UberEats, Amazon Flex, Grubhub, and others.

LOADING
IMPLEMENTATION: CITY-LED PASSENGER LOADING ZONE PILOT IN WASHINGTON, D.C.

Over 100 restaurants and nightlife establishments are concentrated in a 3-block area near Dupont Circle. A recent increase in late-night activity led the Washington D.C. Department of Transportation (DDOT) to launch the Dupont Circle Safety Demonstration Pilot to address traffic and pedestrian safety concerns. A working group facilitated by the Golden Triangle Business Improvement District brought together numerous stakeholders including DDOT, the Department of Consumer and Regulatory Affairs, the Alcohol Beverage Regulation Administration, Metro Police, Office of Planning, the Department of Public Works, Parking Enforcement Management, and the Department for For-Hire Vehicles.

Forty-five parking spaces were reallocated to passenger loading zones between 11 p.m. and 7 a.m. Thursday-Sunday. The City had to modify four regulatory ordinances in order to make the trial possible, but in general, the results have generally been positive since the pilot launched in October 2017 (International Transport Forum, 2018, 54). Wayfinding and enforcement have been the primary challenges since the pilot launched. The police department ending up setting out cones in order to direct drivers to the passenger loading zones and upped enforcement for vehicles parked in the temporary zones. (International Transport Forum, 2018, p. 55).

FIGURE 5-11. Dupont Circle (Washington, D.C.) Nightlife Demonstration Project Passenger Loading Zones



Source: District Department of Transportation (DDOT), 2018. Accessed at https://ddot.dc.gov/release/ddot-nightlife-parking-demonstration-underway.

LOADING
IMPLEMENTATION: CITY-LED PASSENGER LOADING ZONE PILOT IN FT. LAUDERDALE, FL

In a similar move to Washington D.C., the City of Ft. Lauderdale, FL launched a six-month safety demonstration project from January to June 2018 to improve safety on Las Olas Blvd., one of its high crash corridors. Among the various improvements included as part of the pilot was the creation of three "rideshare" zones during prime nightlife hours Thursday-Monday, which necessitated the temporary removal of parking. The City of Ft. Lauderdale issued an evaluation report in July 2018 that found that the rideshare zones helped promote better traffic flow and contributed to a reduction in traffic delays (City of Ft. Lauderdale, 2018, p. 5).


Source: Marie-Louise Verbeke

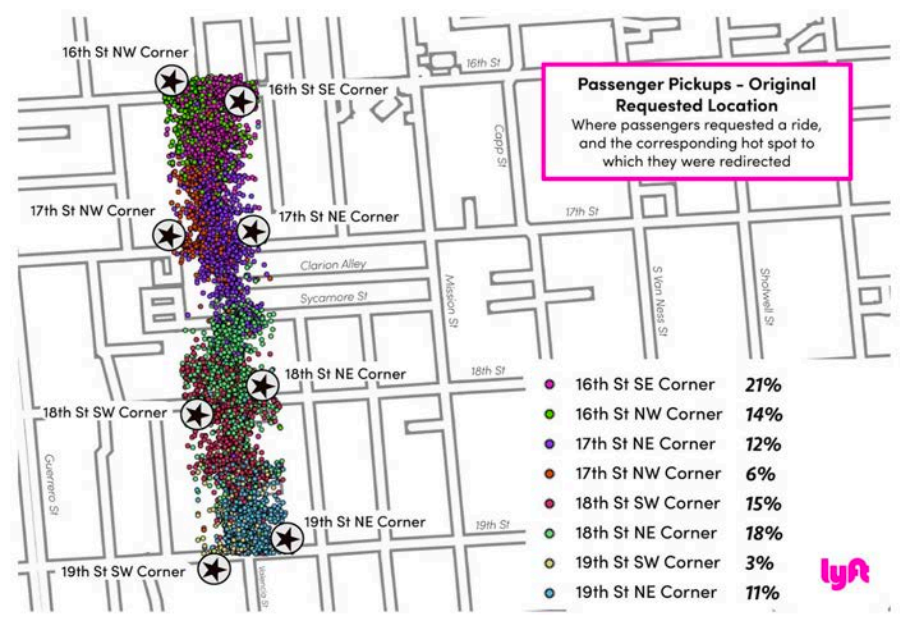
LOADING
IMPLEMENTATION: CITY-LED PASSENGER LOADING ZONE PILOT IN WEST HOLLYWOOD, CA

The City of West Hollywood launched a pilot program in 2018 geared towards promoting safer pick-up and drop-off and reducing travel lane blockages. The City named its program "The Drop," and instead of limiting the passenger loading zones to one street, they have designated 12 curb zones located throughout the City of West Hollywood in areas that experience a high volume of rideshare use during evenings and nights. Similar to Washington, D.C. and Ft. Lauderdale, "The Drop" is time-limited and only applies to the hours between 6 p.m. and 3 a.m. During other parts of the day some of these areas are designated for parking, and others are designated as commercial loading zones during business hours. These passenger loading zones are not "geofenced," meaning that drivers are not restricted to picking up or dropping off passengers in these zones, but they are strongly encouraged to use them (City of West Hollywood, 2018).

