Ridehailing, Uncertainty, and Sustainable Transportation: How Transportation Stakeholders are Responding to the Unknowns Surrounding Ridehailing

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16. Abstract
This study investigates how stakeholders throughout California view the potential impacts of ridehailing services, such as Uber or Lyft, on transportation systems, and how to address such impacts. The stakeholders surveyed included city planning agencies, regional transportation planning agencies, metropolitan planning organizations, state agencies, ridehailing service providers, interest groups, and non-profits. Ridehailing is one of several emerging shared use mobility alternatives, poised to impact transportation systems, for better or worse. For better, if these new services catalyze the development and maturation of well-integrated multi-model transportation systems that serve all travelers and reduce vehicle miles traveled (VMT) and transportation emissions. For worse, if these new services serve merely as a less expensive taxi, allowing more people to forego alternative modes of transportation like public transit and biking, thereby leading to increases in VMT, emissions, and congestion. The high degree of uncertainty surrounding the impacts of these services presents challenges to stakeholders involved in transportation planning and policy making. Through interviews, we investigate the viewpoints of 42 transportation stakeholders throughout the state of California. We find the diversity of interviewees is reflected in the sentiments they have about ridehailing, what issues are important and potential obstacles to achieving positive outcomes. Nonetheless, interviewees agree that regulations should balance local control with state level guidance.

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A National Center for Sustainable Transportation Research Report

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NCST

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Glossary

AV	automated vehicle
CARB	California Air Resources Board
GHG	greenhouse gas
MPO	metropolitan planning organization
NGO	non-governmental organization
TNC	transportation network company
VMT	vehicle miles traveled
ZEV	zero emission vehicle

Ridehailing, Uncertainty, and Sustainable Transportation: How Transportation Stakeholders are Responding to the Unknowns Surrounding Ridehailing

EXECUTIVE SUMMARY

Ridehailing is a recent development in our transportation systems, causing a lot of discussion about what its long-term role may be, and leaving cities and others to address the its potential impacts. This study investigates how stakeholders throughout California view the potential impacts of ridehailing services such as Uber or Lyft, on transportation systems, how they are planning for them, and how to address such impacts. Ridehailing is one of several emerging shared-use mobility alternatives, poised to impact transportation systems, for better or worse. For better, if these new services catalyze the development and maturation of well-integrated multi modal transportation systems that serve all travelers and reduce vehicle miles traveled (VMT) and transportation emissions. For worse, if these new services serve merely as a less expensive taxi, allowing more people to forego alternative modes of transportation like public transit and biking, thereby leading to increases in VMT, emissions, and congestion.

The high degree of uncertainty surrounding the impacts of these services, as well as uncertainty about the potential outcomes of policy approaches, present challenges to stakeholders involved in transportation planning and policy making. How transportation stakeholders view the potential positive and negative impacts of ridehailing and what to do about them is an open question, and one that warrants investigation as these services become more popular and their impacts begin to be understood.

Through interviews, we investigated the viewpoints of 42 transportation stakeholders throughout California—city planning agencies, regional transportation planning agencies, metropolitan planning organizations, state agencies, ridehailing service providers, interest groups, and non-profits. We find the diversity of interviewees is reflected in the sentiments they have about ridehailing, what issues are important, and potential obstacles to achieving positive outcomes. Nonetheless, interviewees agree that regulations should balance local control with state level guidance. The analysis presented here focuses on the discussions of uncertainty in our interviews, and how stakeholders are taking actions in spite of, or in reaction to, the uncertainties surrounding ridehailing and its potential impacts.

Key Findings

Overall, most of the interviewees pointed to a lack of data or information as the underlying reason for their uncertainty. Moreover, the way they talked about uncertainty showed two different perspectives: 1) whether they were uncertain about a specific topic; and 2) the different approaches on how to deal with said uncertainties.

Specifically, one of the key areas driving our interviewees' uncertainty was unknown impacts of TNCs. Comments included: "uncertainty as to what exactly the impacts will be" and "there is sort of a disagreement as to whether or not there is a utopian vision or a dystopian vision."

The uncertainties discussed by interviewees can be summarized in three interconnected areas; transportation, economy, and environment. The connections between these areas are summarized in Figure E-1 below. Some stakeholders are unsure about TNCs having tangible transportation benefits, while others worry about the impacts to public transport. Uncertainties related to the economy included which groups are going to be left out for economic reasons if governments start to incorporate ridesharing in their programs, and the role of government in funding these new technologies. Environmental uncertainties identified by interviewees included their ability to achieve greenhouse gas emission reduction targets.
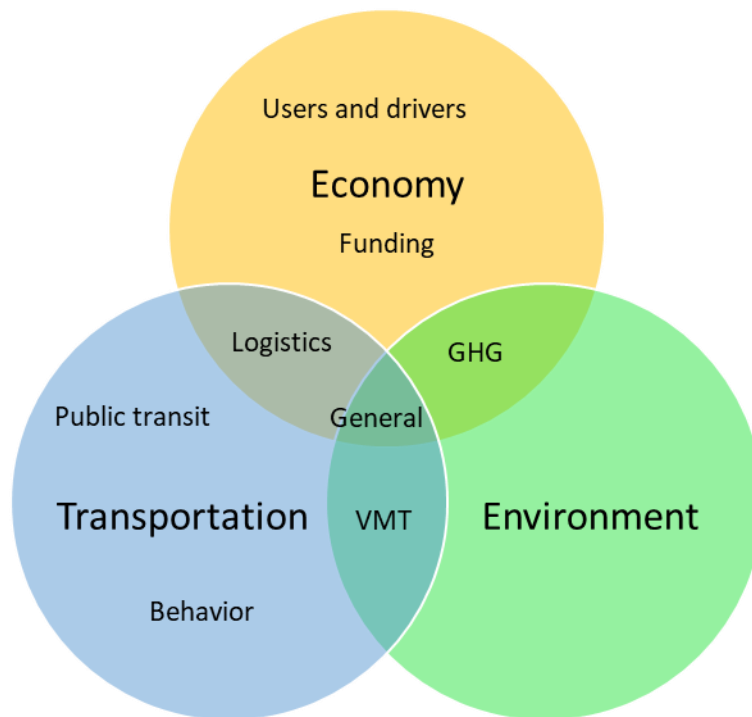
Figure E-1. Areas of impact uncertainty brought up by the interviewees. VMT = Vehicle Miles Traveled. GHG = Greenhouse Gases.

What unites these perspectives is the sentiment that they do not have enough information to address their doubts.

Introduction

This study evaluates stakeholder perceptions of potential environmental and sustainable transportation outcomes of ridehailing (also called ridesourcing or transportation network companies (TNCs)), such as Uber and Lyft, and their perspectives on the policy avenues that might reduce potential negative impacts or facilitate positive outcomes of these services.

The impacts and outcomes related to these services are highly uncertain; they may allow households to shed vehicles, adopt multi-modal travel, and reduce VMT, but they may also replace the use of alternative modes of transportation such as biking and transit, and contribute to increases in VMT and congestion. This uncertainty is marked by the mixed outcomes resulting from early studies, leaving policy makers and planners a wide array of potential actions to address the presence of these services.

