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This whitepaper was prepared to inform the Shared Mobility Policy Playbook. The playbook is a resource for local governments and public agencies to assist in planning, modeling, and regulatory efforts for shared mobility services. Shared mobility is defined as the shared use of a vehicle, bicycle, or other travel mode. This whitepaper summarizes a series of expert interviews, small group discussions, an online survey, and a literature review which were conducted by the Transportation Sustainability Research Center (TSRC), in coordination with Caltrans and the Local Government Commission (LGC). Each section focuses on the impacts of shared mobility services, the experiences of public agencies and local governments with the implementation and monitoring of these services, and practices for incorporating shared mobility into transportation planning and modeling. Common themes for this document include: the need for additional research on the impacts of shared mobility on travel behavior, curb space, the environment, equitable outcomes, and existing transportation systems; and planning for an automated vehicle (AV) future.

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INTERNAL FINAL REPORT FOR THE SHARED MOBILITY TOOLKIT

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Abstract

This whitepaper was prepared to inform the *Shared Mobility Policy Playbook*. The playbook is a resource for local governments and public agencies to assist in planning, modeling, and regulatory efforts for shared mobility services. Shared mobility is defined as the shared use of a vehicle, bicycle, or other travel mode. This whitepaper summarizes a series of expert interviews, small group discussions, an online survey, and a literature review which were conducted by the Transportation Sustainability Research Center (TSRC), in coordination with Caltrans and the Local Government Commission (LGC). Each section focuses on the impacts of shared mobility services, the experiences of public agencies and local governments with the implementation and monitoring of these services, and practices for incorporating shared mobility into transportation planning and modeling. Common themes for this document include: the need for shared mobility operator data; the scarcity of resources for planning and implementing policies for shared mobility services; the need for additional research on the impacts of shared mobility on travel behavior, curb space, the environment, equitable outcomes, and existing transportation systems; and planning for an automated vehicle (AV) future.

Executive Summary

This whitepaper summarizes the findings of expert interviews, small group discussions, a survey, and a literature review on the topic of shared mobility. Specifically, this document was prepared to inform the *Shared Mobility Policy Playbook*, which is meant to inform local governments and public agencies on the incorporation of shared mobility into transportation planning and modeling. Shared mobility is defined as the shared use of a vehicle, bicycle, or other travel mode, usually on an "as-needed" basis.

Expert Interviews:

Ten interviews were conducted in Spring 2018 with city planners, academics, and transportation modelers with experience related to shared mobility. The interviews covered a range of topics including: interviewees' familiarity with shared mobility; their beliefs on opportunities, challenges, lessons learned, and best practices; the extent to which shared mobility is integrated with interviewees' work; the ability of their organization to obtain and use data from shared mobility operators; and questions about planning and modeling.

For data collection, interviewees reported a lack of data from shared mobility operators. The limited data made it difficult for integration of data into planning and modeling efforts. Interviewees noted that shared mobility is not currently integrated into transportation modeling, mainly due to the lack of available data. Some attempts have been made to model the potential impacts of automated vehicles (AVs). Interviewees noted the potential to use scenario planning to understand the potential changes in land use, rights-of-way, and future mobility technologies.

The expert interviews also delved into the interaction of public transit and shared mobility. Once again, interviewees expressed concern about the lack of data regarding shared mobility and its impact on other services. Interviewees expressed different views of the perceived impacts on public transit. Some believed shared mobility would provide first- and last-mile connections, while others worried its low prices and flexibility would draw users from public transit. The interviewees also touched upon automation, and the future potential impacts of AVs on public transit.

Another key topic discussed was equity. The expert interviewees noted that shared mobility, if deployed strategically, has the potential to improve access and mobility to

underserved communities. Once again, the interviewees wanted more data and research on the impacts of shared mobility on equitable outcomes.

Small Group Discussions:

Between April 2018 and June 2018, four small group discussions took place across California including: the San Francisco Bay Area, Sacramento, Central Valley, and Southern California. Attendance ranged from 10 to 20 participants (consisting of local officials, planners, and staff at relevant public agencies) at each of the small group discussions. Three sessions were 90 minutes in length; a smaller session in Modesto was 60 minutes. The discussions covered the following topics: the presence of shared mobility, policy actions to regulate shared mobility, perceived benefits and drawbacks, equity challenges, and data sharing.

Presence of Shared Mobility

A range of shared mobility services were available across California, with more limited service availability in the Central Valley. Most services were available through private operators, though a few were implemented through public-private partnerships. Some services receive public subsidies. Few cities or agencies had regulations in place for shared mobility; however, a few had instituted permit programs for specific modes, such as bikesharing.

Policy Actions

Few cities or public agencies had regulations in place for shared mobility. Some were avoiding rulemaking as an effort to encourage operators to launch services in their jurisdiction, while others avoided rulemaking due to confusion about who has jurisdiction to regulate emerging services (especially in the case of dockless devices). Permitting requirements were the most common type of shared mobility regulation.

Perceived Benefits

Participants emphasized the potential for shared mobility to offer demand-responsive services, which could provide a solution when public transit offerings are limited (such as at night or in low-density areas). Shared mobility could also reduce parking demand, thus reducing parking requirements and increasing density and affordability.

Participants also noted that in the future, AVs could provide significant benefits in terms of accessibility, safety, and cost.

Perceived Drawbacks

Participants were worried about the environmental impact of TNCs; specifically, the vehicle miles traveled and greenhouse gas emissions associated with operations. They were also worried that the public sector could be supporting TNCs, which may compete with public transit services and then later go defunct. Participants also noted that shared mobility services tend to focus coverage in urban areas and may not provide sufficient coverage temporally (across the week and throughout the day). Participants from the Central Valley were worried that costly AV mapping technology would result in AVs only being present in denser regions. Participants also noted that municipalities are having difficulty managing rights-of-way (including roads, curbs, and sidewalks) to handle shared mobility.

Equity

The participants believed that shared mobility operators need to improve on areas pertaining to equity and environmental justice. These include service availability and access challenges for certain populations, including: users in suburban and rural areas, people with disabilities, and unbanked and digitally impoverished users. Participants also noted a lack of multi-lingual options for non-English speakers.

Data Sharing

Most participants were frustrated with the amount and type of data provided by shared mobility operators. Some participants suggested that there could be collective data negotiations between multiple local agencies and a service provider, and that federal agencies or nonprofit organizations could represent jurisdictions to standardize data requests. Participants noted that their departments often lacked the resources and expertise to clean, analyze, and interpret the data provided.

Overall, the small group discussions indicated that shared mobility has the opportunity to address mobility gaps, but that it can also create a number of new concerns pertaining to the environment, accessibility, and impacts on other modes. Public agencies need more policy guidance, particularly in the areas of rights-of-way management, equity, data sharing, and data management.

Survey:

In Summer 2018, the Transportation Sustainability Research Center deployed a 20-minute long online survey to public agency employees throughout California. Survey respondents were asked a series of questions regarding general characteristics of their community – such as its population size, the public transit available, and resident demographics – and shared mobility services.

The survey received 77 complete responses. The respondents worked for or represented communities that varied across average income level, population density, and built environment (ranging from urban city center, edge city, exurban, suburban, and rural communities).

Most of the respondents had heard of the term "shared mobility" (78%), and most of the respondents had shared mobility services operating in their community/jurisdiction (83%). Shared mobility services were less prevalent in rural communities; however, even then over half of the rural communities had shared mobility services and another quarterplanned to deploy shared mobility services. Approximately half of those respondents who had shared mobility services in their community also had public-private partnerships for shared mobility, most commonly to provide paratransit services.

Perceptions of shared mobility were largely positive. The majority of respondents also believed that shared mobility provided cost savings for residents (64%), increased access to employment opportunities (61%), increased access to public transit (57%), reduced emissions (53%), and reduced congestion (52%). Regarding drawbacks, respondents were most concerned with the ability for shared mobility services to meet ADA compliance.

Only one-fifth of respondents had existing policies to regulate shared mobility services in their community/jurisdiction. Similarly, few communities or jurisdictions receive data from operators or plan to receive data. Those who did receive data tended to receive activity data, followed by user demographic data and fleet data. Only 10% of the respondents believed adequate written resources exist for developing and implementing shared mobility policies.

Literature Review:

The literature review outlines how shared mobility services have been incorporated into existing transportation models or have been the basis of entirely new model-types. Researchers at TSRC conducted a scan of peer-reviewed articles, professional reports, and white papers about the integration of shared mobility into transportation modeling. The literature review includes an examination of TNCs, bikesharing, and AVs in modeling efforts.

Transportation Network Companies (TNCs)

A significant body of work exists on modeling techniques for TNCs. Early attempts examined the spatial and temporal differences in TNC demand compared to traditional taxis. Policy makers and researchers are interested in how TNCs affect traffic, congestion, and mode use. Increasingly, studies are indicating that TNCs draw users from public transit more so than from driving, and they may increase VMT and congestion, especially during commute periods.

TNC operators have provided details of their modeling approaches. Uber provided information on an "extreme event forecasting model" that uses historical data and other variables to forecast for anomalies in TNC demand, such as severe weather events or holidays.

Bikesharing

Most models lack the ability to distinguish between privately-owned bikes and shared bicycles. Models that assume bicycles are personally-owned also assume the user will ride their bike for both legs of a trip; however, bikesharing users often only use a bike for a single leg of their trip (and may use another mode for the next leg). This nuance is not captured in today's models. Additionally, electric bicycles may have the added complexity of faster speeds and longer trip ranges. Several studies have explored modeling approaches to bikesharing as stand-alone systems. These include predicting bicycle availability and demand, predicting seasonal closures, and impacts on congestion.

Automated Vehicles (AVs)

A number of studies have attempted to model the impact of AVs on transportation systems. They indicate that AVs could reduce parking demand and could potentially reduce emissions (depending on type of vehicles used in fleets, right-sizing, and acceleration and deceleration rates). However, AVs could increase energy demand due to induced travel. AVs could also impact mode choice in the future; several studies have attempted to predict travel behavior. Predicted impacts vary based on the built environment, growth scenarios, and multimodal connectivity.

Conclusion:

Overall, the participants in this study believe that if deployed strategically, shared mobility can have a positive impact on transportation systems. Positive outcomes include improved mobility and accessibility, reduced congestion, and reduced environmental impact. However, planning, modeling, and regulatory efforts around shared mobility services are limited by the lack of data from shared mobility operators. In addition, shared mobility is not currently integrated into transportation modeling.

Some local governments and public agencies have regulated shared mobility, usually in the form of permit applications. More data and research are needed to support planning and regulatory efforts. Public agencies need more policy guidance, particularly in the areas of rights-of-way management, equity, data sharing, and data management. Finally, the need to plan for and study the potential impacts of an automated vehicle (AV) future featured prominently in discussions of shared mobility.

Introduction

Shared mobility – the shared use of a vehicle, bicycle, or other travel mode – is an innovative transportation strategy that enables short-term access to transportation modes on an "as-needed" basis. The term shared mobility includes various forms of bikesharing, carsharing, courier network services, microtransit, ridesharing (carpooling and vanpooling), scooter sharing, transportation network companies (also known as TNCs, ridesourcing, and ridehailing), and other shared services.

A number of environmental, social, and transportation-related benefits have been reported from the use of shared mobility. Several studies have documented reduced vehicle use, ownership, and vehicle miles/kilometers traveled. Cost savings and convenience are frequently cited as popular reasons for shifting to a shared mode. Shared mobility can also extend the catchment area of public transit, potentially helping to bridge gaps in existing transportation networks and encouraging multimodality by addressing the first-and-last-mile issue related to public transit access. Shared mobility can also provide economic benefits in the form of cost savings, increased economic activity near public transit stations and multimodal hubs, and increased access by creating connections with origin points not previously accessible via traditional public transportation.

Given the growth of shared mobility in California, local, regional and state governments are in need of a framework for developing shared mobility policy. The Transportation Sustainability Research Center (TSRC). This white paper summarizes the findings of the expert interviews, small group discussions, a survey of local governments, and a literature review on practices for incorporating shared mobility into transportation planning and modeling that were used to develop the *Shared Mobility Policy Playbook*.

Expert Interviews

Methodology:

Ten interviews were conducted in Spring 2018 with city planners, academics, and transportation modelers with experience related to shared mobility. The goal of this process was to gain insight into the extent to which shared mobility has been integrated into transportation modeling, and to probe their opinions on these innovative business models and services. Moreover, insights from these conversations filled the gaps from the literature review and highlighted new developments regarding the inclusion of shared mobility into transportation modeling. All interviews followed a protocol that was approved by UC Berkeley's Committee for Protection of Human Subjects and were conducted by TSRC staff. The protocol covered a range of topics, including:

- Interviewees' familiarity with shared mobility and their beliefs on its opportunities, challenges, lessons learned, and best practices.
- The extent to which shared mobility is integrated into interviewees' work as a planner, researcher, or modeler, and/or the challenges to integration.
- The ability of their organization to obtain and use data from shared mobility operators.

There were also more specific questions asked about planning and modeling based on the organizational role of the interviewee. The full protocol for the expert interviews can be found in Appendix B. Interviews were conducted with experts representing the following public and private sector organizations:

Atlanta Regional Commission
Cambridge Systematics
Metropolitan Transportation Commission
Resource Systems Group
San Diego Association of Governments
San Francisco County Transportation Authority
University of Cambridge (UK)
UC Irvine
UrbanLabs LLC

Data Collection:

> ***Key finding:*** Overall, interviewees reported that data from shared mobility operators has been minimally provided, making its integration into planning and modeling difficult.

All interviewees agreed that there was a lack of data on shared modes and their users' travel behavior. Generally, the experts agreed on the metrics wanted from shared mobility data: trip purpose, demographics of users, cost of travel, and change in travel behavior. Many key stakeholders in shared mobility lack answers to these statistics on basic characteristics.

Many interviewees said their organizations do not receive data from shared mobility operators following requests. The few interviewees who had received limited data pursuant to partnership agreements said the data lacked sufficient information to inform policy decisions. Interviewees said there should be compulsory reporting requirements and collective action by local governments to implement data sharing requirements. Across California, several large Metropolitan Planning Organization (MPOs) are working together to negotiate with shared mobility operators for increased data sharing agreements. Interviewees said they think they will have a better chance receiving more useful data negotiating collectively versus individually. Some interviewees suggested that shared mobility providers would rather release their operating data through third parties. However, other interviewees said they did not understand service providers' concern about public agency data requests and would prefer not to pay more for access to third party data sets. To be clear, this issue did not only relate to a lack of data on shared mobility, but also a lack of data *standards*. Thus, there is an important opportunity in the field to develop a range of new data standards applying to emerging modes (TNCs, docked and dockless bikesharing, etc.).

Besides private-sector constraints, many experts noted that limited public-sector resources often restricted their ability to collect and maintain transportation data. Agencies often rely on old or incomplete data sets that may be not granular enough to provide sufficient information about their users or to distinguish between innovative mobility from core or incumbent modes. An expert in a consulting role noted that many public agencies are delaying making decisions to see how larger peer public agencies address shared mobility data requests and modeling. Others noted how they struggled to keep their data consistent and precise, given the time-consuming nature of integrating new modes into models and maintaining large data sets.

Modeling:

> ***Key Finding:*** Interviewees generally agreed that shared mobility is not currently integrated into transportation modeling. In a few cases, there have been attempts to model the potential impacts of automated vehicles (AVs).

Many interviewees discussed the lack of available data (noted in the preceding section) making it difficult to integrate innovative modes into transportation models. This circumstance led several modelers to remark that the field needs to quickly "catch up" given the mainstreaming of shared mobility. In addition, interviewees noted that existing planning models are increasingly becoming obsolete based on the new ways people travel and access goods and services.

For modeling, interviewees noted that lacking data standards can limit their ability to incorporate shared mobility into models. Additionally, some interviewees were apprehensive about transitioning to passenger-based models over trip-based models. For example, two experts shared their challenges in attempting to model bikesharing. Neither was able to access data on electric bikes (e-bikes) and electric standing scooters (e-scooters) from local providers, and bike counters are often unable to distinguish among e-bikes, non-e-bikes, or e-scooters quickly passing by.

One solution to improve the quality and quantity of data coming to planners and public agencies is to increase the pace of administering and analyzing transportation surveys. The rapid changes within the transportation sector are reducing the useful lifespan of household travel surveys, which may necessitate more frequent data collection and exploring new data collection methods (i.e., automated collection). Additionally, one interviewee noted that household travel surveys provide insufficient information about the cycling travel behavior and that it may be necessary to oversample cyclists.

Given the challenges of obtaining data from shared mobility operators, interviewees recommended that public agencies consider increasing the number of sensors and cameras in the transportation network to collect data. Public agencies could consider pairing sensor and camera data feeds with artificial intelligence and machine learning to obtain additional data such as vehicle occupancy, vehicle type, and pedestrian behaviors.

Additionally, interviewees identified the need to capture the ability of TNCs to pool passengers with similar origins and destinations, and the intentionality of travelers across all of these modes for modeling. One interviewee noted that the large changes in transportation taking place today provide the opportunity to connect models from the air quality and land use fields, which currently are very separate. This also is the case for models relating passenger travel and goods movement.