LOADING
IMPLEMENTATION: TNC-LED PASSENGER LOADING PILOT IN SAN FRANCISCO, CA

Lyft ran a three-month pilot from March to June 2018 on San Francisco's Valencia Street, which is part of the city's "Vision Zero High-Injury Network." Using a geospatial tool called "Venues," Lyft created "geofences" around prime pick-up hotspots along the corridor. As Debs Schrimmer of Lyft describes, "When a user tries to request a ride from an area that has been mapped with a Venue, they are unable to manually control the area in which they'd like to be picked up. Venue redirects them to a pre-established location" (Schrimmer, 2018). The geofences push users to walk to less congested side streets for loading purposes. Unlike the other loading zone pilots, this pilot was not time-limited—it ran 24 hours per day—and when it was over, Lyft opted to make the geofencing along Valencia Street permanent. In Lyft's own evaluation of the project Schrimmer concludes "that existing curb space is insufficient and that the city needs more loading zones" (Schrimmer, 2018).

FIGURE 5-12. Lyft Passenger Pick-Up Project on Valencia Street (San Francisco) – Stars Indicate Where Passengers Were Redirected



Source: "Creating a Safer Valencia Street" by Debs Schrimmer, 2018. Accessed at https://medium.com/sharing-the-ride-with-lyft/creating-a-safer-valencia-street-54c25a75b753 on 11.1.2018.

LOADING
IMPLEMENTATION: ALLOCATING SPACE FOR COMMERCIAL LOADING ZONES IN WASHINGTON, D.C.

As highlighted previously in this report, DDOT has a now well-established Commercial Loading Zone Management Program. Carriers are able to obtain information about loading zones using an interactive map and can pay the loading zone fee a variety of different ways, including a pay-by-phone option for hourly access. The locations of loading zones are determined by DDOT's own data analysis but freight industry stakeholders and Business Improvement Districts are also invited to make suggestions about loading zone placement (District Department of Transportation, n.d.).

Source: Jack Kolpitcke for Unsplash

LOADING
IMPLEMENTATION: RESTRICTING PARKING AND COMMERCIAL LOADING TO REDUCE CONGESTION IN NEW YORK CITY, NY

As part of its Congestion Action Plan, the New York City Department of Transportation launched a 2018 "Clear Curbs" initiative at three pilot locations: Midtown, Flatbush Ave., and Roosevelt Ave. (New York City Department of Transportation, 2018). The idea was to restrict curbside parking and commercial loading on both sides of the street during peak weekday hours (7-10 a.m. and 4-7 p.m.) in order to reduce congestion. The pilot did allow for the "expeditious" pick-up and drop-off of passengers, as well for deliveries to off-street loading docks (New York City Department of Transportation, 2018). However, the project ended five weeks earlier than scheduled after many local business owners complained that the pilot was hurting business due to their inability to receive curbside deliveries and because it was off-putting to customers (Charlesworth, 2018).

LOADING
IMPLEMENTATION: USING E-CARGO BIKES FOR URBAN GOODS DELIVERY

UPS announced in October 2018 that it would launch an e-cargo bike package delivery pilot in downtown Seattle near Pike Place Market, in partnership with the Seattle Department of Transportation and the University of Washington's Urban Freight Lab. The idea is that one trailer will be parked in a centralized location and e-cargo bikes will be deployed from there in order to make deliveries in urban environments that would otherwise be difficult for conventional trucks to access. The e-cargo bikes will operate in bike lanes as opposed to vehicle travel lanes, helping to reduce congestion and reduce instances of double-parking (UPS Pressroom, 2018). Portland and Vancouver are also working on similar pilot projects with UPS.