On one hand, these services present an opportunity for policy makers and other transportation stakeholders by enabling new ways to achieve a more sustainable and accessible transportation system. It is thought that if the right policies are put in place, these services, along with automated and electric vehicle technologies, can be part of a more sustainable transportation future (Sperling et al. 2018, Schaller 2016)—one that could lead to improved outcomes in transportation in terms of environment, equity, and other impacts. Policy directions that might lead to positive impacts include incentivizing trips with two or more passengers; facilitating intermodal connections with public transit or active modes; and promoting increased use of electric or low-emission vehicles in shared use systems.

We don't yet know the need for, nor the feasibility of pursuing, these or other policy directions on a large scale or in a variety of transportation and policy-making settings. Further, there is not a one-size-fits-all way these services fit into existing transportation systems and the policies needed in one location may be different than those needed in another. Indeed, there is an ongoing dialogue on these topics among transportation professionals, public interest groups, academics and policy makers. This dialogue often presents two potential future scenarios; a heaven and hell (for example see Chapter 1 in Sperling et al. 2018).

In this study we consider how policy makers and planners are thinking about the potential impacts of ridehailing, and the policy directions critical to integrate these services with sustainable transportation goals.

Background

Uncertain Impacts of Ridehailing

There is uncertainty about where ridehailing will go in the future and the long-term impacts these services will have on transportation systems. Ridehailing is relatively new and the long-term impacts are difficult to predict. Positive environmental/sustainability impacts of ridehailing are expected to occur through reductions in VMT, congestion, and related emissions. The potential for these outcomes to be fostered by ridehailing services would occur

when the services permit individuals to use a suite of transportation modes including public transit, walking, and biking, and to shed household vehicles.

Recent studies suggest that ridehailing services, along with carshare (i.e., Zipcar) can affect shifts towards more sustainable transportation patterns, including reduced household vehicle holdings and individual VMT. For example, carshare participants tend to own fewer household vehicles than others (Martin et al. 2010, Dutzik et. al 2013), and ridehailing adopters may have lower VMT (Rayle et al. 2014), less dependency on automobile travel. Though these results do not necessarily demonstrate a causal relationship, they suggest a correlation between the people who choose to use ridehailing and those who own fewer vehicles.

These services also change the landscape of travel options, by providing first and last mile service that is inexpensive and easy to access. At least one study has found that those who use ridehailing services also tend to use public transit (American Public Transportation Association 2016). If these services are used in "pooled" options, they may also decrease per capita VMT. And although some point to ridehailing as a competitor with public transit, and the reason for on-going reductions in ridership, Manville et al. (2018) point out that falling transit numbers preceded the use of TNCs in large numbers, and reductions in transit use should likely be attributed to a number of factors.

Nonetheless, there is a growing body of evidence that ridehailing adopters would have used public transit had ridehailing not been available (Metropolitan Area Planning Council 2018). Others have similarly found that using these services decreases the use of public transit and other alternatives in some cases (Clewlow and Mishra 2017). In addition, it is estimated that these services will add billions of miles of VMT across major U.S. cities (Schaller 2018).

This uncertainty is further fueled by the narratives presented by different actors. Schaller (2018) points out how the ridehailing industry claims they compete with personal vehicles; even when there is evidence that they operate largely in areas with high levels of transit. In addition, as this industry changes, and as companies like Uber and Lyft work to provide their services with autonomous vehicles, the ability to predict outcomes only becomes more difficult. Further research is needed to tease out the pathways leading to inconsistent study results and the uncertainty faced by policy makers and planners stemming from this inconsistency.

Policy and Planning Actions Related to Ridehailing

Initially, policies related to ridehailing or TNCs focused on ensuring fair labor practices; fairness to incumbent for-hire transportation services, such as taxis and limousines; achieving equity in service; and protecting passenger safety. Policies related to these impacts were implemented as the services entered the market, typically in local (and sometimes state) licensing and permitting (Schaller 2016). A more comprehensive overview of the policy issues related to all shared-use mobility alternatives, including ridehailing can be found in a Shared Mobility Primer (Shaheen et al. 2016). Additional policy summaries are presented in the reports: Policy Guide Regulation of Transportation Network Companies (Washington State Joint Transportation

Committee 2019) and The TNC Regulatory Landscape An Overview of Current TNC Regulation in California and Across the Country (San Francisco County Transportation Authority 2018).

Policy directions that might lead to positive outcomes include incentivizing trips with two or more passengers (pooled or multi-passenger trips); facilitating intermodal connections with public transit or active modes; and promoting increased use of electric or low-emission vehicles in shared-use systems. Policies in these areas are in early phases and the goals of this study include an exploratory look at how the development of policies or programs might move forward. Policy mechanisms and programs that could promote positive environmental outcomes include: the use of taxes or fees for single passenger trips, discounts or subsidies for trips that connect to public transportation or other alternative modes, preferential use of the curb and right-of-way for pooled trips, and incentives for increased use of alternative fuel vehicles.

Alternative Fuel Vehicles

One avenue to reduce the emissions impacts of ridehailing is to impose restrictions on the types of vehicles allowed for use in their services, or to set targets for the use of alternative fuel vehicles in ridehailing services. These and related potential policy mechanisms are identified as guiding principles in a December 2017 report produced by the San Francisco County Transportation Authority (SFCTA). Since the launch of this study, one key policy that has been implemented in California is the Clean Mile Standard, Senate Bill 1014, passed in 2018. It requires the California Air Resources Board (CARB) and California Public Utilities Commission (CPUC) to establish means to reduce greenhouse gas (GHG) emissions generated by TNCs. These standards will involve the establishment of baseline GHG emissions from TNCs and set in place targets to achieve reductions in emissions, with TNCs required to report on emissions and to develop GHG emission reduction plans beginning in 2022. These regulations will potentially have a profound impact on the operation and the emissions of TNCs, and they may pave the way for future emissions reduction requirements of other non-fleet-based transportation types.

Existing regulations such as CARB's zero-emission vehicle (ZEV) requirement may also contribute to the use of low emission vehicles in ridehailing. The mandate uses a credit-based system and requires automakers to produce ZEVs and plug-in hybrids in proportion to the total number of vehicles they manufacture each year. The corporate average fuel economy (CAFE) standards may also provide opportunities for ridehailing to operate with better efficiency and improve sustainability.

Infrastructure Benefits

A number of cities throughout the U.S. have policies related to transit operations and the interactions between TNCs and transit. These policies typically apply existing restrictions on the use of dedicated bus lanes and pickup/drop-off areas to public transit vehicles. These policies are relevant to sustainable transportation outcomes for TNCs because the use of dedicated lanes and curb space offer potential ways that pooled services could be incentivized. Namely, granting vehicles with multiple passengers access to such lanes and curb space would

incentivize pooling. In some cities TNCs may use pickup and drop-off areas and other facilities, such as taxi driver relief stands in NYC (though not 100% of these locations). However, there are not currently mechanisms in place that distinguish between the types of TNC trips that could be used to grant pooled trips access to transit of other public facilities.