Several modelers stated that AVs may actually be easier to adapt to transportation models than TNCs because AVs could have less deadheading (a vehicle repositioning without passengers), particularly when priced. However, one challenge to incorporating AVs into transportation models is that establishing a means of traffic assignment (for human-driven cars) will not apply.

Additionally, the majority of models today do not distinguish between personally-owned and bikesharing cycling usage. In addition, few models distinguish between manual-pedal bicycles and e-bikes. Additionally, the interviewees stated that electric push scooters (such as those deployed by Bird and Lime) are not incorporated into existing models. Missing modal data, the lack of sufficient granularity, a constant stream of new modal options, and the high cost of updating transportation models makes it difficult for many MPOs to plan for changes in transportation. Interviewees noted the potential to use scenario planning to understand the potential changes in land use, rights-of-way, and future mobility technologies.

Interaction with Transit:

> ***Key finding:*** Several MPOs have established policies to improve shared mobility and public transit multi-modal integration. Interviewees expressed differing views on the perceived impacts of shared mobility on public transit. Interviewees agreed that more data and research is needed to understand the role and impacts of shared mobility on public transportation across an array of built environments and communities.

Interviewees expressed concern that unavailable and insufficient data about the impact of shared mobility in their communities made it difficult to understand the impacts of shared modes on public transportation. There was no consensus among interviewees how shared modes are primarily competing with or complementary to public transit, how they impacted single occupant vehicle travel, or what

infrastructure investments (physical and digital) are needed for sustainable transportation outcomes.

Interviewees were optimistic that shared mobility can bridge spatial and temporal gaps in public transit service. Most interviewees emphasized that shared mobility is flexible enough to provide a first-mile/last-mile connection. Interviewees proposed "mobility hubs," which organize shared modes around existing public transit service to enhance multi-modal integration. However, some interviewees were reluctant to support mobility hub investments without research supporting shared mobility hubs' positive impacts on public transit ridership and revenue.

Additionally, many interviewees expressed concern that shared mobility's flexibility and low prices (often supported by venture capital) draw users away from transit systems. A few experts expressed concerned in their agency's commitment to current or planned investments in public transit given the growth of shared mobility and the potential future impacts of AVs. Shared mobility and shared AVs could allow transit operators to re-purpose underperforming lines, though more research and better models are needed to guide public agencies. Density is another important consideration in determining how shared mobility interacts with transit, as one expert representing San Francisco noted that there is a higher ratio of transit boardings to TNC trips outside of the city center. The sharpest contrast to this view came from a transportation modeler who felt that municipal regulations of shared modes were an attempt to protect transit from competition.

Another question discussed by several experts is the relationship between shared mobility, cost of travel, and transportation demand. This discussion relates to the Jevons Paradox, which states than an increase in the efficiency of a use of a resource (e.g. coal), will lead to an increase in the demand for that resource. In the context of shared mobility, one interviewee said that transportation demand could notably increase (known as induced demand) if AVs reduce the cost of travel per person, per mile. The potential future impacts of AVs were discussed by almost every interviewee. While the future of AVs (whether privately owned or shared) is unknown, interviewees noted that automation could draw policy maker's attention away from existing shared modes.

Equity:

> ***Key finding:*** Experts posited that shared mobility, if deployed strategically, can improve access and mobility to underserved communities, and some felt that public incentives can accelerate this trend.

There was general agreement among experts that shared mobility could improve equitable access to mobility. However, more data and research is needed to understand the impacts of shared mobility on equitable transportation outcomes. One interviewee identified ways for public agencies to ensure that shared mobility operators provide equitable and accessible service This interviewee stated that public agencies could offer a financial incentive to a service provider for meeting certain agreed-upon performance metrics, such as a minimum number of cars per square mile in low-income neighborhoods. If those metrics are met, the company could receive a financial incentive or be allowed to expand its service beyond into other areas within a community. In the future, models should incorporate data on income, banking (i.e., un- and under-banked households), people with disabilities, and other special populations to ensure that all transportation modes are equally accessible by all.

Conclusion: Policy and Shared Mobility

Interviewees identified a few examples of how their agencies regulate shared mobility. Key findings throughout the expert interviews include:

- Data from shared mobility operators has thus far been minimally provided, making its integration into planning and modeling difficult.
- Shared mobility is not currently integrated into transportation modeling, but in a few cases, there have been attempts to model the potential impacts of AVs.
- Several MPOs have established policies to improve shared mobility and public transit multi-modal integration, though more data and research is needed to understand the role and impacts of shared mobility on public transportation.
- Experts posited that shared mobility, if deployed strategically, can improve access and mobility to underserved communities, and some felt that public incentives can accelerate this trend.

Small Group Discussions

Methodology:

Between April 2018 and June 2018, the TSRC research team held four small group discussions across California including: the San Francisco Bay Area, Sacramento, Central Valley, and Southern California. These regions were chosen to provide a diverse range of perspectives on shared mobility, including varying built environments (i.e., urban, suburban, and rural). TSRC partnered with the Local Government Commission (LGC) to assist with the project. LGC sent invitations prior to the discussions to local officials, planners, and staff at relevant public agencies (including public transit providers). Attendance ranged from 10 to 20 participants at each of the small group discussions. No incentives (financial or otherwise) were provided to participants beyond light refreshments. Three sessions were 90 minutes in length; a smaller session in Modesto was 60 minutes. TSRC researchers were present at all small group discussions to provide a brief introduction to the project and take notes. Discussions were moderated by LGC staff and guided by a single protocol that probed the following topics:

- The Presence of Shared Mobility: Familiarity with shared mobility and presence of shared mobility services in each of the respective regions/communities/jurisdictions.
- Policy Actions: Official actions taken to regulate shared mobility operators, such as signage policies, permit processes, taxation, fines, and/or impounding of vehicles or equipment.
- Perceived benefits and drawbacks of shared mobility.
- Equity: A number of equity challenges exist including lack of service availability in some geographies; the lack of service options for people with disabilities, underbanked, and digitally impoverished users; and the need for multi-lingual options for non-English speakers.
- Data Sharing: Ability of city staff to obtain data from shared mobility operators and measure and evaluate their activity.

The full protocol for the small group discussions can be found in Appendix A. The views expressed in these discussions do not necessarily represent the views of LGC or TSRC.

Presence of Shared Mobility:

Key Findings:

- A range of shared mobility services were reported across California, with more limited service availability in the Central Valley.
- Most of the shared mobility services available are private operators, although some are implemented through public-private partnerships or receive public subsidies.
- Few cities or agencies have taken any actions to regulate shared mobility. However, a small number have instituted permit programs for specific shared modes, such as bikesharing.

In three of the four small group discussions (Bay Area, Southern California, and Sacramento), participants identified a number of shared mobility services in their communities, including TNCs, docked and dockless bikesharing, carsharing (both network fleets and peer-to-peer), carpooling, public and private microtransit, courier network services, push electric scooters, paratransit, taxis, and TNC programs. Participants in the Central Valley acknowledged that there are fewer shared mobility operators; in some cases, the only shared mobility services in some Central Valley cities are a local taxi company with one or two vehicles.

The scale in which shared mobility services operate also varies across the regions. Some participants reported small pilots, while others noted programs that cross multiple jurisdictional boundaries (such as dockless bikesharing). Additionally, although many shared mobility providers mentioned operating as for-profit enterprises, a number of public-private partnerships that include operator subsidies for first-mile/last-mile connections to existing public transit stations were also discussed.

Photo: SmaRT Ride On-Demand Transit

Policy Actions:

Key Findings:

- Few cities or public agencies have taken action to regulate shared mobility services.
- Permitting requirements are the most common type of shared mobility regulation.

While larger cities like Los Angeles and San Francisco are developing mode-specific regulations, other cities avoid rulemaking in an effort to encourage companies to launch in their jurisdictions. Moreover, some participants said their offices had not taken official policy actions because there is confusion about which agencies have jurisdiction to regulate these emerging mobility services (particularly dockless systems). One city (Santa Monica) enacted an emergency measure allowing city employees to remove and impound dockless scooters that block fire lanes, wheelchair ramps, or special event equipment (such as marathon-route fences).

Perceived Benefits:

Key Findings:

- Participants emphasized the potential for shared mobility to offer demand-responsive services, particularly at times and places where public transit is insufficient.
- Shared mobility can have a synergistic effect with public transit by providing first-and-last mile connections to rail stations and other public transportation hubs.
- AVs may provide significant benefits in terms of accessibility, safety, and cost.

The most common perceived benefit noted by the discussion groups was the ability for shared mobility services to operate in a demand-responsive fashion. For public agencies confronted with the high costs for public transit operations serving low-density areas with limited ridership, shared mobility services such as TNCs and microtransit may be a strategy to reduce per person trip costs. During the Central Valley discussion, TNCs were noted as an important strategy to improve residents' access to regional rail stations, particularly for households without personal vehicles.

In addition to these potential benefits, participants also discussed ways that shared modes could impact other policy areas (e.g., housing). For example, participants in the Sacramento discussion group noted the potential for shared mobility to reduce parking demand in their communities, which could result in lower parking requirements for new homes and apartment buildings, increased density, and greater affordability.

Although not operational, AVs were discussed in almost all discussions. One town in the Sacramento metropolitan area was in contact with an AV provider, and another in the Bay Area had just received an automated shuttle that will be used to transport BART riders to downtown Dublin. For other participants, AVs presented interesting questions such as:

- Should transit agencies pause or rollback investments in public transit because AVs will supplant those systems?
- Should transit agencies embrace these technologies as an opportunity to create a public transit renaissance?
- What type of infrastructure investments should be made to prepare for an automated future?

A new automated shuttle in Dublin, CA. (Photo by Marcel Moran)

Perceived Drawbacks:

Key Findings:

- Participants expressed concern about the congestion and environmental impacts of TNCs and potential competition with public transit.
- Shared mobility operators tend to focus service coverage in urban areas, which has presented service gaps in many suburban and rural areas.
- Many municipalities are having difficulty managing rights-of-way (including roads, curbs, and sidewalks) to handle shared mobility.

Each group raised two TNC-specific concerns. First, there were a number of participants that expressed concern about the potential for increased vehicles miles traveled (VMT) and greenhouse gases (GHG) associated with TNC operations. These participants noted that TNCs may not be pooled and instead may be competing with public transit. Additionally, participants expressed concern about the long-term financial sustainability of the hrcing/TNC business model. Participants were concerned that the public sector may be supporting a competitive mode that could supplement or replace their own public transit services and then later go defunct.

While many Central Valley participants thought TNCs could provide first-mile/last-mile connections to regional rail stations, they were frustrated that consistent TNC availability was limited to only Friday and Saturday nights in many of their towns. In response to service reliability concerns, several participants indicated that their cities were considering subsidizing TNCs to improve driver availability during the weekdays. Participants in the Central Valley small group discussion thought that the requisite mapping technology for AV operation may be cost-prohibitive for their region and may only be an option in denser areas with larger market potential.

Participants across the small group discussions also expressed concern about changes to the built environment that shared mobility may require. Some participants stated that their agencies were considering new infrastructure-design guidelines to adapt to a range of low-speed modes (e.g., push and motorized scooters, robotic delivery, etc.) that are currently incompatible or unsafe for existing curbs and bicycle lanes. In addition, many believed curb management should be updated to handle the following issues:

- Pick-up and drop-off points (or curb space) for TNC trips.
- Designated parking for carsharing vehicles.
- Parking rules for dockless modes, such as bikes and e-scooters.
- Pilots and dedicated rights-of-way for low-speed electric modes, such as Segways, e-scooters, and automated delivery robots.

Equity:

Key Finding:

- A number of service availability and access challenges to using shared mobility exist for certain populations, including users in suburban and rural areas, people with disabilities, and unbanked and digitally impoverished users, as well as lacking multi-lingual options for non-English speakers.

There were several areas pertaining to equity and environmental justice that participants believed shared mobility operators needed to improve. These included improved access for digitally impoverished households (e.g., households without smartphones); un- and under-banked users (e.g., households without a credit or debit card); and access options for non-English speakers. However, participants also offered

possible solutions to address these challenges such as: telephone-dispatch options for TNCs and microtransit; providing subsidies for low-income users; the ability to use existing public transit cards for payment (fare integration); and requiring contracted providers to include translation services as part of their services.

Data Sharing:

- The majority of participants believed that their agencies do not receive enough data from shared mobility operators.
- However, many participants admitted that their departments lacked the resources and expertise to clean, analyze, and interpret the data provided.

The most consistent theme of the four discussions was frustration with the amount and type of data provided by shared mobility providers. Many participants preferred collective data negotiation between multiple public agencies and a service provider rather than each city attempting to obtain data from providers independently. Several participants suggested that federal agencies such as the U.S. Department of Transportation (USDOT) and nonprofit organization such as the National Association of City and Transportation Officials (NACTO) could represent a large number of jurisdictions to standardize data requests.

In addition to the challenges of obtaining private sector data, several participants noted their agencies had insufficient resources (e.g., staffing, time, resources) to use the data provided. Participants also expressed uncertainty about what data they should be requesting and the need for additional guidance. Several participants across discussions indicated that some shared mobility operators (e.g., those that operate in bikesharing) are more open in sharing data with cities.

Summary:

Overall, the small group discussions reinforced the notion that shared mobility is an exciting yet disruptive force for California's local governments. Shared mobility has the opportunity to address mobility gaps, but it can also create a number of new concerns. Large metropolitan areas have more experience with shared modes than small towns and rural areas. The small group discussions found that public agencies need more policy guidance, particularly in the areas of rights-of-way management, equity, data sharing, and data management.

Survey Findings

Introduction:

In Summer 2018, TSRC deployed a roughly 20-minute long on-line survey to public agency employees throughout California. The survey was produced in partnership with the Local Government Commission (LGC) and with funding from the California Department of Transportation (Caltrans). Survey respondents were asked a series of questions regarding general characteristics of their community – such as its population size, the public transit available, and resident demographics – and shared mobility services. The survey was used to gauge public agency needs regarding shared mobility planning, as well as to inform content and features of the Shared Mobility Toolkit. In total, the survey received 77 complete responses.

Community or Jurisdiction Statistics:

Survey respondents were asked a series of questions regarding the characteristics and demographics of the community/jurisdiction that the respondent represented or worked in. First, respondents were asked what type of jurisdiction or organization they represented (Table 1). Three of the respondents choose "Other" and listed the Public Housing Authority, Environmental Council of Sacramento, and the Regional Air District as their employer.

Table 1. Breakdown of Employee Jurisdictions

Jurisdiction or Organization	Number of Respondents
City	40
County	11
Consolidated City/County	2
Joint Powers Authority/Special District	7
Metropolitan Planning Organization (MPO)	7
Transportation Agency	6
Other	3

Next, the respondents were asked to identify their role at their agency. Of the 77 respondents, 35 were staff (management), 22 were elected officials, 12 were staff (non-management), and 7 were appointed officials. One respondent did not answer. Those in staff positions worked for a wide range of departments, displayed in Table 2.

"Other" responses included departments of Environment, General Services, Administration, Community Services; a Land Use Committee Member, a director of a Regional Planning Agency; and a respondent who spanned both the Planning and Public Works Department.

Table 2. Departmental Breakdown of Staff

	City Manager's Office or County Administrator's Office	Economic Development	Planning	Public Works	Transportation	Other
Staff (Management)	3	1	7	6	6	12
Staff (Non-management)	1	0	7	1	2	1

Respondents also provided the geographic location of their jurisdiction and the number of residents in their community. For those who worked for a city or county, their responses were corrected according to corresponding ACS data (table ACS_16_5YR_B01003) and then mapped using GIS. Figures 1 shows the distribution of survey respondents by county, while Figures 2-4 show the number of residents per jurisdiction represented in the survey. The color variation represents the population density. Counties from which the survey had no respondents are grey.