Source: UPS

TAKEAWAYS FOR SPACE ALLOCATION

- Anecdotal evidence from the passenger loading zone pilots suggests that managing passenger pick-up is easier than managing drop-off. Passengers have more control over where they are dropped off and may ask a driver to stop outside of a designated zone. Drivers are likely to accommodate these requests to avoid a negative rating.
- Thus far, most passenger loading zone pilot projects are focused on areas with pockets of concentrated entertainment and most are time-limited (i.e., only enforced during certain hours). There is little information available about other high-demand land uses such as high-density residential, hotels, hospitals or doctor offices, for example.
- There are promising results in terms of desired outcomes related to safety and traffic flow, but there are also challenges. Creating widespread awareness about the location of these zones has been one such challenge. In D.C., cones were set out to help direct drivers to the designated loading zones.
- It is important that flex zones be intuitive. For instance, if an area allows for parking during the day but restricts parking in the evening, signage should be clear and not overly complicated.
- None of the passenger loading zone pilots yet undertaken have included a price component, such as by levying a fee to access a designated loading zone. However, pricing is likely to be addressed in the next round of passenger loading zone pilots.
- The involvement of stakeholders is critical to a successful program or pilot. The outcome of the Clear Curbs NYC project illustrates how important stakeholder involvement is. Business owners asserted that customers were staying away due to the lack of parking and because they were being ticketed. Perhaps a contextualization of the parking restrictions or a more concerted effort to provide information about where to park and make deliveries during the restricted hours might have helped.
- The UPS e-cargo bike pilot is just getting underway. While there are no lessons available yet, looking for ways to move away from gasoline-powered vehicles for deliveries in dense urban areas appears to be promising.
- Courier network services/urban delivery have not been the focus of any identified pilots or projects to date.
- No pilots were identified that prioritized pick-up/drop-off for HOVs but that is something that could be considered.

REGULATION AND POLICY

Cities use a variety of tools and mechanism to achieve their goals. Requiring certain behavior or activities is one of the most direct ways to do so. Pricing is another effective tool.

PRICING

Pricing is a regulatory mechanism that can be used to influence mode choice. Pricing can help maximize efficiency by communicating right-of-way and/or parking supply constraints. Traditionally, efforts to price curb access have been mostly limited to parking fees—which can be flat or variable rates. As new mobility technologies have been introduced cities have begun experimenting with other pricing mechanisms such as “ride fees.” However, these fees apply to trips rather than curb access at specific locales. Cities are also discussing instituting “micro-parking” or “curb-kiss” fees geared towards charging vehicles for the use of passenger loading zones for very short periods of time. While regularly used at airports, these efforts are nascent throughout cities.

PRICING

IMPLEMENTATION: TWO-TIER CURB PRICING FOR TNCS AT SAN FRANCISCO INTERNATIONAL AIRPORT TO MANAGE CONGESTION AT ARRIVALS GATE

Many airports charge TNCs to access the passenger loading zones, including the San Francisco International Airport (SFO). However, SFO updated its fee structure in June 2018 in an attempt to better manage congestion at the curb. They instituted a two-tiered fee structure for TNC pick-ups—passengers picked up curbside pay a $5 fee, but passengers can choose to meet their TNC driver in a nearby parking garage for a reduced fee of $3.60. As part of the change, SFO also required shared TNC services like UberPool and LyftLine to pick up passengers in the parking garage because of additional coordination time required (McGinnis & Jue, 2018). According to a spokesperson for the airport, the new fees have helped divert 20% of TNC traffic from the arrivals gate to the parking garage (Marshall, 2018).

Source: Duke Cullinan for Unsplash

PRICING

RESEARCH: "CURB-KISS" FEE DISCUSSION BY THE INTERNATIONAL TRANSPORT FORUM

The International Transport Forum released the report "The Shared Use City: Managing the Curb" in 2018. In it, they note that as a city becomes more parking "light" and more pick-up/drop-off "heavy" that traffic may be more difficult to manage (International Transport Forum, 2018). They suggest that a pricing mechanism may need to be in place for pick-up/drop-off: a "curb-kiss fee could be digitally triggered every time a vehicle operates a meaningful transaction at the curb...

These 'curb-kiss' fees could be gradated by occupancy, type of services, by time of day and by location. If they are applied based on duration (for freight) or number of passengers, they would incentive shared uses over solo use" (International Transport Forum, 2018, p. 58). They do note that the ability to levy such a fee would require digital infrastructure, regulatory language, compliance and enforcement regimes, and data standards. As a result, no cities have yet to implement a fee of this nature.

Source: Matt Alaniz for Unsplash

ZONING

Cities are just beginning to consider how emerging technologies will change land uses and how zoning codes may need to adapt. Zoning codes impact the design of the street through requirements like curb cuts for parking. Minimum parking requirements may be one of the first zoning regulations that cities tackle. To date, the City of Chandler, AZ appears to be the only city that is allowing developers to reduce minimum parking requirements by creating loading zones based on the deployment of AVs.