Connecting with Public Transit

Another approach to ridehailing that has gained momentum throughout parts of the U.S. may reflect an "if you can't beat 'em, join 'em" attitude on the part of public transit providers and municipalities. Public transit agencies have formed partnerships with ridehailing services to augment existing services. Typically, this is achieved by offering discounted ridehailing service to and from public transit stops, or by providing ridehailing services subsidized with public transit funding during late night hours or on weekends.

These partnerships have attracted the attention of researchers, and there is evidence of emerging best practices. These include right sizing; for example, in dense urban locations fixed route transit services may be best supplemented by on-demand services operating late at night, whereas suburban locations are likely to be best served through pilots that improve first and last mile connections (Feigon and Murphy 2018). Another important area of best practices is regulatory consistency. State and federal regulators should provide more detailed guidance for public agencies on how to meet Americans with Disabilities Act (ADA), environmental justice goals, union and other requirements, when partnering with private industry transportation services (Westervelt et al. 2017).

Taxes and Fees OR Multi-Passenger Trips

The mechanisms available to promote multi-passenger or pooled trips are already partially included in the business models of the industry, through discounts. The role of policy in this area would be to increase the availability of these options through industry requirements, or to increase the use of these services where they are available through programs targeting passengers. There is one existing policy along these lines; in New York City, fees assessed on these trips are reduced for multi-passenger trips. A less direct pathway to fee reductions for pooled trips comes through fees levied as a percentage of fares; fees for pooled trips are smaller since the fare upon which they are based is lower through pooled ride discounts.

A number of cities and states collect taxes or fees from ridehailing companies based on trips, either as a percentage of the fare or a flat amount. Only in California are fees leveraged based on revenue. Collected fees and taxes are used for a variety of things ranging from public transit infrastructure to schools or to city/state general funds (Kim and Puentes 2018). In New York City, where fees are assessed as a flat value per trip, fees are lower for trips made with pooled services (Kim and Puentes 2018). This is one of the potential avenues to encourage the use of shared rides. Offering reduced fees and taxes is only possible in areas where fees are collected. Table 1 summarizes the taxes and fees collected in U.S. cities and states.

Table 1. TNC Taxes and Fees in U.S. Cities and States. Reproduced from Kim and Puentes (2018).

	Location	TNC Tax/Fee	When Enacted or Implemented	Disposition of Funds
Cities	Chicago, IL	$0.67 per trip	January 2018	$0.02 to Business Affairs and Consumer Protection $0.10 to vehicle accessibility fund $0.55 to city general fund
	New Orleans, LA	$0.50 per trip originating inside the parish	April 2015	100% to Department of Safety and Permits
	New York, NY	8.875% of total fare	2014	51% to city general fund 45% to state general fund 4% to Metropolitan Transportation Authority
		$2.75 per trip or $0.75 per rider if pooled	January 2019	100% to Metropolitan Transportation Authority
	Philadelphia, PA	1.4% of total fare of trips originating inside the city	November 2016	By Pennsylvania state law: 66.67% to city public schools 33.33% to city parking authority
	Portland, OR	$0.50 per trip	December 2015	100% to Bureau of Transportation
	Seattle, WA	$0.24 per trip on rides originating inside the city	July 2014	$0.14 to Department of Finance and Administrative Services $0.10 to Wheelchair Accessible Services Fund
	Washington, D.C.	6% of total fare	October 2018	17% to Department of For-Hire Vehicles 83% to Washington Metropolitan Area Transit Authority
States	Alabama	1% of total fare	February 2018	50% to Public Service Commission regulator 50% to trip-originating cities and counties
	California	0.33% of total TNC revenue	September 2013	100% to California Public Utilities Commission Transportation Reimbursement Account
	Connecticut	$0.25 per trip	January 2018	General fund
	Hawaii	4% of total fare	January 2018	General fund
	Maryland	State law allows individual counties and municipalities to impose their own per-trip assessments up to $0.25	July 2015	100% to State Transportation Network Assessment Fund Cities assessing maximum $0.25: Ocean City, Annapolis, Frederick, Brunswick, Baltimore Counties assessing maximum $0.25: Montgomery, Prince George's
	Massachusetts	$0.20 per trip	August 2016	50% to trip-originating cities infrastructure 25% to taxi industry assistance 25% to Commonwealth Transportation Fund
	Nevada	3% of total fare	May 2015	100% to State Highway Fund up to $5 million in a two-year period, then deposits into State General Fund
	New York	4% of total fare on trips originating outside NYC	June 2017	100% to state general fund
		2.5% of total fare	2014	100% to Black Car Fund workers' compensation insurance
	Rhode Island	7% of total fare	July 2016	General fund
	South Carolina	1% assessment on total fare	June 2015	1% to Office of Regulatory Staff 99% to State Treasury Trust and Agency Fund
	South Dakota	4.5% of total fare	October 2017	General fund
	Wyoming	4% of total fare	March 2017	69% to state general fund 31% to local governments

Planning Approaches to Sustainability and TNCs

Throughout California, local governments, metropolitan planning organizations (MPOs), and cities acknowledge the potential for on-demand services to enhance mobility and sustainability outcomes. General plans, local ordinances, sustainable community strategies, and climate action plans mention these services among the actions that will improve sustainability and mobility outcomes. For example, the San Diego Forward: The 2015 Regional Plan (SANDAG 2015 p. 70) states, "There's no reason why our regional transportation system can't leverage the power that mobile applications, or apps, and other smart phone features give us – and they will." In the City of Oakland, the Climate Action Plan includes Action TLU-18, to "Encourage and assist employers and transportation funding agencies to offer support for alternative transportation strategies that can help reduce the need to drive. These strategies may include… ridehailing and car share programs…" (City of Oakland 2012 p. 60). Despite the apparent public interest in these services, policy makers at any level have difficulty knowing what actions to take (if any), given the limited information about the impacts of these services. Indeed, many of the plans noted above lack a clear means for incorporating ridehailing into the achievement of sustainable transportation and planning goals.

Further, integrating on-demand services into the strategies for meeting existing regulatory goals, such as those of SB 375, has the potential to improve sustainability and mobility outcomes beyond the levels the industry may achieve on its own. Perhaps ridehailing can reduce total VMT, decrease the number of vehicles on the road, and improve the efficiency of drivers' time, all without substantially impacting the convenience of the service. Though pooling passenger trips may not have been introduced with sustainable transportation goals in mind, it has the potential to be part of the means for improving the sustainability impacts of ridehailing, even more so, if incorporated into local transportation planning and policy.

Where will policy and planning go from here? If policies or programs were to be implemented to draw on ridehailing to address existing transportation challenges, are there certain policies or programs that would be more appropriate at different scales of government, or are there specific groups that should be involved in developing such policies? Schaller (2016) makes a distinction between "who" and "how much" regulation is needed in the case of ridehailing services, noting that these are distinct issues. There are a number of potential policy processes which can involve decision makers and other stakeholders to different extents. Possible processes include co-regulation, bringing stakeholders and policy makers to the table to address the needs of both groups in the policy making process (Cannon and Chung 2015). However, there are potential drawbacks of this approach, such as overrepresentation of industry interests and the possibility of weakened standards.