Figure 1. Respondents' Distribution at the Level of Counties

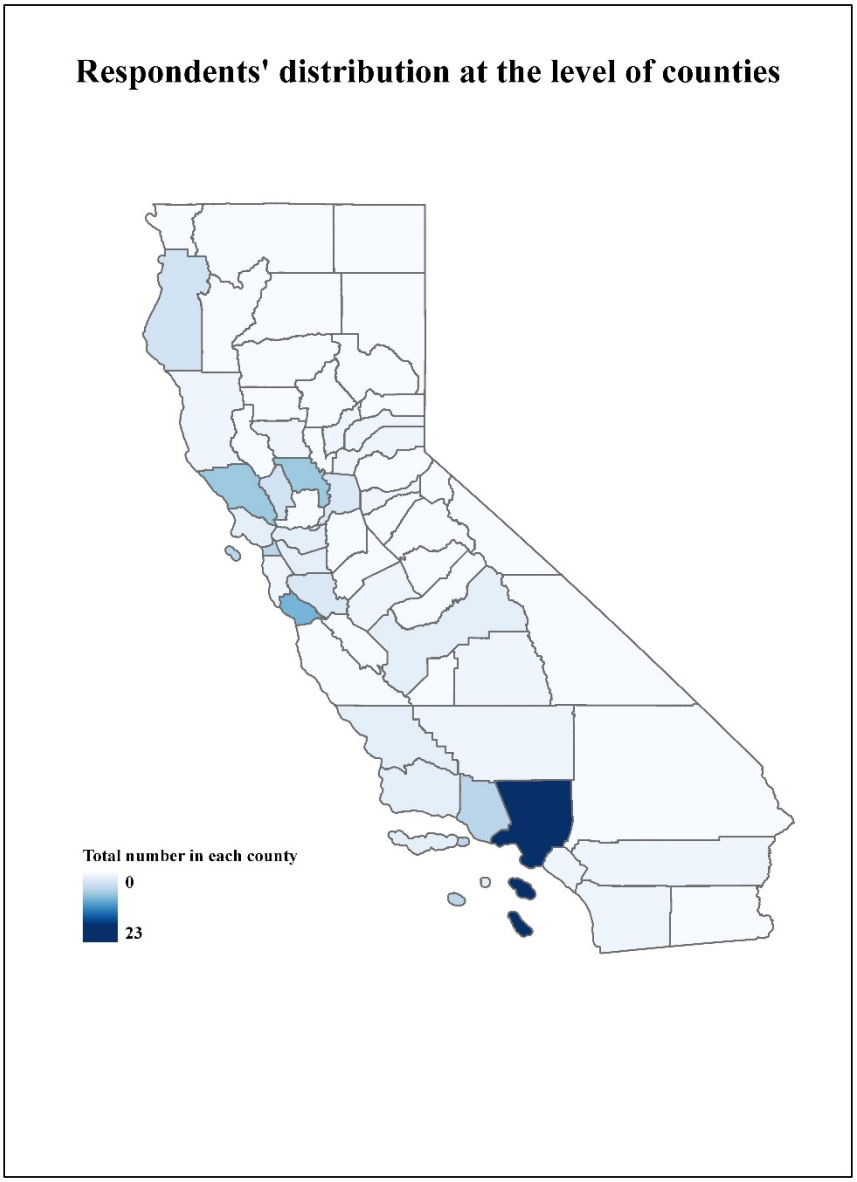


Figure 2. Total Population in Each Jurisdiction with Respondents (All of California)

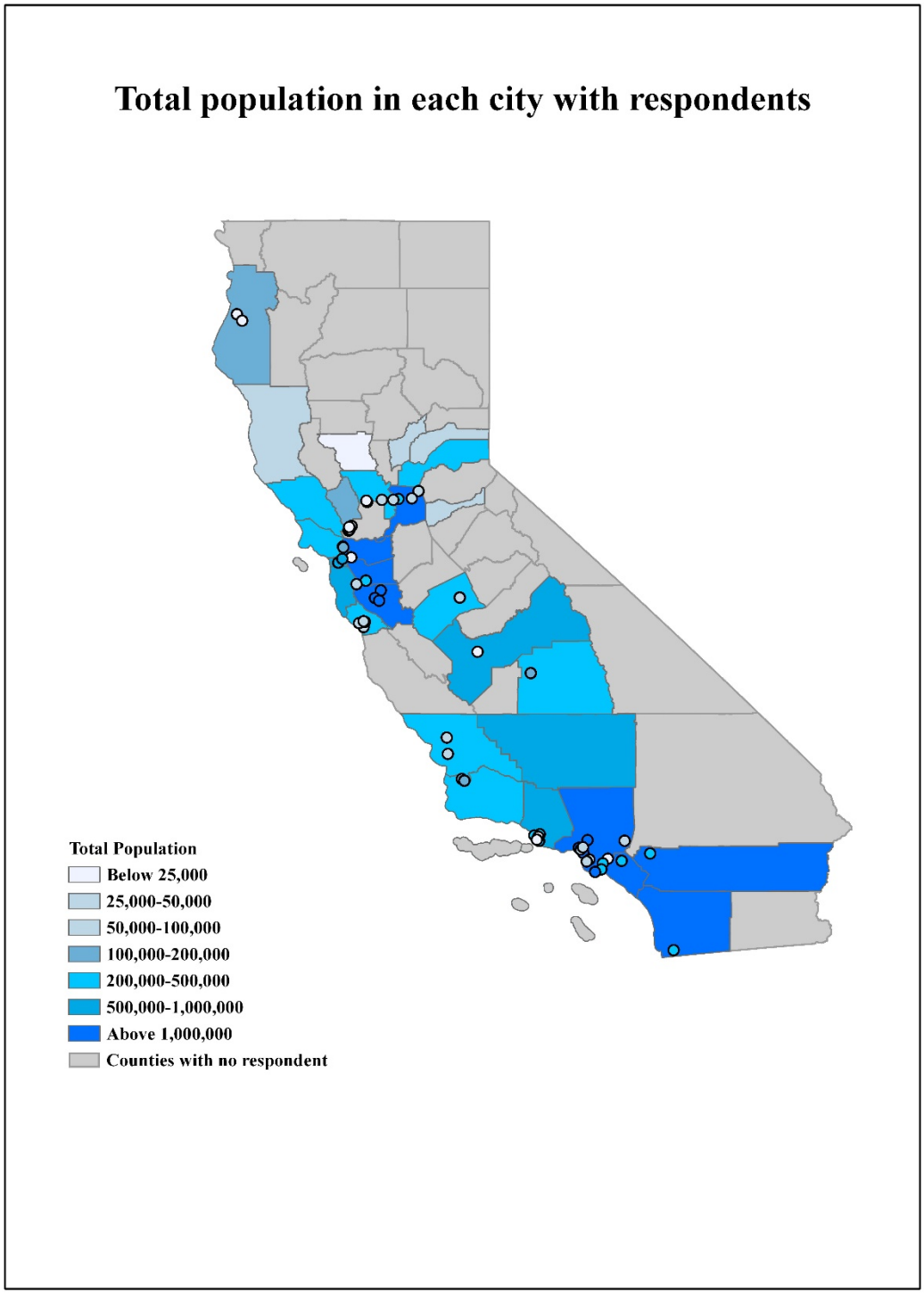


Figure 3. Total Population in each Jursidiction with Respondents (Northern California)

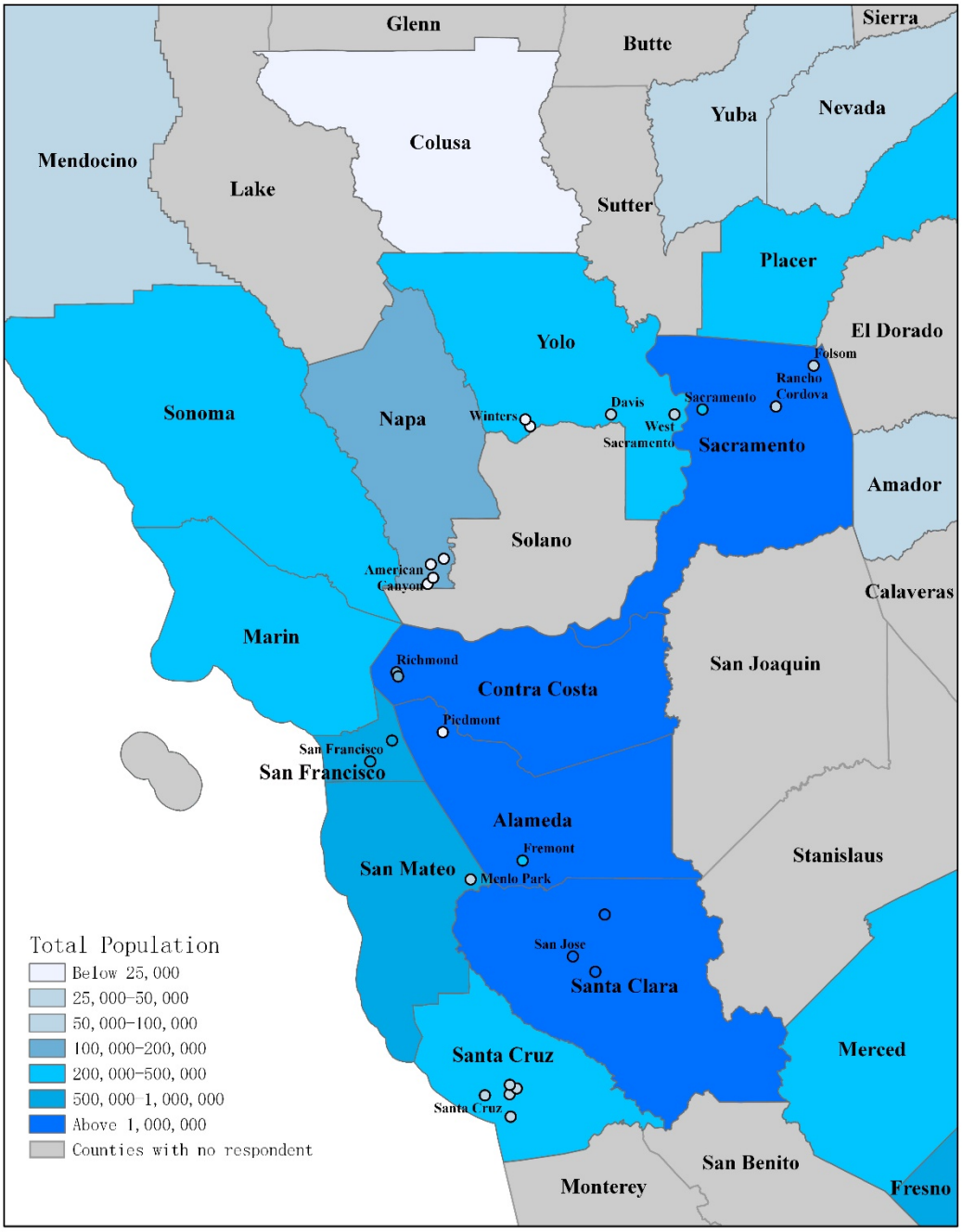


Figure 4. Total Population in Each Jurisdiction with Respondents (Southern California)

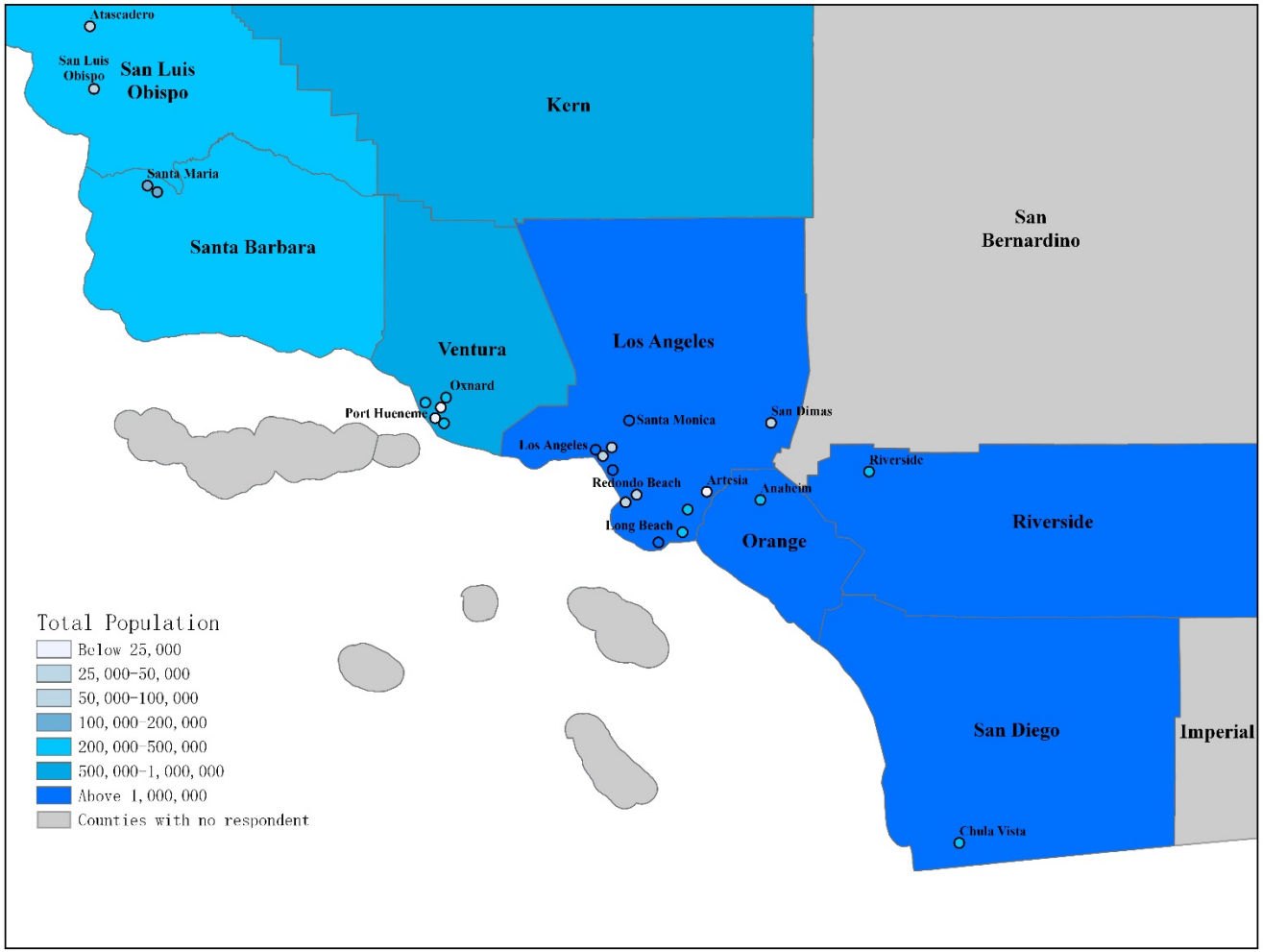
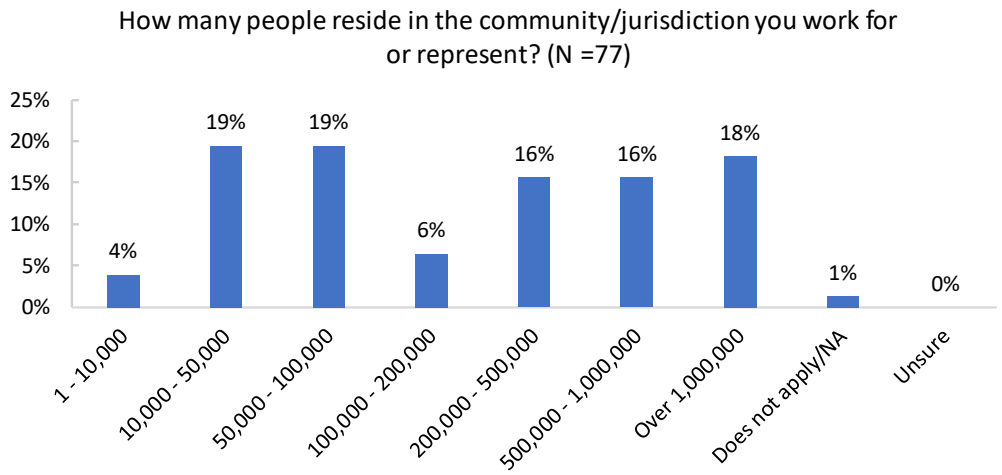


Figure 5 displays the percentage of respondents per jurisdiction population density.

Figure 5. Number of residents in each jurisdiction.



Next, respondents were shown Figure 6, which includes descriptions and graphical representations of different types of built environments. Respondents were asked to select the types of built environment present in their community/jurisdiction. Their responses are listed in Figure 7 below. Only 16% worked in a jurisdiction that contained a rural environment.

Figure 6. Descriptions of the Built Environment.