WAYMO OPERATES COMMERCIALLY DEPLOYED AVS IN CHANDLER, AZ THROUGH ITS *WAYMO ONE* PROGRAM

ZONING

IMPLEMENTATION: ZONING AMENDMENTS IN CHANDLER, AZ

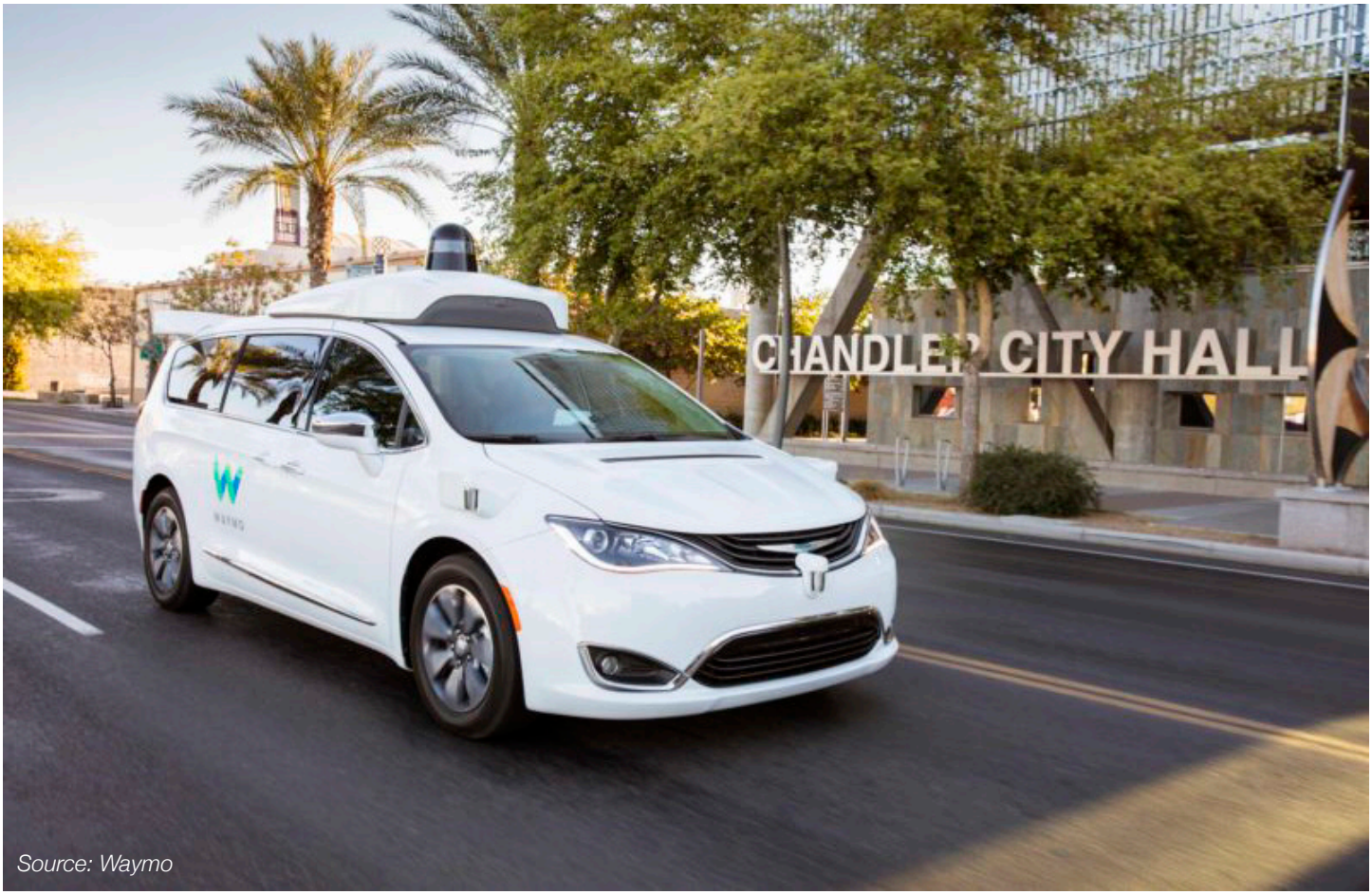
With the support of the mayor and city council, the City of Chandler, AZ adopted zoning amendments in March 2018 that allows developers to apply for up to a 40% reduction in parking in exchange for creating a loading zone (City of Chandler, 2018). In order to determine the building square footage to loading zone ratios city planners looked to nearby cities' on-street loading zones requirements for guidance. No cap was placed on the number of loading zones per block, so if multiple developers choose to apply for a parking reduction on the same block they would theoretically be allowed to.