Strategies for Dealing with Uncertainty

It may be difficult for local governments, and even regional or state agencies to take policy actions because of the high degree of uncertainty surrounding the environmental impacts of ridehailing. Transportation stakeholders may handle this uncertainty about the potential impacts and the best policy avenues to address those impacts in a number of ways.

Following Bijlsma et al.'s (2011) overview of the different methods in which policy makers handle uncertainty, we find that one possible pathway of action for policy makers is to take a passive stand, either from ignorance (unknown unknowns), or recognized ignorance (known unknowns that are not addressed during the policy making process). Policy makers may also adopt avoidance, where the framing of the policy is shifted to avoid the uncertainty coming from measures of effectiveness or feasibility (Swanson et al. 2010; Bijlsma et al. 2011). In the case of TNCs, these passive approaches were widespread during their initial deployment throughout the U.S., with few jurisdictions actively addressing the uncertainties that came with those services by placing a cap on the number of drivers or banning them outright (Brooks 2014; Sachs 2016). Although in some cases this could be linked to the uncertainty of potential impacts, in others, action was driven by external factors, such as to comply with regulations.

A first step towards actively handling uncertainty is to increase tolerance for uncertainty by enacting measures such as transparency and safeguards regarding quality of knowledge and evidence, or by building trust among actors, which addresses procedural uncertainty (van der Sluijs et al. 2008; Bijlsma et al. 2011). Transparency around TNC services has been a key issue limiting jurisdictions' capability to enact policies. Those looking to do more research to reduce their uncertainties have found a barrier in the lack of data shared by ridehailing companies; data has only been available from smaller, non-profit ridehailing services (Tengilimoğlu 2019). This has encouraged city governments around the world to demand more data from TNCs, including through regulations that require publicly available datasets like those in New York City and Chicago (Joshi et al. 2019).

Another way jurisdictions work around uncertainty is by mimicking others. For example, even as best practices are evolving and long-term effectiveness is not known, many U.S. transit agencies have launched partnerships with ridehailing companies. Cities are expected to mimic one another when it reduces the cost of learning or using a novel approach to a relevant policy area (Marsden et al. 2011). It should not be assumed that mimicking or adopting a policy similar to that of another jurisdiction will lead to effectiveness; indeed there are a number of reasons that cities may engage in limited information gathering, and even try a new policy *before* relevant impacts (positive and negative) are well understood (Marsden et al. 2011).

Alternatively, policy makers may rely on scenario building, prediction and modeling, which, according to Marchau et al. (2010) is a strategy that assumes "that the future can be predicted well enough to develop a static policy that will produce acceptable outcomes in most plausible future worlds" (p. 940). This approach, also known as ´predict and act,´ increases uncertainty tolerance (Bijlsma et al. 2011) and is commonly used in transportation policy (Navarro-Ligero et al. 2019). Although it incorporates different scenarios some fields of uncertainty may be left

out; such as economic and demographic changes and technological breakthroughs. This may limit the capacity to address short-term changes brought about by external drivers (Marchau et al. 2010). Therefore, incorporating TNCs into transportation models, does not improve the ability of such models to address unanticipated impacts. Moreover, law scholars argue that static approaches to policy making, like in the case of the taxi industry, led to policies that drove the creation of TNCs in the first place (Strong 2015, Sachs 2016, Wyman 2018).

On the other hand, adaptive management and dynamic policies have been suggested as tools that acknowledge anticipated as well as unanticipated outcomes, actively integrating uncertainty in the policy making process (Navarro-Ligero et al. 2019). Rather than following optimal solutions for a single anticipated future, adaptive policy making has the capability to address changes through learning, and therefore focuses on building robustness for a range of futures (Swanson et al. 2010). Additionally, adaptive management expands the meaning of expert knowledge by incorporating the diverse epistemologies of the communities that have stakes in the issue at hand. Another important benefit of adaptive policies is that implementation does not have to be delayed until all uncertainties are resolved, and at the same time, its integrative approach allows it to reduce uncertainty both from knowledge about the issue and about the procedural outcomes (Bijlsma et al. 2011).

However, there are more areas that work towards overall uncertainty reduction that have not been completely followed in the case of TNCs. Specifically, in terms of acquiring more knowledge or doing more research, establishing best available knowledge, defining procedures and involving influential stakeholders (van der Sluijs et al. 2008; Bijlsma et al. 2011). In the case of research, jurisdictions looking to take up or replicate initiatives like partnerships are concerned about the small amount of studies or results showing the efficiency and success of those programs (Moran et al. 2017). However, some have started to actively address that issue, like the aforementioned cap enforced by the New York City Council, which determined a one-year limit in order to review the results and determine future policy directions. On the other hand, procedure establishment and the involvement of influential actors has been addressed through calls for the state or federal agencies to set more guidelines regarding TNCs, including performance metrics and best practices.

Finally, as stakeholders of different types seek actions related to the uncertain future of ridehailing, they will encounter hurdles, and will also be limited by their available resources and level of motivation (Krause 2011). Krause (2011) finds that local-level characteristics including demographics, city size, education rate, income levels, and political tendencies are all relevant in the adoption of climate policies among U.S. cities. There are a number of additional approaches that have been proposed to guide these services in ways that will safeguard consumers and improve their integration with transportation systems, and potentially align them with sustainable transportation goals (for an overview see Shaheen et al. 2016 or Schaller 2016).

Local Versus State Authority

A final policy area relevant to environmental outcomes of ridehailing is the extent to which the state retains all authority over the regulation of these services. The balance of state and local authority is addressed in a recent report titled "Regulation of Transportation Network Companies Policy Guide" produced by the Washington State Joint Transportation Committee (2019). There are a number of ways that states may allow local agencies and governments (i.e., cities) to regulate these services. The balance of local and state authority is important as there are a variety of opportunities to address VMT, emissions, and congestion issues at the local level. Further, integration with transit and the partnership involving ridehailing are formed and managed by local agencies or transit authorities. Connections with bikeshare or other systems are also locally regulated. Figure 1 presents some of the alternative means to balance state and local authority.

PRE-EMPTION

Most states pre-empt local regulatory authority, but some have created carve-outs or exemptions to the state pre-emption. Examples of each are summarized below.

- Nevada and New York allow **carve-outs** for their larger cities. Vermont has a time limited population carve-out until 2022.

- Illinois and South Dakota's laws **set minimum regulations** that all governments must follow, but cities have authority to be more restrictive than these minimum standards.

- In states like Alabama, Alaska, and New York, local jurisdictions can **opt out of state regulation** by not allowing TNCs to operate in their city or town.