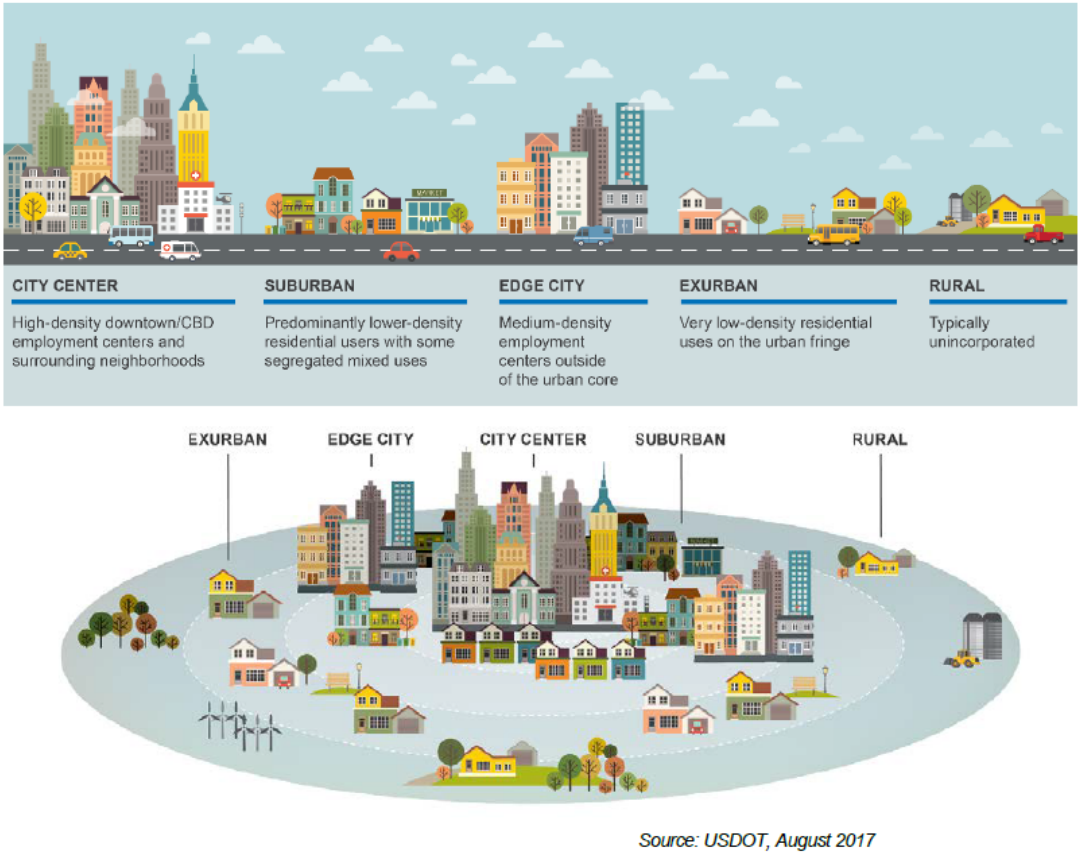
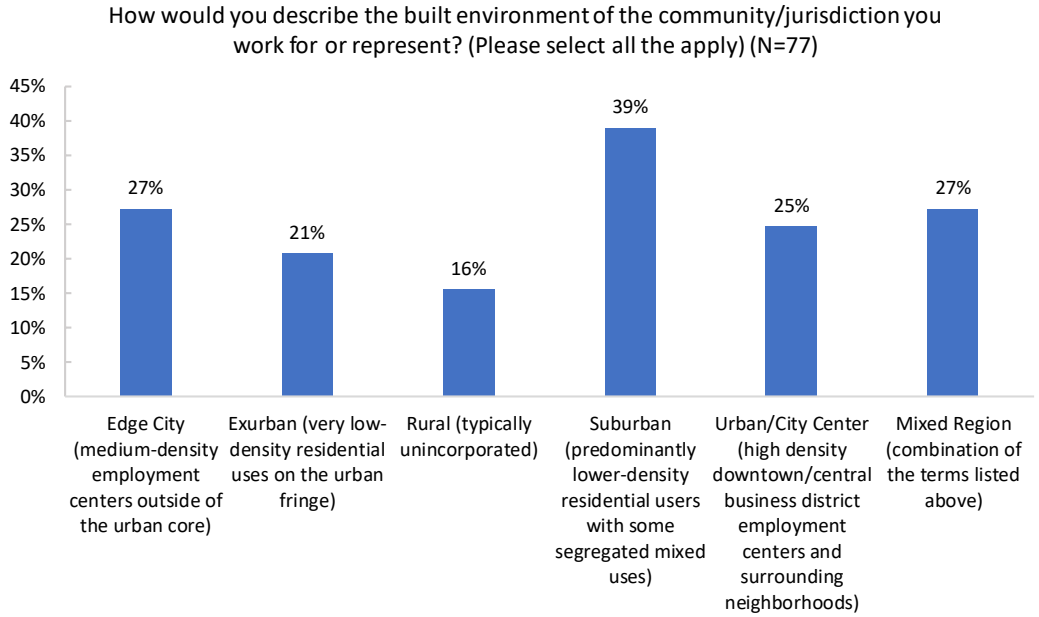
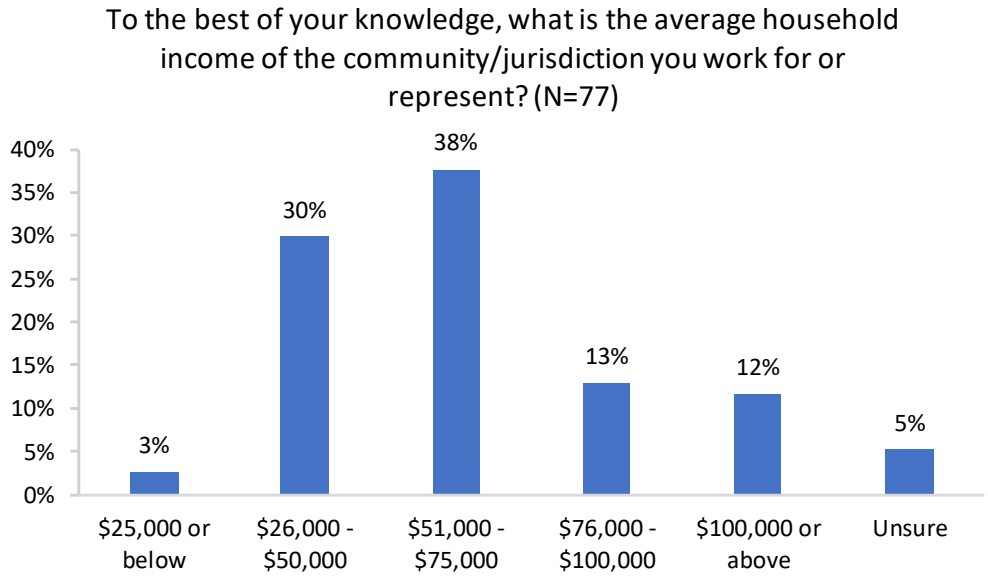


Figure 7. Built Environment Represented by Survey Respondents.



Next, respondents were asked to estimate the average household income of the jurisdiction for which they worked or represented. A summary of their estimates is available in Figure 8.

Figure 8. Estimated Household Income of Jurisdiction



Next, the researchers created maps of the median income for the jurisdictions represented in the survey responses. A few responses were corrected based on the corresponding ACS data (table ACS_16_5YR_S1902).

Figure 9. Median Household Income in Each Jurisdiction with Respondents (Whole California)

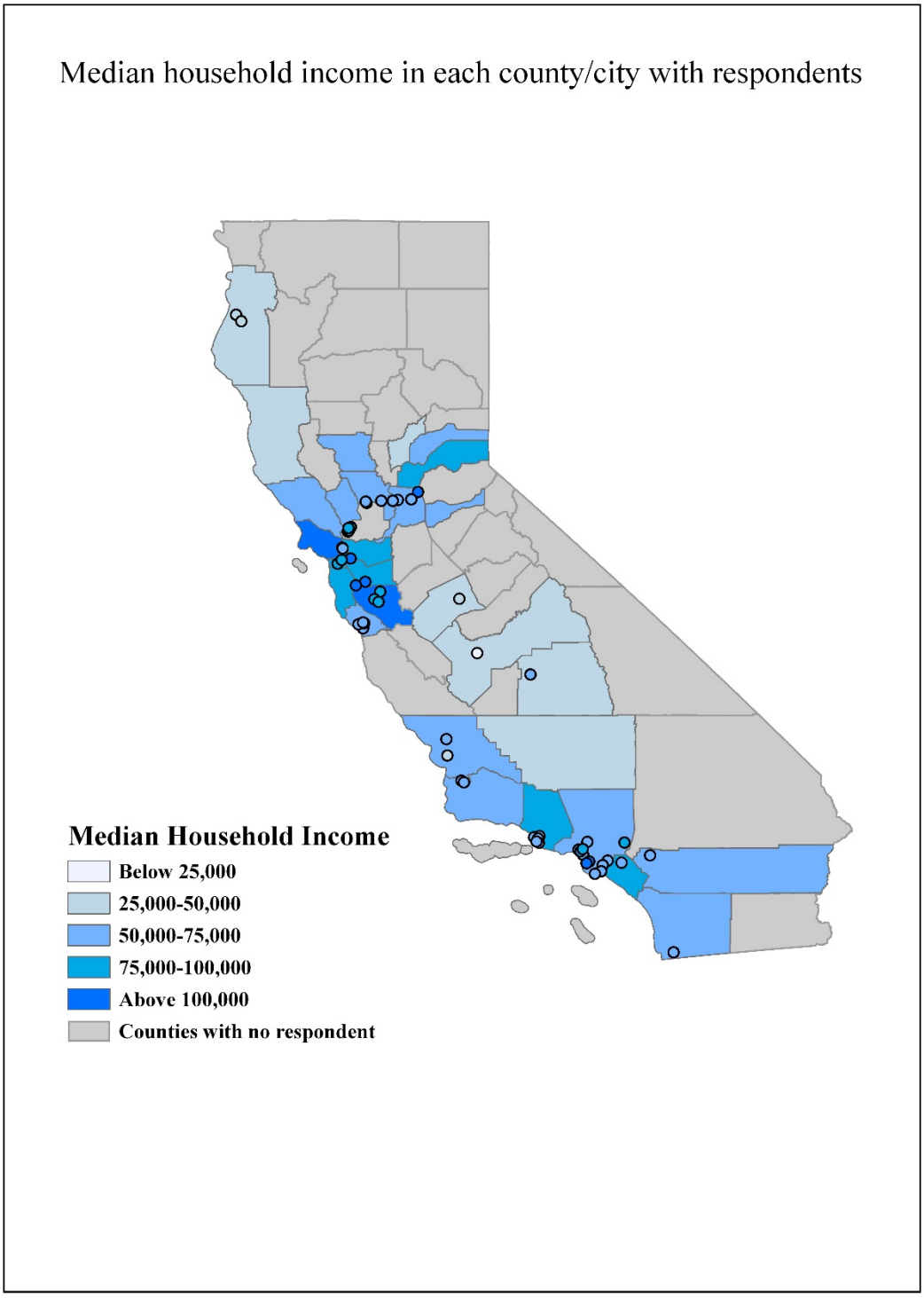


Figure 10. Median Household Income in Each Jurisdiction with Respondents (Northern California)

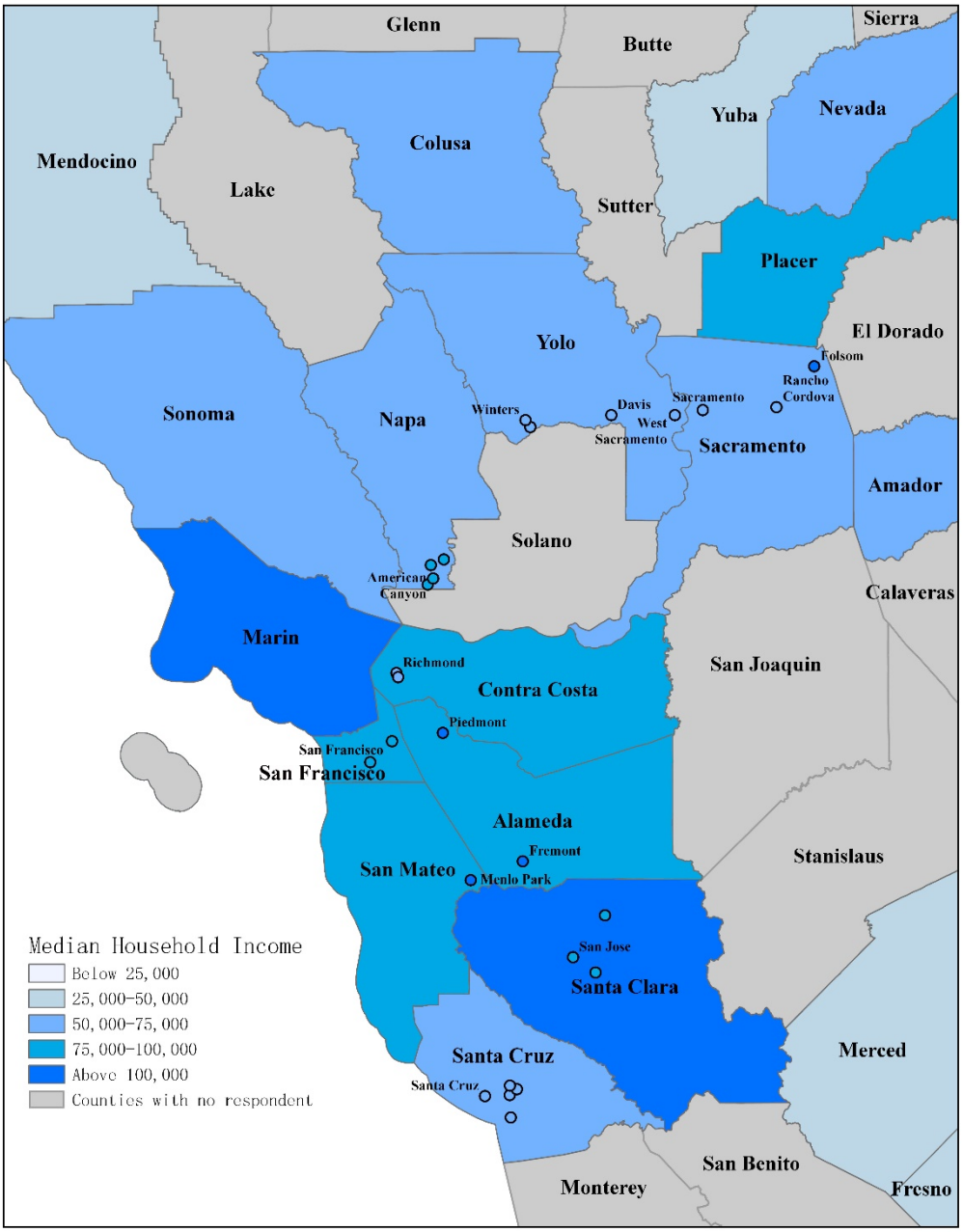
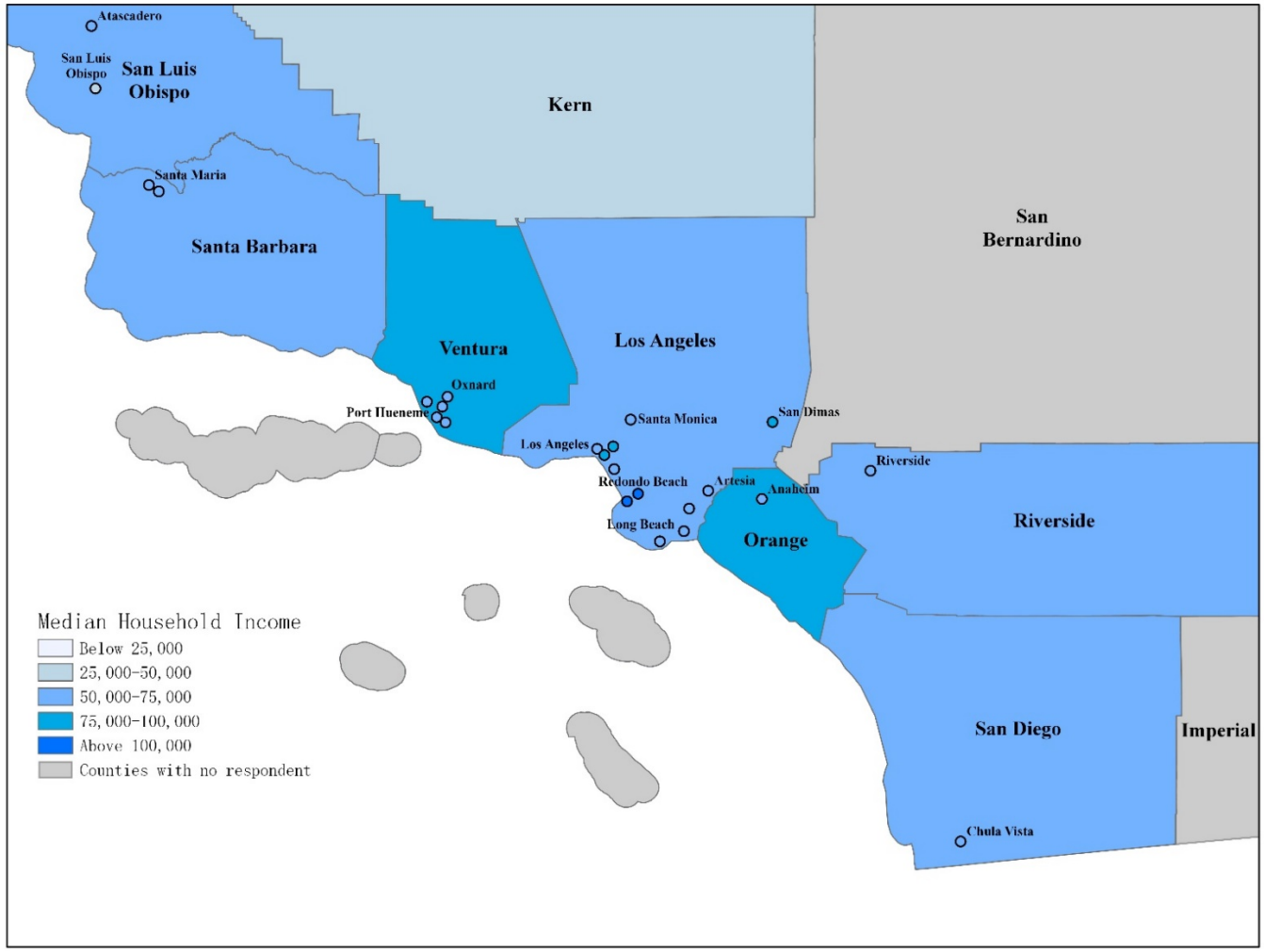
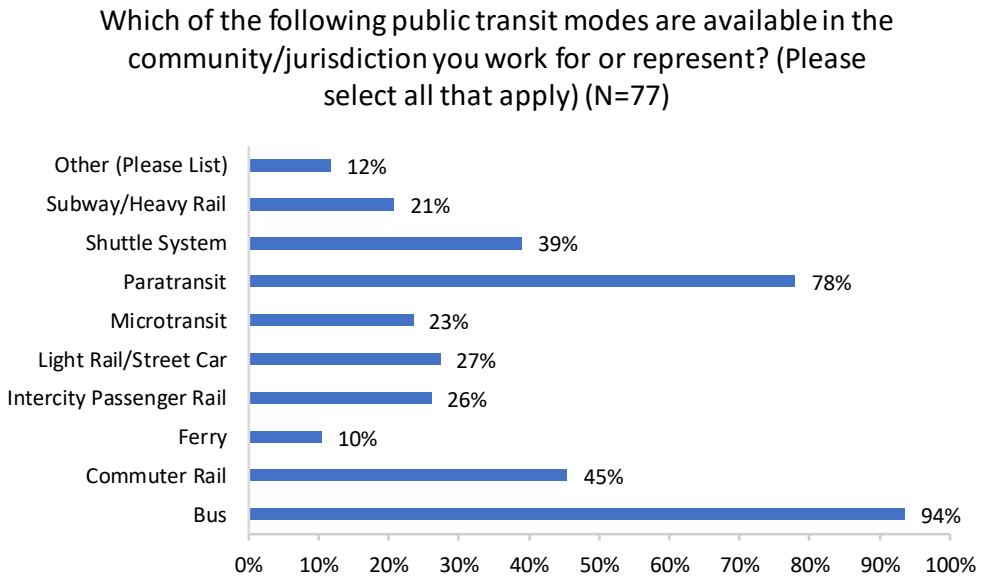


Figure 11. Median Household Income in Each Jurisdiction with Respondents (Southern California)



Respondents were asked to identify the public transit modes available in their community/jurisdiction. The majority had bus services (94%) and paratransit (78%). Under "Other," respondents mentioned bikesharing, scooter sharing, vanpools, an intercity commuter bus, and on-demand microtransit.