Developers may be required to submit a parking demand study that could include projected demand for passenger loading zones, projected demand for staging area spaces for TNCs or AVs, and/or projected demand for short-term parking spaces for couriers, restaurant delivery, and similar uses.

City staff acknowledged that this information is not readily available as yet since cities are still struggling to understand usage. However, they noted that the zoning amendments are meant to be a jumping off point and they can be amended as new infromation becomes available. The idea is to get in front of parking changes and prepare for more changes to come by increasing flexibility within the code.

TAKEAWAYS FOR REGULATION AND POLICY

- Evidence from SFO suggests that the two-tier TNC pricing is helping reduce congestion, but it may still be too soon to know whether there is enough of a price difference to change behavior.
- There are still a number of challenges to creating a “curb-kiss” fee, so there are no implementation examples yet. However, there are discussions being had about how this might work and the next phase of TNC loading zone pilots may offer some insights if pricing is a component.
- Zoning code amendments adopted in Chandler, AZ may be preemptive since more information is likely needed in order to create parking to loading zone ratios. An alternative approach could be to abolish minimum parking requirements altogether, but that does not necessarily result in the creation of loading zones. Chandler’s approach is a way to try and proactively plan for the future while accounting for the need for some flexibility down the line.



Source: Waymo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06 | EMERGING THEMES AND RESEARCH GAPS

EMERGING THEMES

In November, representatives from the Cities of Portland, Seattle, and Vancouver gathered for a one-day workshop centered on curb management and discussed emerging technologies and the opportunities and the challenges they see in the road ahead. An overarching theme of the discussion was that **emerging technologies will need to be proactively shaped by cities** in order to take advantage of the opportunities presented. The emerging themes are organized by the four categories presented in Section 5.

PLANNING/VISIONING

OPPORTUNITIES FOR REGIONAL COLLABORATION AND COORDINATION

The Cities of Portland, Seattle, and Vancouver are already closely aligned in many regards with all three cities having adopted a “people first” approach to transportation and mobility. During the workshop, city representatives discussed opportunities to continue to work together and the benefits that regional collaboration could yield moving forward. For instance, speaking with a regionally unified voice could prove useful in negotiations with mobility service providers. The cities could also potentially maximize limited staff resources and funding via pilot project coordination and data sharing. While pilot projects are context-specific in design and results from one place may not be exactly replicable in another, some pilot elements are usually transferable in principle and practice. The cities intend to share data and findings where applicable.

DATA COLLECTION

OPPORTUNITY TO GATHER BASELINE DATA IN VANCOUVER

The Province of British Columbia is currently working on enabling legislation for transportation network companies, but that process is still underway. As a result, TNCs are not yet operating in Vancouver, putting the city in a very unique position. Unlike many U.S. cities, Vancouver has the opportunity to collect incredibly valuable baseline data in advance of TNC deployment. City representatives stressed how valuable it would be not just for Vancouver, but for many cities to be able to see those baseline metrics.

CHALLENGE OF COLLECTING AND ACCESSING DATA

City representatives expressed concern about the possibility of not being able to collect and/or access the data they need to make informed decisions pertaining to curb management. Acquiring data from private new mobility companies is a growing challenge. However, there have been some promising developments in the realm of data sharing with the work being done to create open data platforms by the Los Angeles Department of Transportation with the Mobility Data Specification, and SharedStreets.

SPACE ALLOCATION

NEAR-TERM OPPORTUNITIES TO CONDUCT PASSENGER LOADING ZONE PILOTS

Passenger loading zone pilots are likely the most easily implementable in the next 12-18 months, and the cities may consider pilot projects like those undertaken by Washington, D.C., Ft. Lauderdale, FL, and others. A person-first approach to a loading zone pilot could prioritize high occupancy/multiple passenger loading over single passenger loading.

REGULATION AND POLICY

OPPORTUNITY TO MANAGE MOBILITY COMPREHENSIVELY

Historically, the focus of right-of-way and curb management has been on traffic management as opposed to mobility in general. As a result, private vehicles have traditionally been prioritized. The era of new mobility is helping to spur conversations about mobility management in a much broader sense. City officials are viewing this as an important opportunity to rethink street design. Traditional metrics such as level-of-service (LOS) and vehicle throughput are being reconsidered, and some jurisdictions are moving towards metrics that more closely align with desired outcomes, such as vehicle miles/kilometers traveled and person throughput.