- Nebraska has **no state pre-emption.**

- Some states have **specific exceptions to state pre-emption.** For example, Kentucky allows the City of Louisville to determine their own driver requirements; Maryland allows cities collecting fees prior to January 2015 to continue doing so if they are higher than the current rate; and Alaska's municipalities can regulate TNCs' trade dress (logo, insignia, or other emblem identifying the TNC company that is visible from the exterior).

Figure 1. Balance of State and Local Authority over TNCs. Reproduced from Washington State Joint Transportation Committee (2019).

Methods and Data

This section describes the interview data collection and the coding of the interviews. We conducted semi-structured interviews to assemble stakeholder perspectives on the potential for on-demand ride services to improve sustainability outcomes in transportation and to gain insight into what policy mechanisms, and at what scale of government they should be pursued. Interviewees were stakeholders from a variety of sectors within California, working on transportation, environmental resource protection, or involved in the ridehailing industry. This section provides an overview of the interview research methods.

Sample

This study aims to capture the viewpoints of stakeholders from many different roles in planning and policymaking related to transportation. We focus on the concept of stakeholders, because the potential impacts of ridehailing are relevant at all levels of planning and policy making in transportation systems as well as for advocacy and interest groups. Stakeholders invited to participate included representatives from California State agencies related to transportation and/or the environment such as the CPUC and CARB. We also included stakeholders within regional and local governments, such as representatives from MPOs, regional transportation planning authorities (RTPAs), and city-level community development and/or transportation planners from throughout California who are involved in the regulation of and planning for TNCs in their areas. Additional stakeholders we invited were from the ridehailing industry and non-profits and non-governmental organizations (NGOs) involved in equity or sustainability related to transportation.

Table 2. Interview Participants by Sector

Target Group	Total Population	Sample Goal	Invitations (estimated**)	Interviews Completed	Response Rate (estimated**)
City Planning Agencies – 26 Randomly Selected Cities	Approx. 430	10	39	11	31%
City Planning Agencies – 26 largest cities in California	26	10			
Regional Transportation Planning Agencies and Metropolitan Planning Organizations, including County Transportation Commissions	44	20-25 (combined)	44	17	36%
State Agencies	12	10	9	5	55%
Ridehailing Service Providers	11*	10	3	1	33%
Interest Groups and Non-profits	25	10	42	8	19%
Total**	**70-75**		137	**42***	31%

There were 11 companies with TNC permits in CA at the time of project initiation.
***Invitations and response rates are estimates, because these only include invitations sent via email, and not interviews that we were able to set up over the phone*
****A total of 42 interviewees participated, from 39 organizations and agencies.*

Other stakeholders considered for participation were county planning departments, transit agencies, and air quality management districts. These were not included in order to keep the scope of the project manageable; to distinguish this project from our other research efforts;

and to avoid possible interviewee fatigue that might arise if participants were invited to too many studies. Table 2 presents the planned and final counts of interviewees from each sector.

The interviews were completed from late January to late March in 2018. A senior member of each agency or organization was invited, by email or by phone, to participate in an interview. It was not possible to find the correct contact information for all agencies and organizations, this complicates the response rate calculations, these should be viewed as estimates, as in some cases multiple calls were made but did not lead to an eventual interview.

Invitation emails requested that the initial contact forward the invitation to a more appropriate colleague, if applicable. Interviews were completed over the phone and ranged from 20 to 40 minutes. In a few cases, more than one participant from an agency was interviewed; in one case two individuals were interviewed separately; these are treated as two separate interviews. In the other cases the original interviewee was joined by colleagues whom we had not anticipated. These are treated as single interviews, and this is not expected to introduce bias into the responses. In total, 42 individuals from 39 California agencies and organizations participated.

Interview Content

The interviews consisted of 13 questions across three sections. We gathered background information about the organizations; how large they are, who they serve, and what types of environmental and/or transportation activities they are involved in. The second section covered perspectives on policies related to ridehailing. This section also asked about discussions and policy activities, as well as hurdles for policies that might enable on-demand transportation services to increase multi-passenger trips or otherwise improve sustainable transportation outcomes. The third section of the interviews covered the policy process with questions about who the stakeholders talk to about these topics, who they want to talk to, and what governmental venues or levels are best suited to address the potential impacts of ridehailing. Additional questions and clarification were provided as needed. Information was also gathered about the professional experience of the individual completing the interview.

The interview script was modified over the course of the study to better outline the relevance of the project to participants and to improve question clarity. Notably, we shifted the focus of the interview questions from increasing the use of pooling in ridehailing, to addressing the sustainable transportation impacts of ridehailing services more broadly.

Codebook Development

Development of the codebook and coding of the interviews was performed by two coders. The coders familiarized themselves with the content of the interviews during the transcription process, as suggested by Corbin and Strauss (2008). From there, a summary of the answers was encoded in a data frame in order to have a preliminary visualization of the main topics emerging from the interviews. Subsequently, a codebook was developed through two iterations that followed two different approaches on how to determine the themes, the first one being a

structural approach and the second one by coding for content, also known as open coding (Benaquisto 2008; Corbin and Strauss 2008; Guest, MacQueen, and Namey 2012).

For the first iteration, the main themes were determined according to the design of the interviews, following the structure of the questions and allowing for a fractured structure where codes could be identified in later instances even when the answers were not related to the question asked at the moment (Guest, MacQueen, and Namey 2012). An intercoder reliability (ICR) test was carried out for the first codebook, in which six interviews were selected according to the type of organization the interviewee belonged to (NGO, MPO, industry, city, county, and state government) to account for the differences from each one, and complying with the recommended minimum 10% subset of the whole set of 39 interviews (Campbell et al. 2013). Overall accuracy was measured by counting the number of equal codes and dividing it by the sum of all the codes identified. For all the interviews the accuracy was below 50%, as shown in Table 3.

Table 3. Overall accuracy of the first ICR test

Interview	Overall accuracy of the coding (%)
1	39.4
2	43.5
3	45.2
4	30.3
5	23.3
6	25

Given the low level of reliability, the two coders analyzed the discrepancies in their coding and modified the codebook to incorporate issues identified from the first iteration. They then performed a second ICR test with five interviews, again trying to account for the different organizations represented in the data. The same measure of accuracy was applied, which is shown in Table 4.