Figure 12. Public Transit Available in Jurisdictions



Shared Mobility:

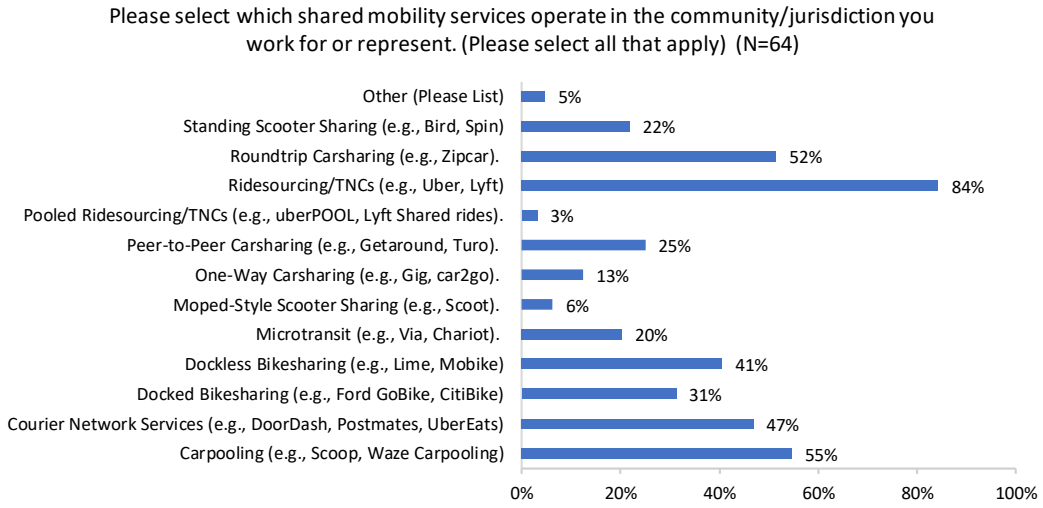
Seventy-eight percent of the 77 respondents had heard of the term "Shared Mobility." Only 16% had not heard the term, and 6% were unsure whether they had heard of the term. After this question, survey respondents were given a definition of shared mobility, as follows:

"Shared Mobility" can be defined as the shared use of a vehicle, bicycle, or other travel mode that enables users to have short-term access to a mode of transportation on an as-needed basis.

Once all the respondents had been familiarized with the concept, they were asked whether the community/jurisdiction they worked for had any operating shared mobility services. Most respondents (83%) did have shared mobility services in their community/jurisdiction, and another 6% of respondents had for this type of service to launch. Six percent had no plans to launch a service of this type in their community and 4% were unsure.

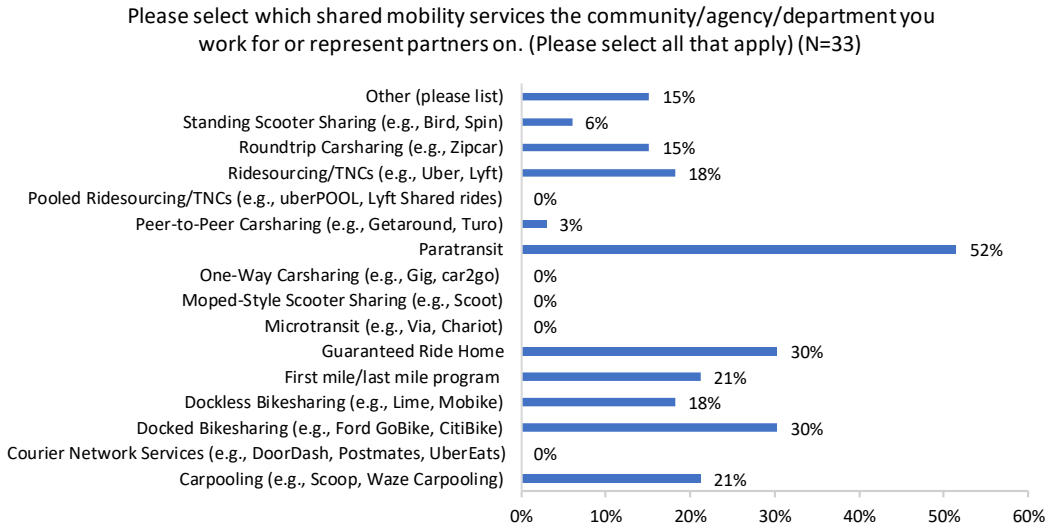
In the next question, the respondents who had shared mobility services operating in their communities were asked to identify the existing services. The breakdown of services is available in Figure 13.

Figure 13. Shared Mobility Services in Operation.



The same group of respondents were also asked whether their community has partnered with any shared mobility provider. This could include partnerships for first-/last-mile connections or for paratransit, among others. Of the 64 respondents, 52% responded yes, 42% responded no, and 6% were unsure. Public/private partnerships most commonly took place to provide paratransit service, guaranteed ride home programs, or docked bikesharing services. See Figure 14 for more details.

Figure 14. Shared Mobility Services Operating with Partnerships.

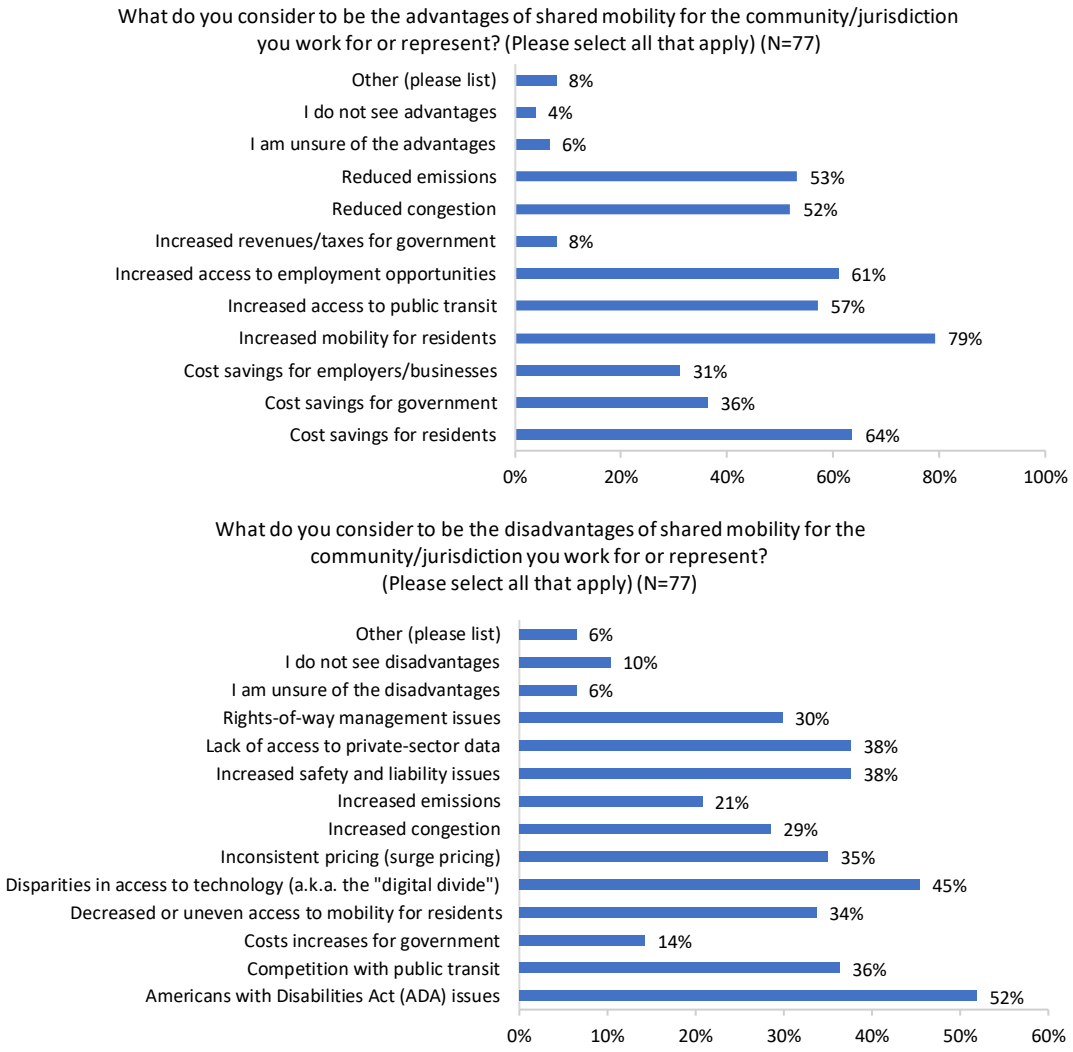


Perceptions of Shared Mobility

Perceptions of shared mobility among the respondents was largely positive. Almost three-quarters of 74 respondents agreed with the statement that "Shared mobility services will improve transportation and quality of life in my community/jurisdiction."

The survey respondents were asked to note the advantages and disadvantages of shared mobility for their community/jurisdiction. Respondents were presented a list of advantages and disadvantages and could select as many as applicable. Increased mobility for residents was seen as an advantage of shared mobility by 79% of all respondents. The majority of respondents also believed that shared mobility provided cost savings for residents (64%), increased access to employment opportunities (61%), increased access to public transit (57%), reduced emissions (53%), and reduced congestion (52%). Only 4% of respondents saw no advantages to shared mobility. Respondents also did not see shared mobility as an opportunity for increased revenue for government, with only 8% choosing this as an advantage. For the disadvantages of shared mobility, the survey respondents were most concerned with equity challenges. Respondents most commonly chose Americans with Disabilities Act (ADA) compliance (52%) and disparities in access to technology (45%) as the disadvantages. See Figure 15 for additional information on perceptions of shared mobility.

Figure 15. Advantages and Disadvantages of Shared Mobility.



Views on the impact of shared mobility on public transportation varied. Of 74 respondents, 34% thought that it complemented public transit more so than competed with it while 11% thought it competed with public transit more than complemented it. Another 35% thought it both competed and complemented existing public transit to the same extent.

To help gauge what community members think of shared mobility services respondents and how operators interact with communities, the respondents were asked whether their community/jurisdiction had received feedback on shared mobility and who issued the feedback. Approximately a third were unsure or replied that the question wasn't applicable. Otherwise, respondents reported varied sources of feedbacks. In descending order: 43% of communities/jurisdictions received feedback from residents, 35% from elected officials, 34% from nonprofit organizations, 29%

from shared mobility operators, 26% from local businesses, and 22% from police/public safety officials. Feedback mainly centered around:

- Safety
- Potential to reduce environmental impact and congestion
- Accessibility
- Equity concerns
- Community interest in obtaining new shared mobility services
- Questions regarding operations

Shared Mobility Policies

Only 21% of 76 survey respondents worked for or represented a community/agency/department that has policies to regulated shared mobility services (one person did not answer). These respondents were asked to identify the policies in place and the type of service the policy applied to. The communities/jurisdictions most commonly had policies implemented for dockless bikesharing, docked bikesharing, and electric standing scooters (Table 3). Popular policies included establishing dedicated drop-off/pick-up locations and a permitting process for shared mobility services. None of the communities/jurisdictions applied taxes, and very few had bans or prohibitions against shared mobility services.

Another 13% of respondents, or 10 respondents, worked for or represented jurisdictions/communities that did not have policies regulating shared mobility services but planned to implement such policies. As can be seen in Table 4 below, most of these policies will designate dedicated drop-off or pick-up locations.

Table 3. Existing Shared Mobility Policies.

	Dedicated drop-off/pick-up locations	Joint marketing	Land-use subsidies (e.g., parking spots, bike racks, etc.)	Permit process	Service-type bans or prohibitions	Signage or markers	Subsidies (discount per ride, etc.)	Taxes	Vehicle or equipment impounding	Other (please list)
Carpooling	13%	0%	0%	6%	0%	0%	6%	0%	6%	0%
Carsharing (One-Way)	25%	13%	6%	6%	0%	6%	6%	0%	0%	0%
Carsharing (Peer-to-Peer)	6%	6%	0%	0%	0%	6%	0%	0%	0%	0%
Carsharing (Roundtrip)	19%	6%	19%	19%	6%	6%	0%	0%	0%	0%
Courier Network Services	6%	6%	0%	0%	0%	0%	0%	0%	0%	0%
Docked Bikesharing	44%	25%	31%	19%	0%	19%	6%	0%	6%	0%
Dockless Bikesharing	44%	25%	19%	50%	6%	6%	13%	0%	13%	0%
Microtransit	0%	19%	0%	19%	0%	0%	13%	0%	0%	0%
Pooled Ridesourcing/TNCs	6%	0%	0%	6%	0%	0%	6%	0%	6%	0%
Ridesourcing/TNCs	13%	6%	0%	6%	0%	0%	13%	0%	6%	0%
Scooter Sharing (Moped- Style)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Scooter Sharing (Standing Style)	19%	0%	0%	31%	13%	0%	0%	0%	13%	0%

Table 4. Planned Shared Mobility Policies

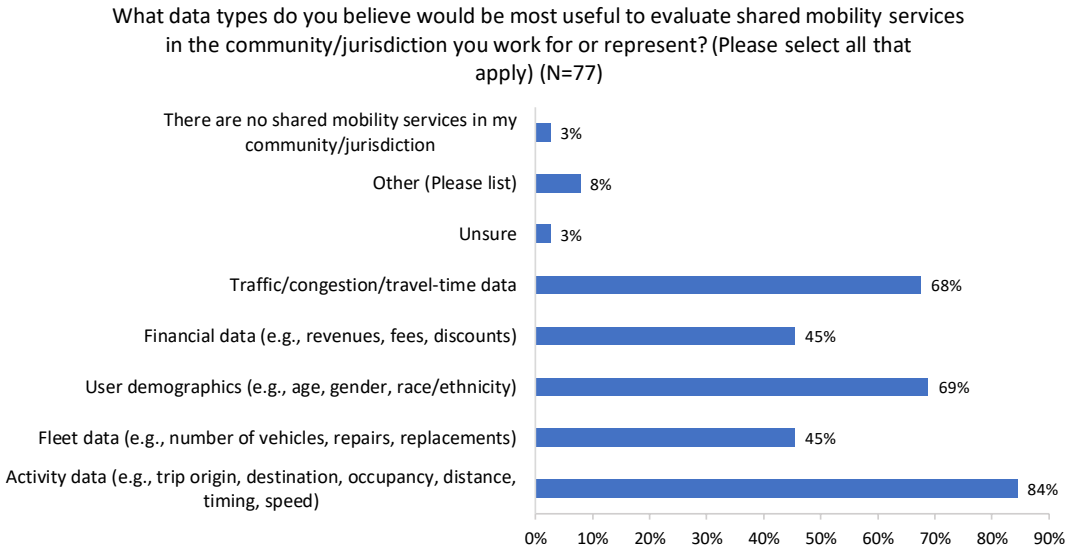
	Dedicated drop-off/pick-up locations	Joint marketing	Land-use subsidies (e.g., parking spots, bike racks, etc.)	Permit process	Service-type bans or prohibitions	Signage or markers	Subsidies (discount per ride, etc.)	Taxes	Vehicle or equipment impounding	Other (please list)
Carpooling	10%	10%	0%	0%	0%	0%	10%	0%	0%	0%
Carsharing (One-Way)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Carsharing (Peer-to-Peer)	10%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Carsharing (Roundtrip)	10%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Courier Network Services	10%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Docked Bikesharing	40%	10%	0%	0%	0%	0%	0%	0%	0%	0%
Dockless Bikesharing	50%	0%	0%	20%	0%	0%	0%	0%	0%	0%
Microtransit	20%	10%	0%	0%	0%	0%	10%	0%	0%	0%
Pooled Ridesourcing/TNCs	10%	10%	0%	0%	0%	0%	0%	0%	0%	0%
Ridesourcing/TNCs	20%	20%	0%	0%	0%	0%	10%	0%	0%	0%
Scooter Sharing (Moped- Style)	10%	0%	0%	0%	10%	0%	0%	0%	0%	0%
Scooter Sharing (Standing Style)	40%	0%	0%	20%	20%	0%	0%	0%	0%	0%

Shared Mobility and Data

Survey respondents were asked a series of questions regarding data availability, the usefulness of different types of data, and resources available for data analysis. Their responses are summarized in this subsection.