CHALLENGES POSED BY PREEMPTION

City representatives acknowledged that federal and/or state/province preemptions could pose serious challenges to the cities' abilities to enact regulations that might otherwise enable them greater control over management of new mobility in the right-of-way. For instance, every U.S. state—with the exception of Oregon—has adopted a statewide law regulating transportation network companies in some fashion, thereby preempting local authorities to varying extents (James, 2018). This is not unto itself a bad thing, and a representative from Lyft reiterated that it would be incredibly difficult to operate if every jurisdiction had its own regulatory framework. However, statewide regulations that preempt local authorities can effectively eliminate important leverage points at the local level. To that end, city representatives discussed the importance of also focusing on the areas where local authorities have jurisdiction. For instance, cities do already have the ability to pedestrianize the street and prioritize active modes over private vehicles.

CHALLENGES POSED BY VERTICAL INTEGRATION OF PRIVATE MOBILITY SERVICES

Uber recently acquired the e-bikeshare and e-scooter company Jump, and Lyft acquired the bikeshare provider Motivate. Both companies are also expanding their services to include e-scooters. While there are benefits from this kind of vertical integration of mobility, particularly with regards to encouraging users to not just rely on vehicle trips, there are also challenges. City representatives expressed concern about the ways in which vertical integration by a handful of private mobility providers could have potentially negative impacts on the cities' abilities to achieve mobility equity, and other important outcomes.

RESEARCH GAPS

Interest in curb management is piquing, and there are a number of efforts underway to better understand how the curb is conceptualized, managed, and used. However, many questions remain. Based on the literature review, policy and pilot project review, interviews, and workshop discussion, a number of research gaps have been identified. These research gaps are organized by the primary categories previously identified, and Urbanism Next has briefly summarized the needed research.

DATA COLLECTION

IN-SERVICE TNCS AND DEADHEADING

GAPS:

Information about the total number of in-service TNCs on the road without passengers (e.g., drivers waiting for a new trip request).

Information about usage of parking spaces of in-service TNCs between passengers and parking locations.

Impact of deadheading (distance driven to pick up passenger from a requested location or between passenger trips) on total VMT/VKT.

NEEDED RESEARCH:

Data analysis of TNC deployment; surveys of TNC driver behaviors; spatial analysis of TNC vehicles or proxies by observing key corridors.

COURIER NETWORK SERVICES (E.G. UBEREATS, GRUBHUB , AMAZON FLEX)

GAPS:

Information about the frequency of deliveries, dwell times, hours and locations of peak demand, delivery patterns, vehicle type, and curb usage by courier network services.

NEEDED RESEARCH:

Data analysis of courier network services spatial data; proxies: observing key corridors.

DELIVERY-DEPENDENT SMALL BUSINESSES

GAPS:

Understanding the freight and delivery needs of delivery-dependent small businesses.

NEEDED RESEARCH:

Surveys of small businesses.

ADOPTION RATES AND USERS OF NEW MOBILITY TECHNOLOGIES

GAPS:

Additional information about the adoption rate of new mobility technologies and the socio-demographics of the users.

NEEDED RESEARCH:

Surveys of residents; secondary analysis of survey data.