Table 4. Overall accuracy of the second ICR test

Interview	Overall accuracy of the coding (%)
1	46.7
2	44.4
3	28.6
4	30.0
5	42.3

Although the level of accuracy was generally higher, it was still lower than 50%. After discussing the discrepancies again, the coders re-created the codebook, using the open coding approach

where themes and subthemes were identified as they emerged from the answers rather than from the interview structure. As seen in the final codebook (see Appendix 2), a broader code was generated for the context in which the interviewees arrived at the answers, since during the interview they would oftentimes change their answers from talking about TNCs to autonomous vehicles (AVs), public transportation services, partnerships, or transportation in general. This umbrella code for each category (A= Public programs, B=Partnership, C=TNC, D=AV, E=Transportation in general) precedes the rest of the categories which have to do with the broader themes that emerged from the answers (for example, VMT, equity, or congestion). However, some elements of the previous codebook that were identified as useful were retained for the new codebook. For example, the categories of potential policy avenues and appropriate scales of implementations are derived from the interview questions and therefore, still follow a structural approach. Hence, the final code is read the following way:

1. Identify the context in which the speaker is talking (codes A, B, C, D, E).
2. Identify the broader theme (1-16).
3. For each broader theme, identify its:
    a. Subthemes (Roman numerals)
    b. Categories (Lower case letters), and/or
    c. Values (positive + or negative –)

Using this approach, one would categorize someone talking about taxes as a positive potential policy avenue for TNCs with the code A2II+, where:

1. A (TNC)
2. 2 (Policy avenue)
3. II (Tax)
4. + (positive)

The coders also determined that an intercoder agreement approach was more useful for this study than pursuing intercoder reliability. Unlike intercoder reliability, which looks for the coders to select the same code for the same unit of text in isolation, the idea of intercoder agreement is for the coders to discuss their discrepancies about a code and conjointly arrive at a desired result in relation to the meaning of a unit of text (Campbell et al. 2013). The rest of the coding followed this approach.

Results

Throughout the interviews, "uncertainty" in relation to TNCs appeared 45 times. In addition, there are 6 times uncertainty is coded in relation to AVs, and one time related to partnerships. Uncertainty was noted by 23 out of 38 of the interviewed agencies (some were repeated in the same interviews).

We interviewed one TNC in the course of this study, but their interview was not included in the analysis related to uncertainty. Overall, most of the interviewees pointed to a lack of data or

information as the underlying reason for their uncertainty. At the same time, the way they talked about uncertainty showed two different perspectives: 1) whether they were uncertain about a specific topic; and 2) the different approaches on how to deal with said uncertainties. Taking these two perspectives as a starting point, we identified the topics and approaches mentioned throughout their interviews, arriving at a total of 52 instances where they mentioned the topics with which there uncertainties were related (Table 5), and 26 where they talked about strategies they or others use to address uncertainty (Table 6).

Table 5. Topics on which the interviewed agencies identified uncertainties related to TNCs.

Sector / Type (N = 52)	Extent (3)	Impacts (13)	Policy (10)	Technology (14)	AVs* (3)	Policymakers concerns (7)	Users concerns (1)	Industry concerns (1)
State (4)	1	1	-	1	1	-	-	-
MPO (9)	-	2	3	2	-	1	1	-
NGO (31)	1	7	5	10	1	6	-	1
City (8)	1	3	2	1	1	-	-	-

AVs = Automated Vehicles.

As seen in Table 5, one of the key areas driving our interviewees' uncertainty was that of the unknown impacts of TNCs. Besides mentioning a general "uncertainty as to what exactly the impacts will be" and confirming that "there is sort of a disagreement as to whether or not there is a utopian vision or a dystopian vision," some were more specific on the types of impacts they were uncertain about, which are summarized in Figure 2. Some are unsure about TNCs having tangible transportation benefits, while others worry about the impacts that they are having on ridership of public transport. Another issue is that of economic uncertainties: which groups are going to be left out due to economic reasons if governments start to incorporate ridesharing in their programs? How should funding new technologies be addressed inside of government? Some perspectives were about "the logistical things" like parking, insurance, and liability. Finally, others recognized that their worries were more environmentally related, for example, one agency was worried about the uncertainty that the introduction of TNCs had created around their ability to achieve their GHG emission reduction target, while one NGO mentioned the following: "Most of our populace is already engaged and has their opinion on whether these services are making life easier for them individually. It's a matter of: are we leading to greater mobility options, at the same time reducing our environmental impact?"
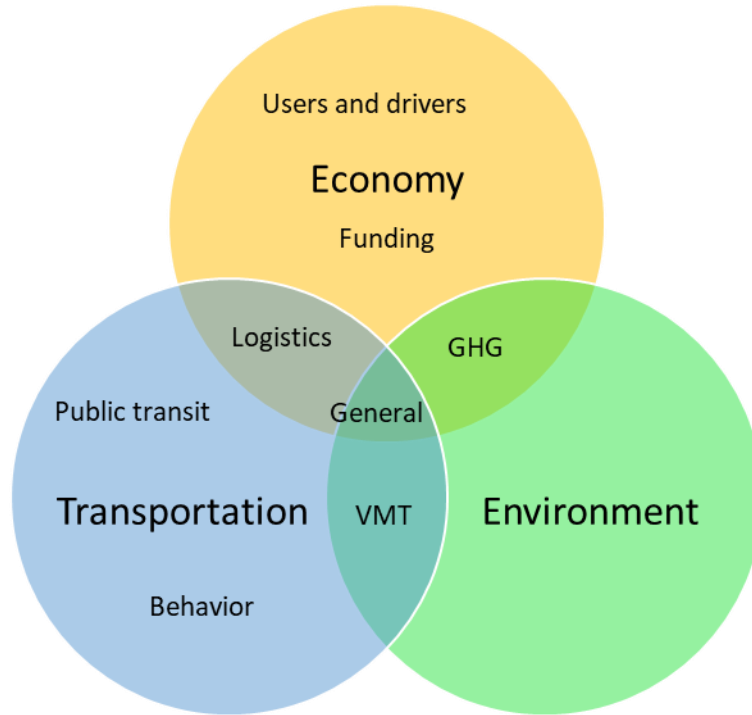
Figure 2. Areas of impact uncertainty brought up by the interviewees. VMT = Vehicle Miles Traveled. GHG = Greenhouse Gases.

What unites these perspectives, however, is the feeling participants had of not having enough information to address their doubts, which explains why so many presented more cautious strategies, like learning and waiting, to deal with their specific uncertainties.

Table 6. Strategies interviewees identified to deal with uncertainties related to TNCs.

Sector / Type (N = 26)	Wait and see (9)	Learn (10)	Adapt to context (3)	More conversation (1)	Encourage policy design (3)
MPO (15)	5	6	3	-	1
NGO (5)	1	1	-	1	2
City (6)	3	3	-	-	-

Some trends emerge if we look at the results from a sectoral perspective. At the state level, only one of the three agencies interviewed explicitly expressed uncertainty. While worried about the potential impact of TNCs on their GHG emission reduction targets, they have also heard that ridesharing along with the introduction of AVs "could help facilitate an electric, low-carbon, efficient system." However, the different positions they are hearing about potential impacts against potential benefits contribute to their uncertainty, which is increased by how rapidly these technologies are changing and their lack of knowledge about the extent of these services across the state.

Six of the 11 MPOs in the sample addressed uncertainty through different points of view. Transportation agencies serving rural areas pointed to their size and lack of experiences with these services to indicate that they are not ready to implement policies, while bigger cities might have more knowledge to do that. Although they acknowledge the similarity of ridehailing with other services that have gained popularity in their areas, like vacation rentals, which they have been forced to regulate, they still present a wait and see attitude for the implementation of policies regarding TNCs. Paradoxically, even when they want to see what others are doing because they might have more experience and resources, they are wary of the few examples that they have heard of, as they believe they might not fit their specific context. Two planning organizations have a similar approach, where they feel that ridehailing services are too novel too know the full extent of their effects in terms of safety or parking and are waiting for more guidance coming from state regulations. This is reflected in the number of mentions seen in Table 3 and 4, where MPOs are more uncertain about the impacts of ridesharing, the implementation of policies, and the rapid changes in technology, but they still favor a wait and see attitude and would rather learn what other jurisdictions are doing.