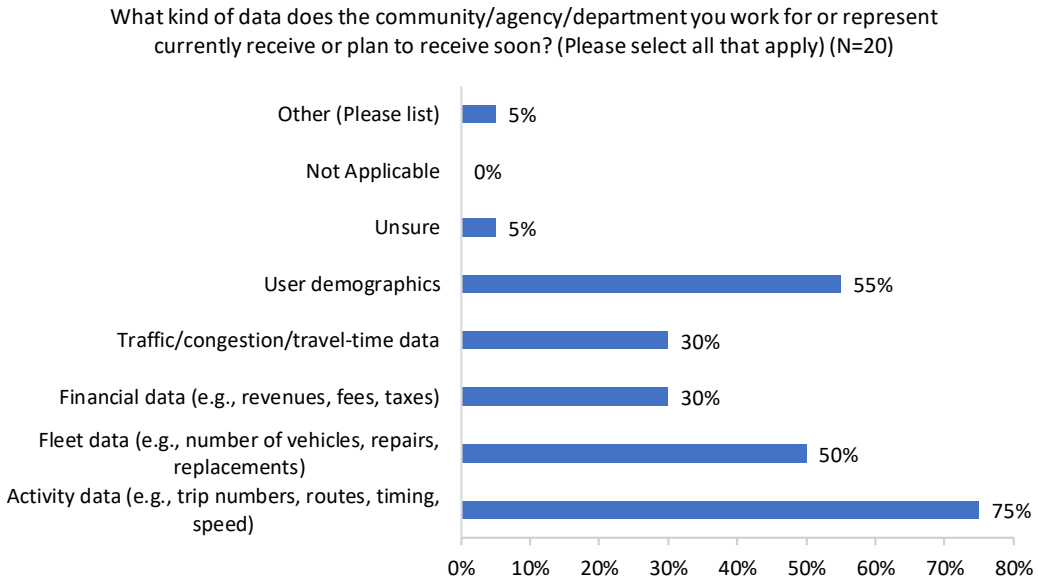
Respondents were asked to select the data types they believed would be most useful for evaluating shared mobility services. Activity data, fleet data, and traffic data were chosen as useful by the majority of the survey respondents. Only 3% of the survey respondents were unsure about the types of data that would be useful, indicating that data is a prescient topic for those implementing and regulating shared mobility services. Full responses are summarized in Figure 16. Six of the respondents wrote in responses to this question and listed data on vehicle fuel type, passenger miles, unlinked trips, deadheading miles/hours, complaints (including civil rights complaints), on-time performance, and modal shift as useful for evaluating shared mobility.

Figure 16. Useful Data for Evaluating Shared Mobility Services.



Of the 77 survey respondents, 26% worked for or represented a community/jurisdiction that currently receives (or plans to soon receive) data from a shared mobility operator. A significant portion (approximately one-fifth) were unsure of whether they received or planned to receive data from an operator. Three respondents did not answer the question. Figure 17 provides a breakdown of the type of data received (or planned to receive). Operators most commonly provided public entities with activity data. The "Other" response is from a community/jurisdiction that receives bikesharing data from neighboring communities.

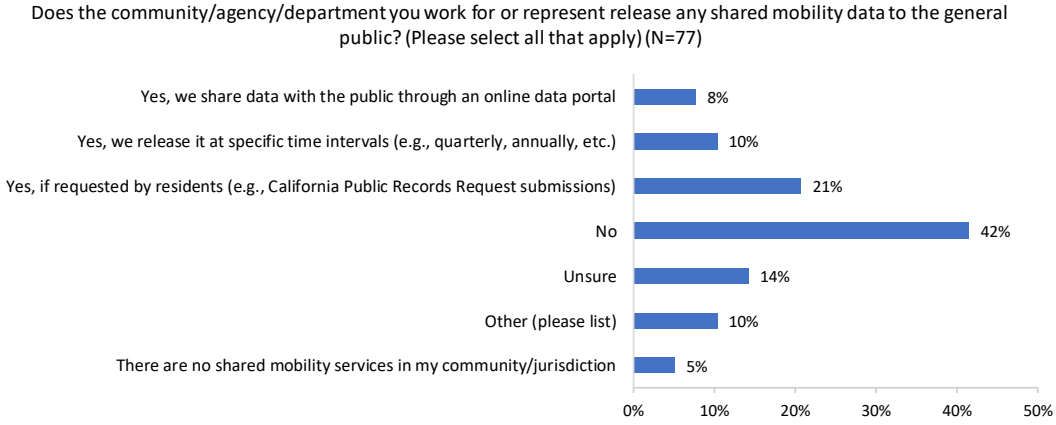
Figure 17. Data Types Provided by Operators.



Of the respondents who noted that their community/jurisdiction received data, approximately half believed their community/jurisdiction had resources in place to analyze the data.

Finally, respondents were asked whether their community/jurisdiction released any shared mobility data to the general public. A summary of their responses is available in Figure 18. Almost one-fifth of the respondents said "Yes." The data is made available through different methodology: 5% make data available through an online portal, 10% release data at specific time intervals, and 14% provide data only if requested by residents. Most of the "Other" responses described a lack of data or preparations to make data available in the future.

Figure 18. Publicly-Available Shared Mobility Data



Planning for Shared Mobility

This survey served as a precursor to the development of the Shared Mobility Toolkit, a resource to help public employees plan for and regulate shared mobility services in their communities. Several of the questions in the survey assessed resource needs and preferred characteristics of educational material.

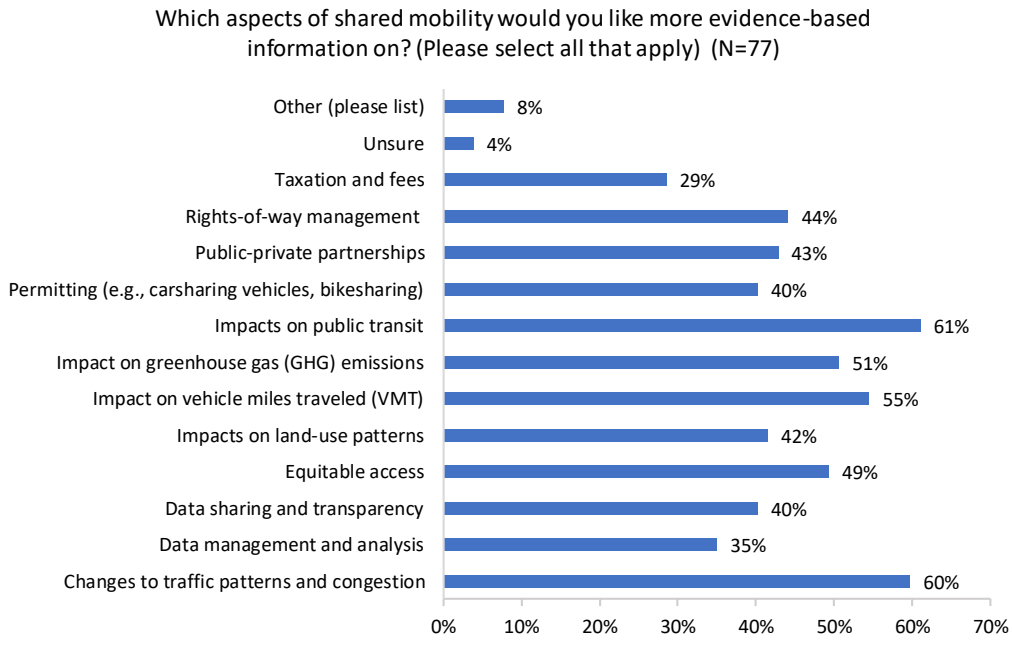
Only 10% of the total number of respondents believed adequate written resources exist for developing and implementing shared mobility policies. Existing written resources that were mentioned include:

- Sonoma County Transit Authority's data analysis on shared mobility projects
- Resources from TCRP
- Resources from SUMC
- Resources from NRDC
- Seattle New Mobility Playbook
- SFCTA's Emerging Mobility Evaluation Report

The remaining respondents did not believe there were adequate resources (47%), were unsure (43%), or thought that existing resources were too high level and not specific to their built environment (9%).

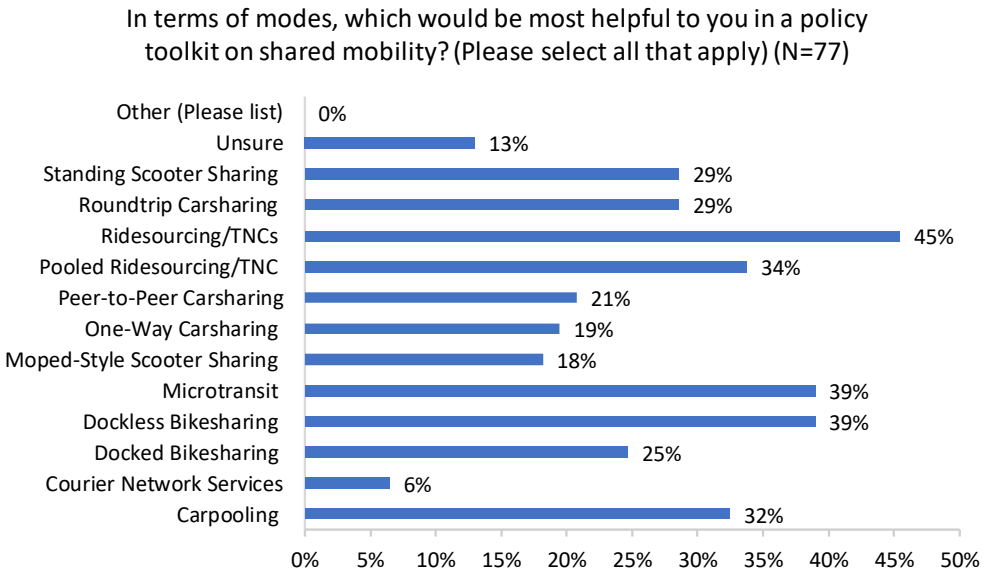
Figure 19 provides a detailed overview of shared mobility topics that respondents would like more evidence-based information on. The percentage amount represents the number of respondents who chose the topic.

Figure 19. Aspects of Shared Mobility that Need Additional Evidence-Based Information.



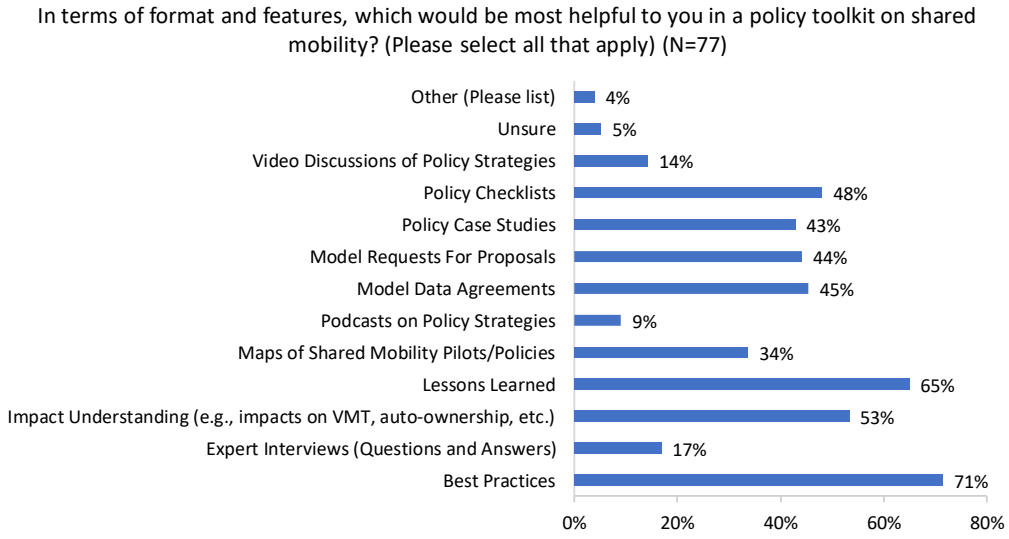
Respondents also chose the shared mobility modes that they would most like to learn more about. Ridesourcing/TNCs, microtransit, and dockless bikesharing were most commonly chosen.

Figure 20. Shared Mobility Modes



Next, respondents were asked what formats and features were most useful for ingesting information on shared mobility for the policy toolkit. Many respondents identified "Best Practices" and "Lessons Learned" as useful features for presenting information in a shared mobility toolkit. Respondents were also interested in understanding the impacts of shared mobility services and example policies and data agreements.

Figure 21. Formats and Features Helpful in a Shared Mobility Toolkit.



Cross Tabulation Analysis:

The researchers performed a cross tabulation analysis to better understand the characteristics of the communities that were familiar with shared mobility concepts and practices. Awareness of the term "Shared Mobility" was lowest among those respondents who worked for communities that have rural and suburban environments (Table 5). However, even for those with the lowest awareness, more than 70% of the respondents had heard of the term. There did not appear to be any trend regarding familiarity with shared mobility and the population density or average household income of a community. Overall, the term "Shared Mobility" was familiar to respondents who worked in a wide spectrum of communities.

Table 5. Cross tabulation for familiarity with shared mobility.

Have you heard of the term "Shared Mobility"?			
	Yes	**No**	**Unsure**
Number of residents in the community/jurisdiction			
1 - 10,000, N=3	100%		
10,000 - 50,000, N=15	67%	20%	
50,000 - 100,000, N=15	73%		
100,000 - 200,000, N=5	80%	20%	
200,000 - 500,000, N=12	67%	33%	
500,000 - 1,000,000, N=12	92%	0%	
Over 1,000,000, N=14	93%	7%	
Does not apply/NA, N=1	0%	100%	
$25,000 or below, N=2	100%		
$26,000 - $50,000, N=23	74%	17%	
$51,000 - $75,000, N=29	86%	10%	
$76,000 - $100,000, N=10	80%	20%	
$100,000 or above, N=9	78%		
Unsure, N=4	25%	50%	
Built environment of the community/jurisdiction			
Edge City, N=21	100%		
Exurban, N=16	88%	13%	
Rural, N=12	75%	8%	
Suburban, N=30	73%	23%	
Urban/City Center, N=19	79%		
Mixed Region, N=21	90%	10%	

Next, the researchers performed a cross tabulation for community characteristics against whether any shared mobility services were present in the community/jurisdiction. As the population density increased in the community, the more likely it was that there were shared mobility services present (Table 6). Most communities, irrespective of their built environment, had some type of shared mobility service. Rural communities were the exception, with around 58% possessing shared mobility services. However, an additional 25% of the rural communities planned to launch shared mobility services.

Table 6. Cross tabulation for presence of shared mobility services.

Are there any shared mobility services in the community/jurisdiction you work for or represent?	Yes	No, and there are no plans for any to launch	No, but there are plans for these services to launch	Unsure
Number of residents in the community/jurisdiction				
1 - 10,000, N=3	33%	0%	33%	33%
10,000 - 50,000, N=15	60%	27%	0%	13%
50,000 - 100,000, N=15	87%	7%	7%	0%
100,000 - 200,000, N=5	80%	0%	20%	0%
200,000 - 500,000, N=12	92%	0%	8%	0%
500,000 - 1,000,000, N=12	92%	0%	8%	0%
Over 1,000,000, N=14	100%	0%	0%	0%
Does not apply/NA, N=1	100%	0%	0%	0%
Average household income of the community/jurisdiction				
$25,000 or below, N=2	0%	0%	100%	0%
$26,000 - $50,000, N=23	87%	9%	0%	4%
$51,000 - $75,000, N=29	90%	3%	3%	3%
$76,000 - $100,000, N=10	70%	10%	10%	10%
$100,000 or above, N=9	78%	11%	11%	0%
Unsure, N=4	100%	0%	0%	0%
Built environment of the community/jurisdiction				
Edge City, N=21	95%	0%	0%	5%
Exurban, N=16	94%	6%	0%	0%
Rural, N=12	58%	17%	25%	0%
Suburban, N=30	87%	3%	3%	7%
Urban/City Center, N=19	89%	5%	5%	0%
Mixed Region, N=21	100%	0%	0%	0%

There were no discernable trends regarding the presence of policies to regulate shared mobility services and the population density or average income (Table 7). Regarding the built environment, none of the rural communities had or were considering policies. Overall, few communities had policies in place to regulate shared mobility.