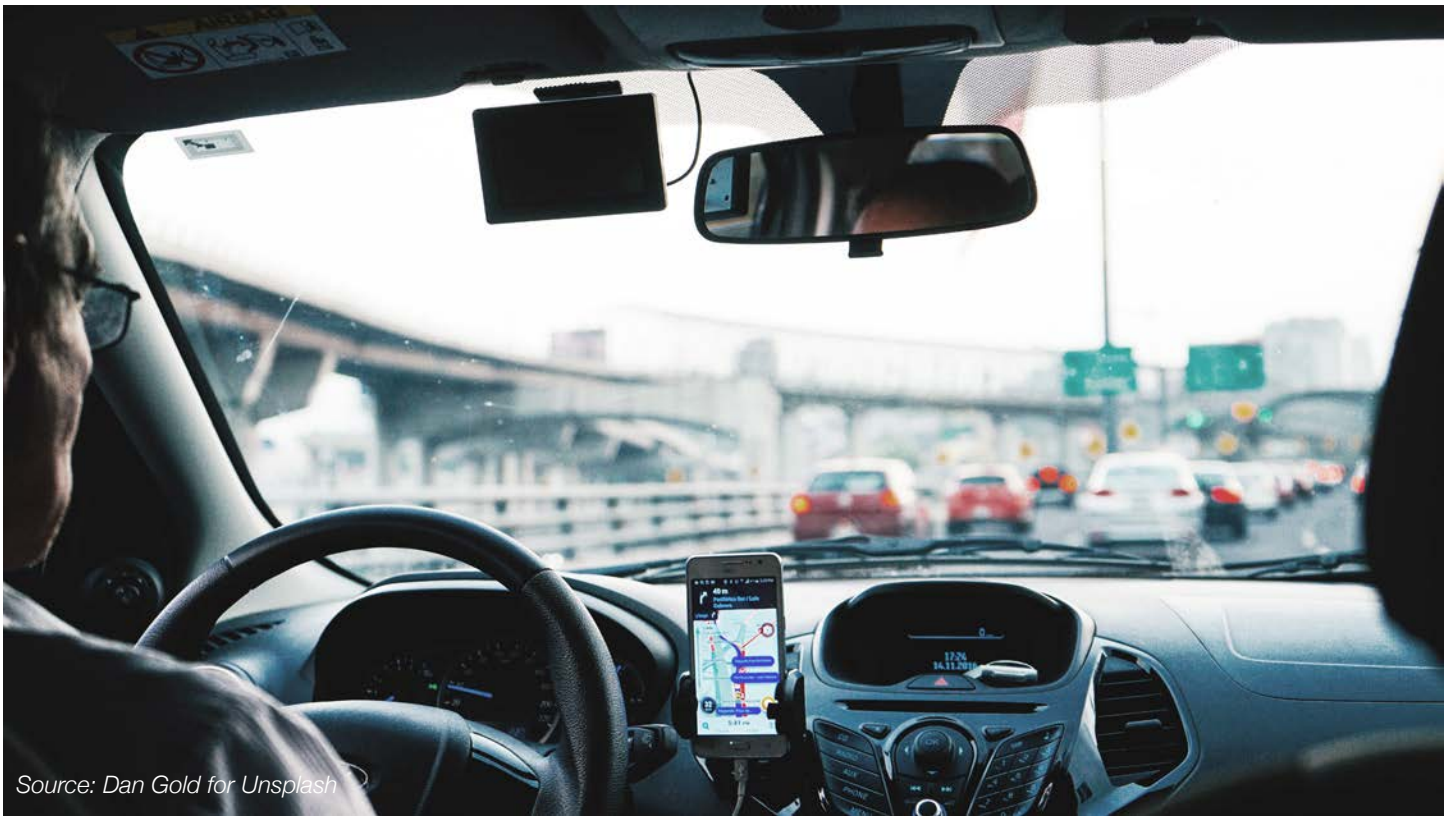
DEDICATED PASSENGER LOADING ZONES AND TRIP PATTERNS

GAPS:

Understanding whether or not the existence of dedicated passenger loading zones increases overall vehicle trips and/or impacts mode choice.

NEEDED RESEARCH:

Observational data paired with streets with and without passenger loading zones or before/after passenger loading zones.



Source: Dan Gold for Unsplash

SPACE ALLOCATION

ELECTRIC AND NON-ELECTRIC MODE INTERACTIONS

GAPS:

Understanding how to manage the interactions between electric (e.g., e-scooters) and non-electric modes.

Understanding the role of the ROW management in enabling electric modes (e.g. EV charging in the ROW, charging depots, etc.).

NEEDED RESEARCH:

Design analysis to examine ideal placement for charging depots.