Only one planning organization is actively looking to implement policies that address not only current ridehailing technologies but also those that might come in the future. They point to modelling as a tool which they can use to reduce their uncertainties, however, they still feel that more data is needed not only from on-demand transportation companies themselves but also from other government agencies that have implemented policies already. However, unlike other planning agencies, they have a more positive attitude about the novelty of on-demand services and their technologies, as they highlight the need to look at the issues that the new technologies are trying to solve before trying to regulate them. Moreover, this agency also addressed the issue of uncertainty coming from a user point of view, where lack of information about ridesharing programs can act as a barrier to use those services.

Interviewees working at the city level (8 out of 10) showed a very diverse approach to uncertainty. Several of them indicated that they don't know yet the magnitude of the impacts that ridehailing might have in their communities or how policies might address those impacts. For some cities, all of this is very new, while others mention their willingness to research how ridehailing services work and how they can incorporate them in current regulations. However, although they are more knowledgeable about the policies they can potentially implement to address ridehailing, they are also uncertain about the possible outcomes of said policies, like changing infrastructure or modifying zoning codes to include on-demand services and automated vehicles. Even examples of those who have already developed pilot programs agree that it is too early to know the outcomes.

Finally, for seven out of nine NGOs, uncertainty seems to take two different pathways. On one hand, their uncertainties echo those mentioned by other agencies, such as not being sure about the magnitude of impacts, difficulty in predicting what will happen, or what will be the effects of implementing certain policies. From the perspective of these stakeholders, concerns about impacts on users and drivers seem to also be a key issue. However, one of the main areas of uncertainty was related not to their own concerns, but to the relationship between rapid

technological change and policy makers' attitudes towards it. From this second perspective, interviewees from NGOs see the business model of TNCs as something that can make government stakeholders freeze, which in turn discourages them from enacting policies like taxes, and therefore, this uncertainty shows how "our funding structures to serve public service are frail." Another interviewee also described TNCs as externalizing uncertainty to the public sector, which also leads to mistrust from policymakers. One interviewee succinctly summarized the overall feeling that people from NGOs have around uncertainty, TNCs, and policy makers responses: "I think the uncertainty of the fact that the whole technology is still so kind of new, and so much is changing with these sort of more futuristic transportation modes, certainly policy makers want to hold off and see where things are going before they implement more restrictions. We are taking kind of the opposite approach by encouraging them to more actively steer that direction so it's what we want to see, not what we don't want to see. I think that it's an area of challenge that is just so new, people feel like they don't know enough."

Discussion and Conclusions

Taking uncertainty as a fundamental part of the context surrounding policy and planning for ridehailing, we explore how this relates to the concerns, activities, and future directions of transportation stakeholders throughout California. Some explicitly mentioned uncertainty, while others described scenarios in which the services could contribute to a brighter and more sustainable future transportation system.

Interestingly, the development and discussion of scenarios seems to be a way that some of our interviewees are managing the uncertainty related to these services. Rather than thinking through what needs to happen, they adopt the recommendation that with the right policies in place, these innovations can be steered in the right direction. How we get there is not so clear, in part because the impacts are not certain, but having a grasp on one or more potential scenarios seems to help planners and policy makers cope with the uncertainty.

The balance of state and local guidance and control over decision making likely represents another means of addressing uncertainty. Local governments would like to leave part of the equation up to the state, including guidance, identification of priorities, or target setting. The local governments are willing to take on more responsibility for how targets are met, but are more reluctant to take on the big picture, which has a lot of questions surrounding it.

All of these are reasonable approaches to dealing with uncertainty, and we see a trend that how stakeholders are dealing with uncertainty is directly linked to capacity and resources. The smaller cities are typically not doing anything in part because there is more at stake, especially if the services are limited in their areas. What seems most telling is the actions of the moderately sized cities. They are decidedly taking a wait and see approach; some interviewees pointed out that they do not want to initiate actions until some best practices or lessons learned have been observed. This is an expected way of dealing with uncertainty, and in this approach, our interviewees stress that they are just trying to understand what might happen. They are looking to others who have possibly taken action or are reading about potential impacts from a variety of sources. Those who are taking action, the larger cities or MPOs, are

those that are more able to experiment with different actions and have less at stake in terms of the commitment of resources.

Policy making related to sustainable transportation and ridehailing is still in early stages. Pilots are testing some approaches and the policy dialogue continues. Policies and programs addressing ridehailing must be flexible enough to address the impacts occurring across the diversity of California communities, but specific enough to offer real guidance and targets.

Local governments should advocate for local control but be willing to work within state level frameworks. Regulations and planning related to the impacts of ridehailing needs to become more tangible and must address the needs of California's diverse stakeholders and communities to the greatest extent possible.

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Data Management

Products of Research

This dataset consists of a portion of interview data collected in January through March of 2018; for each interviewee, discussions related to perspectives on uncertainty were identified and included in this dataset.

This data was collected through semi-structured interviews by phone with 42 stakeholders involved in transportation planning or policy from state, regional, and local agencies, as well as public interest groups or non-profits. Each interview was recorded and transcribed, and then the content was coded using a confirmatory method.

The entire interview for each participant was coded, and the codes for each interview are entered into datasets in two ways. First, each interviewee is represented as a row, with columns included for every possible code; binary indicators (0 = not present, 1 = present) are used to denote whether the participant had any portion of their interview coded in that way. In addition, a second form of the dataset was produced, in which each row represents a single code from one interview; this format includes every code for each interview. Thus, each interviewee appears multiple times—one for each code assigned to a part of their interview. In addition to the list of codes, snippets of text are included that represent the portion of the interview for which the code was assigned.

Each interviewee is assigned an ID number which also indicates the type of participant; city, MPO, etc. The data is stripped of all identifiable information.

Data Format and Content

There are three spreadsheets contained in one Microsoft Excel file.

Sheet1 – Each row represents a single interview and each column corresponds to each of the set of codes related to uncertainty. All data entries are binary (0 = not present, 1 = present), denoting whether that interview was assigned the code designated by each column. This format includes every participant regardless of the codes assigned to their interview—note that there are some participants who did not discuss uncertainty, so they have 0 for every entry (but they discussed other topics to be included in later reports and papers).

Sheet2 – Each row represents one code from one interview. This format includes every code for each interview. Because a row represents a single code, every interview appears one time for each code it has been assigned. The columns in this sheet are Interview, Codes, Note, and Quote. Codes indicate the code assigned to the interview; Note lists any additional information of use to the researchers, and Quote includes a short segment of the portion of interview for which the code was assigned.