Table 7. Cross tabulation for policies to regulate shared mobility.

Has the community/agency/department you work for or represent established policies to regulate shared mobility services?				
	Yes	No	Unsure	There are no shared mobility services in my community/jurisdiction
Number of residents in the community/jurisdiction				
1 - 10,000, N=4	0%	75%	0%	25%
10,000 - 50,000, N=15	0%	80%	13%	7%
50,000 - 100,000, N=16	38%	56%	0%	6%
100,000 - 200,000, N=5	20%	60%	20%	0%
200,000 - 500,000, N=12	8%	75%	17%	0%
500,000 - 1,000,000, N=12	25%	75%	0%	0%
Over 1,000,000, N=14	29%	64%	7%	0%
Does not apply/NA, N=1	100%	0%	0%	0%
Average household income of the community/jurisdiction				
$25,000 or below, N=3	0%	67%	0%	33%
$26,000 - $50,000, N=23	13%	83%	4%	0%
$51,000 - $75,000, N=28	32%	64%	4%	0%
$76,000 - $100,000, N=10	20%	50%	30%	0%
$100,000 or above, N=11	9%	64%	9%	18%
Unsure, N=4	25%	75%	0%	0%
Built environment of the community/jurisdiction				
Edge City, N=20	20%	80%	0%	0%
Exurban, N=15	13%	80%	7%	0%
Rural, N=13	0%	92%	0%	8%
Suburban, N=30	27%	63%	10%	0%
Urban/City Center, N=21	29%	57%	5%	10%
Mixed Region, N=21	24%	71%	5%	0%

Finally, a cross tabulation was performed for community characteristics and whether the community received (or intended to receive) shared mobility data. There was no discernable trend among the different demographic variables and community characteristics (Table 8, next page).

Table 8. Cross tabulation with data sharing policies.

Does the community/agency/department you work for or represent currently receive (or plan to soon receive) data from shared mobility operators?	Yes	No	Unsure	There are no shared mobility services in my community/jurisdiction
Number of residents in the community/jurisdiction				
1 - 10,000, N=3	0%	67%	33%	0%
10,000 - 50,000, N=16	19%	50%	19%	13%
50,000 - 100,000, N=15	40%	53%	0%	7%
100,000 - 200,000, N=5	0%	80%	20%	0%
200,000 - 500,000, N=12	17%	33%	50%	0%
500,000 - 1,000,000, N=12	33%	50%	17%	0%
Over 1,000,000, N=13	31%	46%	23%	0%
Does not apply/NA, N=1	100%	0%	0%	0%
Average household income of the community/jurisdiction				
$25,000 or below, N=2	0%	0%	100%	0%
$26,000 - $50,000, N=23	26%	57%	13%	4%
$51,000 - $75,000, N=29	28%	55%	14%	3%
$76,000 - $100,000, N=9	33%	33%	33%	0%
$100,000 or above, N=10	10%	40%	40%	10%
Unsure, N=4	50%	50%	0%	0%
Built environment of the community/jurisdiction				
Edge City, N=21	19%	52%	29%	0%
Exurban, N=16	19%	50%	31%	0%
Rural, N=12	8%	50%	33%	8%
Suburban, N=31	29%	42%	26%	3%
Urban/City Center, N=20	20%	55%	20%	5%
Mixed Region, N=19	37%	32%	32%	0%

Key Takeaways:

The following section documents key takeaways from the online survey deployed to public agency employees. The survey targeted the respondents' perceptions of and experiences with shared mobility services. Results and analyses are summarized as follows:

- The survey, which was deployed online in summer 2018, received 77 complete responses.
- Respondents worked for or represented communities or jurisdictions that varied across average income level, population density, and built environment.
- Most of the respondents had heard of the term "shared mobility" (78%).
- Most of the respondents had shared mobility services operating in their community/jurisdiction (83%).
    - About half of those with shared mobility services participated in public-private partnerships, most commonly to provide paratransit services.
    - Ridesourcing/TNC services were prevalent in the communities that had shared mobility services (84% of the 64 respondents with shared mobility services in their community).
- Perceptions of shared mobility were largely positive. The majority of respondents also believed that shared mobility provided cost savings for residents (64%), increased access to employment opportunities (61%), increased access to public transit (57%), reduced emissions (53%), and reduced congestion (52%).

- Respondents were most concerned with the ability for shared mobility services to meet ADA compliance.
- Only one-fifth of respondents had existing policies to regulate shared mobility services in their community/jurisdiction.
- Similarly, few communities or jurisdictions receive data from operators or plan to receive data.
    - Those who did receive data tended to receive activity data (75% of 20 respondents), followed by user demographic data (55%) and fleet data (50%).
- Only 10% of the respondents believed adequate written resources exist for developing and implementing shared mobility policies.
- Shared mobility services were less prevalent in rural communities; however, even then over half had these services (58%) and another 25% planned to deploy shared mobility services.

Literature Review: Shared Mobility and Modeling

Introduction:

As shared mobility expands across California and the United States, there is a need to understand how these services influence a wide spectrum of land use, density, and built environments. In addition, guidance is needed on how to incorporate these emerging modes into transportation modeling and scenario analysis for MPOs covering a variety of model types, methods, and levels of sophistication. The following literature review seeks to delineate the different ways shared mobility services have been adapted to existing transportation models or have been the basis of entirely new model-types.

External Literature Review:

Researchers at TSRC conducted a scan of peer-reviewed articles, professional reports, and white papers about the integration of shared mobility into transportation modeling, including carsharing, bikesharing, TNCs, microtransit, e-scooters, and AVs. The following section summarizes literature on TNCs, bikesharing, and AVs.

Transportation Network Companies (TNCs)

Of these various modes, a significant amount of work has been done on the role of TNCs given their widespread, rapid growth and their status as one of the longer-running shared modes. Faghih et al. (2018) reviews early attempts using modeling techniques to enhance the understanding of the impacts of TNCs, as well as spatial and temporal differences in their demand compared to traditional taxis. Using one temporal model and two spatial-temporal models based on Uber data provided by New York City, authors found that this method could identify key trends in a number of metropolitan areas that are struggling with congestion brought upon by intense TNC activity (Faghih et al. 2018).

One of the liveliest debates at present is how TNCs affect traffic, congestion, personal auto use, and public transit ridership. There are now an increasing number of studies indicating that TNCs draw riders away from transit more so than they do from those driving themselves (Schaller, 2018), which raises the salience of adapting this shared mode to city and regional transportation models. One attempt to do this from researchers at the University of Washington determined that, from a modeling standpoint, as the percentage of TNC vehicles increases as a percentage of vehicles on the road, VMT will increase (Ban, 2017). Further, they pointed out the TNC's effect on congestion is asymmetric throughout the day; this mode is likely to have the highest impact on congestion during the AM commute as opposed to off-peak times.

Beyond academia and nonprofit research centers, some of the most intriguing modeling applications pertaining to shared mobility originate directly from operators. For example, Uber

has published a number of written posts that detail how its engineers run models to improve the company's performance, which may be adaptable for public-sector applications. One model involves planning for anomalies in TNC demand (i.e., holidays, large special events, and severe storms). To optimize ride availability during these occurrences, Uber generated an "extreme event forecasting model" using historical data and other variables to forecast anomalies in transportation demand over the course of the entire year (Laptev et al., 2017). It is likely that parts of this model could be applied to similar coverage issues and large events for public transportation fleets.

Bikesharing

Bikesharing (both docked and dockless) is also a fast-growing shared mode in the U.S., but one current issue with incorporating these systems into transportation models is that most lack the ability to distinguish bike use between privately-owned bikes or those among shared fleets. The reason this matters is because models that assume bicycles are personally-owned also assume the user will ride their bike for both legs of a trip (such as home to work and work back to home). As bikesharing users often only use a bike for a single leg of their trip (and can make the return trip by transit, or walking, or TNCs, etc.), this nuance is not captured in today's models. Furthermore, with the advent and widespread growth of e-bikes, the question has also been raised of whether models should now consider the type of bicycle being used, given e-bikes can go faster than traditional bikes, and often have longer ranges. Together, these issues effectively represent some of the challenges in terms of the updates needed in models to stay representative of today's shared modes.

Aside from issues of discriminating across bike type, several studies have explored modeling approaches to bikesharing as stand-alone systems. These include predicting bicycle availability (Ashqar et al., 2017) and demand (Tran et al., 2015), as well as how seasonal closures of systems (such as during winter months in cities with inclement weather) can negatively impact ridership (Morency et al., 2017). However, these studies are more isolated in nature, as opposed to exploring the incorporation of bikesharing into comprehensive transportation models used by city planning departments and MPOs. In contrast, Hamilton and Wichman (2016) used data from Washington, D.C.'s Capital Bikeshare to test the effect of the system on the region's notoriously heavy traffic (Hamilton and Wichman, 2016). Courtesy of a dataset that is highly detailed in terms of spatial and temporal traffic, the authors report that the presence of bikesharing docks reduce congestion upwards of 4% at the scale of a neighborhood.

Automated Vehicles (AVs)

Although AVs are still primarily being tested (with some small commercial pilots underway), a number of studies have attempted to model their potential varied impacts. For example, Berrada and Leurent (2017) found that AVs could have large effects on the number of vehicles needed to move the same number of passengers, and that parking demand could be notably reduced even

with modest AV market penetration. The same study also modelled the emission outcomes given the increased efficiency AVs demonstrate in terms of acceleration and deceleration rates (Berrada and Leurent, 2017). Greenblatt and Saxena (2015) found that possibly right-sizing the vehicles in a shared automated vehicle (SAV) network by the trip taken could reduce per-mile GHG emission by 63% to 83% compared to a privately-owned hybrid vehicle by 2030. The authors found even more savings with electric vehicles. However, Ross and Guhathakurta (2017) found that full automation could result in more energy consumption due to induced travel demand. The authors concluded that the environmental impacts will likely depend on the proportion of SAV travel is pooled and the percentage of the fleet that is electrified. Other scholars have pointed out that there needs to be a clear distinction in modeling of AVs between the benefits of connectivity versus automation (Talebpour and Mahmassani, 2016). The former relates to vehicles' ability to share information between each other, and the latter refers to a vehicle's ability to alter its behavior without manual inputs from the human driver.

Another consideration is how AVs may impact mode choice, including existing modes such as personal vehicles, public transit, and walking. A number of studies have attempted to enhance understanding of future mode choice. Using a model based on Austin, Texas, Chen and Kockelman (2016) predicted that a shared fleet of electronic vehicles could comprise of 27% of all trips generated, and that most of these trips would be at the expense of the privately-owned automobile. Davidson and Spinoulas (2016) studied growth scenarios in 2035 and 2046 and found that active transportation modes would increase market share over time even as SAV fleets increased. Sessa et. al. (2015) conducted a survey that found Peer-to-Peer (P2P) SAVs with no pooling could lead to more overall trips and fewer public transit trips, while a system of SAVs owned by a third-party business or government could complement public transit and draw trips away from private automobiles. The authors assumed that as automation increases, the ease with which users can switch between modes of transportation will increase providing first-mile/last-mile access and will reduce the non-monetary costs for using public transportation. The cities that travel behavior models are based on may influence predictions about modal shift. For example, a smaller, vehicle-oriented city like Austin may predict more shifts away from the private automobiles, cities such as Boston or San Francisco with more robust public transportation networks could see more shifts away from transit (Gehrke et. al., 2018) (Hampshire et. al., 2017) (Rayle et. al., 2016). While the impacts of AVs and SAVs are uncertain future mode choice and mode shift will likely vary based on a variety of local factors such as the built environment, service scaling (i.e., fleet sizes), and multimodal connectivity (i.e., the ease in which riders can switch between public transportation and an automated vehicle).

Conclusion

Shared mobility is defined as the shared use of a vehicle, bicycle, or other travel mode. Shared mobility is an innovative transportation strategy that enables short-term access to transportation modes on an "as-needed" basis. The term "shared mobility" includes various forms of bikesharing, carsharing, courier network services, microtransit, ridesharing (carpooling and vanpooling), scooter sharing, transportation network companies (also known as TNCs, ridesourcing, and ridehailing), and other shared services.

This document summarizes findings of expert interviews, small group discussions, a survey of local government employees and representatives, and a literature review. Each section revolves around the impacts of shared mobility services, experiences with the implementation and monitoring of these services, and practices for incorporating shared mobility into transportation planning and modeling. These resources were used to develop the *Shared Mobility Policy Playbook*.

The following provides a brief summary of each section of the report:

Expert Interviews Summary

Ten interviews were conducted in Spring 2018 with city planners, academics, and transportation modelers with experience related to shared mobility. The goal of this process was to gain insight into the extent to which shared mobility has been integrated into transportation modeling, and to probe their opinions on these innovative business models and services.

Interviewees identified examples of how their agencies regulate shared mobility. Key findings throughout the expert interviews include:

- Data from shared mobility operators has thus far been minimally provided, making its integration into planning and modeling difficult.
- Shared mobility is not currently integrated into transportation modeling, but in a few cases, there have been attempts to model the potential impacts of AVs.
- Several MPOs have established policies to improve shared mobility and public transit multi-modal integration, though more data and research is needed to understand the role and impacts of shared mobility on public transportation.
- Experts posited that shared mobility, if deployed strategically, can improve access and mobility to underserved communities, and some felt that public incentives can accelerate this trend.

Small Group Discussions Summary:

Between April 2018 and June 2018, the TSRC research team held four small group discussions across California including: the San Francisco Bay Area, Sacramento, Central Valley, and

Southern California. At each discussion, about 10 to 20 participants (consisting of local officials, planners, and staff of relevant public agencies) touched on the following topics: the presence of shared mobility, policy actions, perceived benefits and drawbacks of shared mobility, equity, and data sharing.

Key takeaways from the small group discussion include:

- Shared mobility is an exciting yet disruptive force for California's local governments.
- Shared mobility has the opportunity to address mobility gaps, but it can also create a number of new concerns.
- Large metropolitan areas have more experience with shared modes than small towns and rural areas.
- Public agencies need more policy guidance, particularly in the areas of rights-of-way management, equity, data sharing, and data management.

Survey Findings Summary:

In Summer 2018, TSRC deployed a roughly 20-minute long on-line survey to public agency employees throughout California. The survey was used to gauge public agency needs regarding shared mobility planning, as well as to inform content and features of the Shared Mobility Toolkit. In total, the survey received 77 complete responses.

Key takeaways from the survey include:

- Most of the respondents had heard of the term "shared mobility" (78%).
- Most of the respondents had shared mobility services operating in their community/jurisdiction (83%).
- Perceptions of shared mobility were largely positive. The majority of respondents also believed that shared mobility provided cost savings for residents (64%), increased access to employment opportunities (61%), increased access to public transit (57%), reduced emissions (53%), and reduced congestion (52%).
- Respondents were most concerned with the ability for shared mobility services to meet ADA compliance.
- Only one-fifth of respondents had existing policies to regulate shared mobility services in their community/jurisdiction. Similarly, few communities or jurisdictions receive data from operators or plan to receive data.
- Only 10% of the respondents believed adequate written resources exist for developing and implementing shared mobility policies.
- Shared mobility services were less prevalent in rural communities; however, even then over half had these services (58%) and another 25% planned to deploy shared mobility services.

Literature Review Summary:

The literature review delineated the different ways shared mobility services have adapted to existing transportation models or have been the basis of entirely new model-types. Researchers at

TSRC conducted a scan of peer-reviewed articles, professional reports, and white papers about the integration of shared mobility into transportation modeling, including carsharing, bikesharing, TNCs, microtransit, e-scooters, and AVs.

Key takeaways from the literature review include:

- *Transportation Network Companies (TNCs)* – There are many documented efforts to model the impact of TNCs on transportation systems, with ongoing debates of how TNCs affect traffic, congestion, personal auto use, and public transit ridership. Some operators have published materials describing their modeling operations and planning and forecasting efforts.
- *Bikesharing* – Transportation models often lack the ability to distinguish bikesharing use from privately-owned bicycles. They often don't capture that users may only ride a shared bicycle for a single leg of their trip (private owners typically use a bicycle for a roundtrip). Models also may not capture electric bicycles, which can travel at faster speeds and often have longer trips. Several studies have approached modeling bikesharing as stand-alone systems.
- *Automated Vehicles (AVs)* - While AVs are still in the testing and development phase, a number of studies have attempted to model their potential impacts. Possible effects include a reduction in the number of vehicles needed to serve passengers, reduced parking demand, varied emissions outcomes, and impacts on mode choice. Outcomes are uncertain. Scholars have pointed out that there needs to be a distinction in modeling AVs between the benefits of connectivity versus automation.