ON-STREET VS. OFF-STREET LOADING ZONES

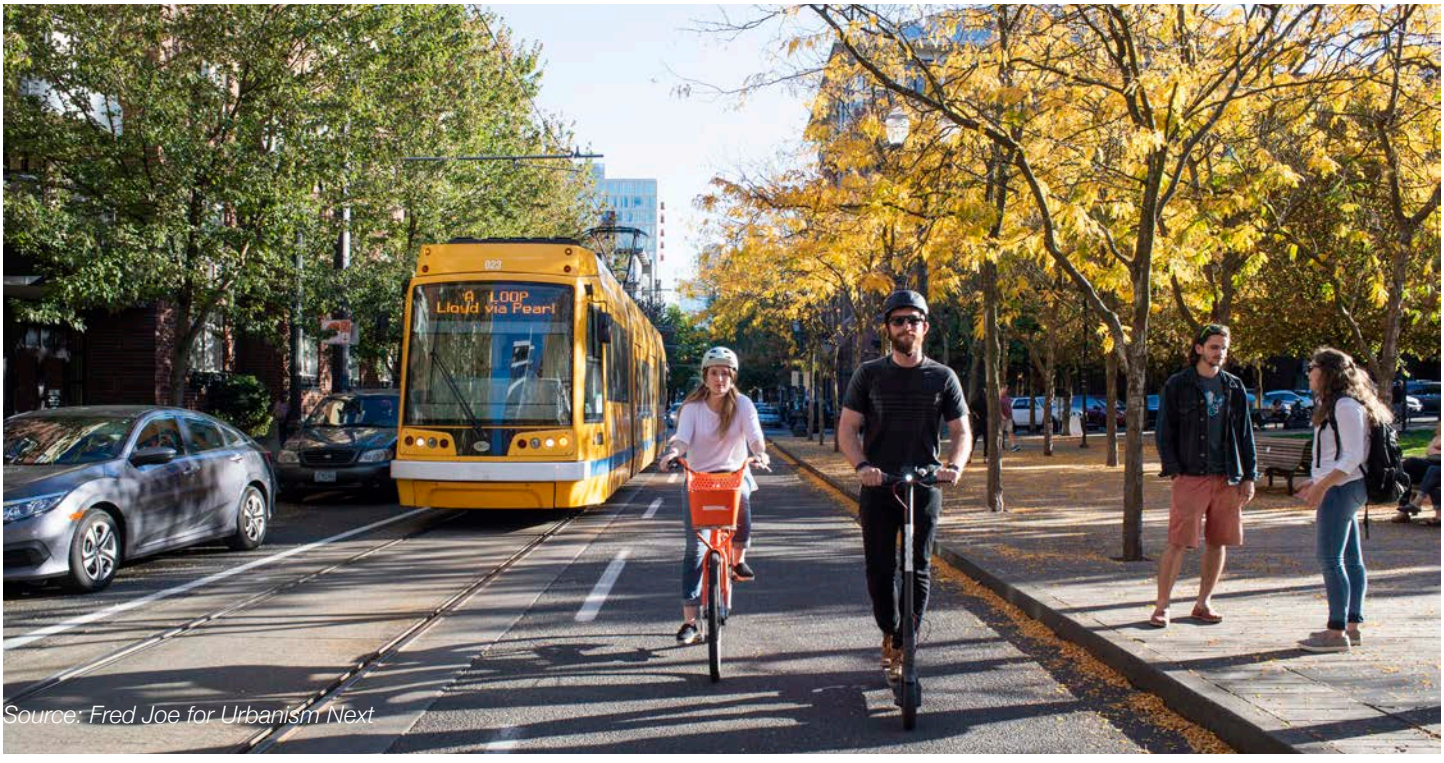
GAPS:

Understanding the mode conflicts that arise in on-street passenger loading zones and if/how they compare to off-street loading zones (e.g., private bays, docks, etc.).

Understanding what opportunities exist to increase off-street goods loading.

NEEDED RESEARCH:

Observational data comparing on-street and off-street loading.



Source: Fred Joe for Urbanism Next

REGULATION AND POLICY

PRICING AND BEHAVIOR

GAPS:

Understanding the appropriate pricing for different uses of the curb that achieve the desired outcomes of nudging users toward higher occupancy, lower carbon modes of travel.

Understanding what income-sensitive mechanisms in curb pricing are needed in order to mitigate existing disparities.

NEEDED RESEARCH:

Surveys of willingness to pay for curb usage; impact analyses; observational data comparing before/after curb usage by mode and occupancy.

ZONING MECHANISMS

GAPS:

Understanding of the potential to use zoning mechanisms to incentivize off-street loading zones and what loading zone formulas might be appropriate.

NEEDED RESEARCH:

Observational data: passenger/ goods loading trip counts by land use and place type, including a temporal component.

ENFORCEMENT

GAPS:

Understanding the most effective and efficient enforcement of changes to the curb given limitations of city staff and budgeting constraints.

NEEDED RESEARCH:

Policy review examining how bus/ transit only lanes are enforced in different jurisdictions; interviews with jurisdictions that have implemented curb pilots.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CONCLUSION

Congested streets are not a new phenomenon. Curb management is not new either—cities have long regulated this space. However, new mobility technologies are changing the demand for the curb. The curb is a finite resource and it needs to be managed more comprehensively than it has been in the past. This means looking at its various uses and then prioritizing those uses in ways that are most likely to achieve desired outcomes. Cities also need to gather more data about the curb in order to better understand current usage patterns. This information will help inform decisions about how space should be allocated, and what regulatory or pricing mechanisms may be needed. Cities need to undertake these efforts now not only to prepare for the deployment of autonomous vehicles but also to improve current conditions—which, in most cases, prioritize automobiles over people.


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