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Appendix A – Small Group Discussion Protocol

Introduction

As part of the development of a comprehensive toolkit on shared mobility policies, small group discussions are being planned with local officials charged with regulating transportation. The goal of these sessions is to gauge their familiarity with shared mobility services, surface policy responses, and determine relevant knowledge gaps to fill. This document represents the protocol for leading these discussions.

Protocol

1. Introductory Remarks
    a. Personal introductions by TSRC staff, LGC staff and attendees.
    b. Brief overview of TSRC's research agenda on shared mobility and SAVs, existing resources for policymakers, and vision for the policy toolkit.
    c. Present definition/overview of shared mobility from FHWA.
    d. Importance/function of these group discussions for toolkit development and outline of questions to follow (printed agendas should be provided).

2. Baseline Questions on Shared Mobility
    a. How familiar are you with the term "shared mobility," and the types of services and products it encompasses? Is shared mobility a form of public transportation? Is public transit part of shared mobility or separate from it?
    b. Does your city/community currently include any services thought of as shared mobility? What are they, and who are they operated by?
    c. Are you familiar with bikesharing, carsharing, ridesourcing/transportation network companies (e.g., Lyft and Uber), ridesplitting (e.g. UberPool, Lyft Line), courier network services (e.g. UberEats, Postmates), and/or microtransit (e.g., Chariot, Via)?
    d. Outside of your official capacity, have you personally used any of these types of shared mobility services? Which ones?

3. Thoughts, Impressions, and Concerns for their Agencies
    a. What aspect of shared mobility interest or concern you the most in terms of its effects on your city/community? (If no immediate responses, we could introduce specific topics, such as parking, traffic, pricing, access, etc.)
    b. Have you taken any official policy action, such as creating a permit process, or adding specific signage, for any aspect of shared mobility in your community? Are you in the process of negotiating with shared mobility operators currently or are you considering any official action in the future? Are you considering how to measure the impact (and/or model) these services on access, car ownership, VMT, congestions, GHG emissions, etc.?

c. What are the biggest benefits (top 3) you see in these types of services currently? What's your hope for its future benefits (top 3)? What are the biggest disadvantages (top 3) currently? What's your biggest worries (top 3) about the future of shared mobility for your community?

4. Best Practices, Lessons Learned, Model Policies, and Gaps/Needs
    a. Are there distinct steps you or your agency/department have taken to improve the integration of shared mobility services into your city/community? What did you do? Have you thought about how equitable shared mobility is in your community? Do all people have access to it (probe on digital and income divide, disabled)?
    b. What lessons have you learned from engaging with your community, as well as shared mobility operators? What would you do differently, if you could start over? Who was present in these conversations, and who do you wish you had heard more from?
    c. Have you developed your own policies and policy tools? Could you please share those with us?
    d. What gaps do you see in available resources for developing policy options for shared mobility (e.g., current resources are too highly aggregated, only reflect certain land use and built environments, do not reflect different temporal scales)? What information would be the most helpful?
    e. What resources have you used to address this type of policy making? Which organizations have you turned to when looking for shared mobility resources?
    f. Is there someone else we should talk with about the development of shared mobility policies in your region and this shared mobility toolkit?

Appendix B – Expert Interview Protocol

I. Introduction

Before we begin the interview, I would like to read this consent form to you and confirm that you agree to participate in this research. (If the consent form has been previously sent, obtain verbal consent.)

II. Preliminary Information

a) Identify name, position, and organization/jurisdiction of interviewee
b) Determine how interviewee's job pertains to Innovative, Shared, or Emerging Mobility Technologies
c)Note date and time during which the interview took place
d) Request permission to record the interview for notetaking purposes

III. Expert Information

I. <u>Shared Mobility Deployment</u>

- **a.** Are you familiar with the terms shared mobility, shared-use mobility, mobility on demand, mobility-as-a-service (MaaS), or transportation-as-a-service (TaaS)? What do these terms mean to you?
- **b.** As a baseline, are there any shared mobility services deployed in your area, such as bikesharing, carsharing, ridesharing, microtransit, or ridesourcing/TNCs?
- **c.** Has there been demonstrated demand for such services? Have shared mobility options expanded, and are there multiple operators in the same modal category?

II. <u>Shared Mobility Policies</u>

- **a.** Does your city/town currently have shared mobility strategies/policies in place?
- **b.** What goals did you have in permitting those services or in enacting specific policies?
- **c.** What initiatives does your city/agency plan on undertaking in the next 3-5 years regarding shared mobility?
- **d.** What do you consider best practice for shared mobility policy to date?

III. <u>General Perceptions</u>

- **a.** As a department/team, how do you plan for innovative, shared, and emerging mobility technologies (e.g., scenario analysis, modeling, surveys, charrettes, etc.)?
- **b.** What are the planning processes your organization uses (e.g., Policy Analysis, Case Studies, Best Practices, Modeling, Sketch Planning, etc.)?
- **c.** Where do you look for information on these topics? (Probe sources, such as websites, publications, etc.)
- **d.** What do you think are the greatest benefits of innovative/shared mobility technologies in your city/county/region (e.g., equity, accessibility, environment, cost effectiveness, etc.)?

e. What do you think are the greatest challenges/drawbacks in incorporating or managing innovative/shared mobility in your city/county/region (e.g., data sharing, security, equity, privacy, etc.)?
f. On a scale of 1-5 (5 being the most), how committed is your city to innovative and emerging transportation technologies?

IV. Measurement and Management
a. What outcomes do you want to achieve by deploying shared mobility strategies? Are these measurable?
b. Do you follow a model for monitoring the implementation of innovative transportation concepts and programs in your city (which ones and why, probe for key examples)? Does monitoring vary across modes? Did you model these policies after approaches from other cities or states (which ones and why, probe for key examples)?
c. What do you consider best practice for measuring and managing shared mobility systems?
d. How do you monitor the progress, response, and usage of shared mobility systems (e.g., third-party evaluations, private sector data, surveys, etc.)? How do you manage data from private operators?
e. How do you enforce regulations for innovative and shared transportation initiatives (e.g., ticketing, parking enforcement)? Thus far, have you needed to curtail a shared mobility service in your area (e.g., impound bikes)?

Experts will be asked a set of questions based on their expertise. More than one set of questions may be asked, if interviewee has expertise in more than one topic area:

V. **Track 1: Theoretical Frameworks**
a. Do you think it would be helpful to have resources to aid in implementing innovative transportation concepts or initiatives? If so, what types of resources? What gaps should be filled?
b. How do you involve different stakeholders (operators, residents, community groups) in the development of innovative transportation projects? Please provide specific examples.
c. What worked well in outreach to different constituencies? Please provide examples.

VI. **Track 2: Leveraging Big Data & Internet of Things**
a. As a baseline, what types of analysis does your city conduct on transportation data?
b. Does your city/agency leverage "big data" and/or IoT (sensors and smart objects) to gather, analyze, and respond to data?
c. Do you require the private sector, including shared mobility operators, to share data with your agency? If so, what types of data are required to be shared?
d. In terms of data analysis, what types of methodological approaches do you use (e.g., machine learning, sentiment analysis, GIS, modeling, etc.)?

e. How do you share data results (e.g., to a board of directors)? Do you publish the data your department collects to the public? Do you have an "open data" policy?

VII. **Track 3: Public Policy:**

a. How are your innovative transportation initiatives funded and organized for ridesourcing/TNC, ridesharing, microtransit? For bikesharing? For carsharing?
b. In what ways does shared mobility impact public transit, and vice versa? Do you think shared mobility complements or competes with public transit?
c. How are your innovative transportation initiatives administered? Please provide examples. Do these vary by mode?
d. Do you consider which neighborhoods/areas have access to shared mobility services when new systems launch?
e. How do you respond to equity challenges such as digital poverty (also known as the "digital divide") and under/unbanked users? Please provide examples.

VIII. **Track 4: Modeling:**

a. Do you model innovative transportation services? Why or why not?
b. If so, why do you model innovative transportation services (e.g., budgeting, city/MPO planning, long-range planning, transportation improvement programs, investment studies, environmental processes, air quality conformity, congestion, etc.)?
c. What types of tools does your agency use? What types of tools would they like to use if budgeting was not a question?
d. What types of challenges have you encountered trying to model innovative transportation services? Do you include data from shared mobility operators in your modeling?
e. What types of transportation alternatives do you model (e.g., TDM policies, no-build/no-implementation, land-use alternatives, modal alternatives/changes, capacity changes, alternative locations, etc.)?
f. What data are needed and how do you obtain it? What data would you like to have (but do not)?
g. How do you use existing models to forecast the impacts of innovative transportation services?
h. How do you develop alternatives to forecast the impacts of innovative transportation services?
i. Do hierarchical vs. traditional grid street patterns impact how you model (or your modeling process)?
j. How is the city represented for computer analysis (e.g., TAZ, census block, census tract, etc.)?
k. How do you evaluate and implement model results? Are these models shared with city officials, other agencies, and/or the public?
l. Do you track the accuracy of the results (i.e., do you compare these to other available models)? If so, how accurate are the results?
m. Have you seen evidence that innovative and shared modes drive future capital investment decisions? If so, how?

IX. Conclusion

a. Overall, what do you view as best practices and frameworks for innovative mobility development at the local level?

b. Is there anything we did not talk about that you would like to tell me?

c. If I have any follow-up questions to clarify any of your responses here, may I call you?

Thank you for your time.

Appendix C – Survey

Introduction:

A key component of the Policy Playbook is an online survey sent out to 700 local governments in California to document existing policies and perspectives on shared mobility. The survey will be distributed to local governments of different sizes and include rural, suburban, and urban communities. The survey will be open for 3-4 weeks following its launch and a reminder will be sent over email to increase participation. The results of this survey will be reported as a working paper in the Policy Playbook.

Section 1: Respondent Information

A. What type of jurisdiction do you represent or work for?

- City
- County
- Consolidated City/County
- Joint Powers Authority
- Metropolitan Area
- Regional Public Agency
- Other (Please List)

A. How many people reside in your government jurisdiction?

- 1 - 10,000
- 11 - 50,000
- 51 - 100,000
- 101 - 200,000
- 201 - 500,000
- 500,000 - 1,000,000
- Over 1,000,000

B. How would you describe the community you work for?

- Rural
- Rural/Suburban
- Suburban
- Suburban/Urban
- Urban
- Mixed Density (Rural, Suburban, and Urban)

C. To the best of your knowledge, what is the median income of your jurisdiction?

- $25,000 or below

- $26 - 50,000
- $51 - 75,000
- $76 - 100,000
- $100,000 or above

D. Which of the following public transit modes does your community currently offer? (Please select all that apply)

- Bus
- Light Rail/Street Car
- Subway
- Heavy Rail/Train
- Paratransit
- Other (Please List)

Section 2: Baseline Questions on Shared Mobility

A. Have you heard the term "shared mobility"?

- Yes
- No [If no, a definition of shared mobility is provided in the next screen, along with examples including bikesharing, ridesourcing, and carsharing.]
- I don't know

B. Does your community currently offer residents any shared mobility services (such as bikesharing, ridesourcing/Transportation Network Companies – e.g. Uber, Lyft – or carsharing)?

- Yes
    - If yes, what type of shared mobility services are currently available in your community? (Please select all that apply)
        - Bikesharing
        - Carsharing (e.g., Zipcar, Getaround, Turo)
        - Ridesourcing/Transportation Network Companies (e.g., Uber, Lyft)
        - Pooling (e.g., uberPOOL, Lyft Line)
        - Scooter sharing
        - Microtransit (e.g., Via, Chariot)
        - Courier Network Services (e.g., Postmates, UberEats)
        - I don't know
        - Other (please list)
- No, and there are no plans to do so
- No, but there are plans to do so in the near future
- I don't know

C. Has there been demonstrated demand for shared mobility services in your community?

- Yes
- No
- I don't know
- There are no shared mobility services in my community

D. Does your agency/department run any of the following services, or partner with providers for first mile/last mile, paratransit, or other public services?

- Yes

  If Yes, please select all that apply:

  - Bikesharing
  - Carsharing (e.g., Zipcar, Getaround, Turo)
  - Ridesourcing/Transportation Network Companies (e.g., Uber, Lyft)
  - Pooling (e.g., uberPOOL, Lyft Line)
  - Scooter sharing
  - Microtransit (e.g., Via, Chariot)
  - Courier Network Services (e.g., Postmates, UberEats)
  - Paratransit
  - Guaranteed Ride Home
  - First mile/Last mile program
  - Other (please list)
- No

E. What do you consider to be the advantages of shared mobility for your community? (Please select all that apply)

- Cost savings for residents
- Cost savings for government
- Reduced congestion
- Reduced emissions
- Increased revenues/taxes for government
- Increased access to mobility for all residents
- Increased employment opportunities
- Increased access to public transit
- Other (please list)

F. What do you consider to be the disadvantages of shared mobility for your community? (Please select all that apply)

- Inconsistent pricing (surge pricing) for residents
- Costs increases for government
- Increased congestion
- Increased emissions
- Lack of access to private-sector data

- Decreased or uneven access to mobility for all residents
- Disparities in access to technology (a.k.a. the "digital divide")
- Rights of way management issues
- ADA access
- Undermining of existing transit system
- Increased safety and liability issues
- Other (please list)

Section 3: Shared Mobility Policies

A. Have you taken any specific action to regulate shared mobility services in your community?

- Yes
    - If yes, please select all that apply:
        - Signage or markers
        - Permitting process
        - Taxes
        - Dedicated drop-off/pick-up locations
        - Subsidy (discount per ride, etc.)
        - Land subsidy (parking spots, bike racks, etc.)
        - Service bans
        - Vehicle/equipment impounding
        - Other (please list)
- No
    - If no, are you considering taking an official action in the near future?
        - Yes
            - If yes, please select all that apply:
                - Signage or markers
                - Permitting process
                - Taxes
                - Dedicated drop-off/pick-up locations
                - Subsidy (discount per ride, etc.)
                - Land subsidy (parking spots, bike racks, etc.)
                - Service bans
                - Vehicle/Equipment impounding
                - Other (please list)
        - No
- There are no shared mobility services in my community

B. Have you been encouraged to regulate shared mobility services in your community by advocacy or nonprofit organizations?

- Yes
- No

- There are no shared mobility services in my community

C. Have you or your office been in contact with shared mobility operators about their current or planned operation in your community?

- Yes
- No
- There are no shared mobility services in my community

D. Who from your community have you not heard from, or not heard enough from, in regards to shared mobility services?

- Residents
- Local businesses
- Police/public safety
- Shared mobility operators
- Other (Please List)

Section 4: Data Sharing and Evaluation

A. Do you currently receive, or plan to soon receive data from shared mobility operators in your community?

- Yes
    - If yes, what kind of data do your currently receive, or plan to soon receive: (please select all that apply)
        - Activity data (trip numbers, routes, timing, speed, etc.)
        - Deployment data (number of vehicles, repairs, replacements, etc.)
        - User demographics
        - Financial information (revenues, fees, taxes, etc.)
        - Traffic/congestion/travel-time data
        - Other (Please list)
- No
- There are no shared mobility services in my community

B. What data types, from the list above, do you believe would be most useful to evaluate shared mobility services in your community? (Please select all that apply.)

- Activity data (trip numbers, routes, timing, speed, etc.)
- Deployment data (number of vehicles, repairs, replacements, etc.)
- User demographics
- Financial information (revenues, fees, taxes, etc.)
- Traffic/congestion/travel-time data
- Other (Please list)
- There are no shared mobility services in my community

C. Do you release any shared mobility data your government collects (either on its own or from operators) to the general public?

- Yes, we release it at specific time intervals (annually, etc.)
- Yes, if requested by residents (e.g., Freedom of Information Act - FOIA) submissions)
- No
- There are no shared mobility services in my community

D. How do you think shared mobility services are impacting (or would impact) existing public transit in your community?

- They will complement existing public transit
- They will compete with and hurt existing public transit
- They will both complement and compete with public transit
- They will have no effect on existing public transit
- I don't know

Section 5: Conclusion and Gaps in the Field

A. Are there adequate external resources to develop and implement shared mobility policies in your community?

- Yes
- No
- I don't know

B. What aspects of shared mobility services would you like more evidence-based information on? (Please select all that apply)

- Permitting
- Rights of way management
- Impact on land use patterns
- Data sharing and transparency
- Taxation and fees
- Public-private partnerships
- Impact on public transit
- Change to traffic patterns
- Impact on vehicle miles traveled and greenhouse gas emissions
- Equity of access
- Other (please list)

B. To what extent do you agree or disagree with the following statement?

"Shared mobility services, as a category, will improve transportation and quality of life in your community."

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

C. What information would you want a policy playbook on shared mobility to include?

[Text Box]

C. Is there anything else you would like to tell us about shared mobility?

[Text Box]