Sheet3 – Code 2.0. This is the code applied to the interviews in the study. It details each of five potential components of the code and describes the types of interview content that receive each code. This code is included in Appendix B: Interview Codebook.

Data Access and Sharing

The data is publicly available on the Dryad data repository at https://doi.org/10.25338/B87G9W.

Reuse and Redistribution

There are no restrictions. Data can be reused and redistributed with credit to this report and properly cited using the following:

Pike, Susan (2020), Ridehailing, Uncertainty and Sustainable Transportation, UC Davis, Dataset, https://doi.org/10.25338/B87G9W

Appendix A: Interview Script

Introduction

First off, thank you for agreeing to participate in this interview today. This interview is part of research I am conducting at the Institute of Transportation Studies at UC Davis, and funded by the National Center for Sustainable Transportation in partnership with Caltrans. The motivations for the study stem from an uncertainty about whether ridehailing services—such as Uber, Lyft and others—will exacerbate existing transportation issues, or help alleviate them.

To that end, I am interested in learning about your perspective on the types of actions that might enable on-demand services to help alleviate existing transportation issues, including congestion, emissions, and inequality of access/mobility. These actions might include incentivizing pooling, or trips with two or more passengers; facilitating intermodal connections with public transit or active modes; and improving access in areas that are underserved.

Participation in this interview is entirely voluntary, and you may choose to not answer any of our questions. The use of your responses in any reports, publications or presentations, will be completely anonymous and will not be connected to you personally. (*If not Susie*: If you have any questions related to the project or your interview, you may contact the project's director, Susan Pike at scpike@ucdavis.edu, or XXX-XXX-XXXX.) I would like to audio-record our conversation today in order to transcribe the information you share with me. Once the transcription is completed, the audio recording will be deleted. Do you agree to participate in this interview today?

Background information

Before we begin the audio-recording I would like to confirm some information about you and your role at < Name of organization or agency > (*This information is to be collected prior to any audio recording, and may be available from the interviewee via email, prior to the interview.*)

Name of organization:
Type of organization (transit agency, MPO, nonprofit, TNC, etc.):
Location of organization, or interviewee's usual office location:
Size/ number of employees:
Size/ number of office locations:
Name of interviewee:
Role or job title of interviewee:

Now I would like to begin audio-recording the remainder of our conversation.

Interview Questions

1. Organization

I'll start by asking a few general questions about your agency or organization.

In your own words what is the function or mission of your org/agency?

Additional prompt: What outcomes are you trying to achieve, for example: provide reliable public transportation in the San Francisco Bay Area, or manage air pollution within the State of California.

    A. Who does your org/agency serve, and who do you interact with?

Additional prompt: For example, private citizens, land developers, city councils, etc.

    B. What, if any, activities related to environmental quality and/or sustainability is your agency involved in?

Skip this question for transportation specific orgs – should be covered adequately by question 1.

    C. What, if any, activities related to transportation is your agency involved in?

2. Ride-Splitting Policies

Now, let's discuss some of the actions that might enable on-demand services to help alleviate existing transportation issues including congestion, emissions and inequality of access/mobility. I am interested in hearing your perspectives on potential outcomes, and the need for policies or programs in this area.

    A. First, have you been discussing, or hearing about on-demand ride services in the context of sustainable transportation? If so, what are some of the major themes that have been a part of those conversations?

    B. Is your org/agency involved in any work related to on-demand ride services and sustainable transportation or mobility? If so, what?

    C. Some (other) proposed or existing policies include taxing all trips, with a potential exception for multi-passenger or pooled trips, subsidizing trips that connect to other modes of transportation, or allowing the use of public facilities like taxi stands and bus stops for passenger loading/unloading for multi-passenger (or other specific) trips. What are your reactions to these kinds of policy avenues?

    D. Do you think there are any ideal policies or programs to enable ridehailing to alleviate issues in transportation such as congestion and/or emissions?

    E. What do you see as the primary hurdles for policies to enable on-demand transportation services to help increase multi-passenger trips, or alleviate other transportation challenges (congestion, access, etc.)?

3. Policy Process

There are a number of different scales and policy making venues at which the types of policies we just discussed could be developed and implemented. There are also a variety of stakeholders and interest groups that could be involved. I am interested in your views on the different regulatory venues, and different types of stakeholders that could be involved.

Possibly skip this question for some types of stakeholders; namely those directly involved in on-demand services; the TNCs, the PUC [California Public Utilities Commission], others?

A. First, who do you talk with about these topics; the impacts of on-demand ride services on sustainable transportation and mobility outcomes?

B. Are there other individuals, organizations, or agencies with whom you would like to be in a dialogue with, related to these topics? If so, who, and what aspects of these topics?

C. If policies or programs were to be implemented to draw on ridehailing to address existing transportation challenges, are there certain policies or programs that would be more appropriate at different scales of government? For example, if a tax were introduced, what level of government would be best suited to implement something like that? How about for other policy approaches?

4. Information about the individual completing the interview

I have a few more questions I would like to ask about you.

How long have you been working for this org/agency? What is your current position, and how long have you been in this role? And, what is your educational background?

Wrap-Up and Open Ended Discussion

Is there anything else you think I should pay attention to related to the alignment of on-demand ride services, and sustainable transportation goals and mobility outcomes?

A. Do you have any other concerns or ideas about the potential to affect the impacts of on-demand ride services on sustainable transportation and mobility outcomes; or specifically about increasing multi-passenger trips in on-demand ride services?

And lastly, is there anyone else we should talk to about this topic?

Okay. That's it! Thank you again for your participation in this interview today. (*Say something more personal about the participant, or something they said that is particularly interesting.*)

Appendix B: Interview Codebook

Context	Code	Themes	Code	Subthemes	Code	Categories	Code	Value	Code	Full code
Public program (A) Partnership (B) TNC (C) AV (D) Transportation in General (E)	A, B, C, D, E	VMT	1	N/A	N/A	N/A	N/A	increase	+	A1+
								decrease	-	A1-
		Policy Avenue	2	Incentives	I	N/A	N/A	Positive	+	A2I+
								Negative	-	A2I-
				Tax	II			Positive	+	A2II+
								Negative	-	A2II-
				Price	III			Positive	+	A2III+
								Negative	-	A2III+
				ROW*	IV			Positive	+	A2IV+
								Negative	-	A2IV-
				Planning	V			Positive	+	A2V+
								Negative	-	A2V-
				New Mobility Programs	VI			Positive	+	A2VI+
								Negative	-	A2VI-
				Extra	VII			N/A		A2VII
		Public Transport	3	N/A	N/A	N/A	N/A	Positive	+	A3+
								Negative	-	A3-
		First Mile / Last Mile	4	N/A	N/A	N/A	N/A	Positive	+	A4+
								Negative	-	A4-
		Congestion	5	N/A	N/A	N/A	N/A	Positive	+	A5+
								Negative	-	A5-
		Split	6	N/A	N/A	N/A	N/A	Positive	+	A6+
								Negative	-	A6-
		Ridematching / Carsharing / Carpooling	7	N/A	N/A	N/A	N/A	Positive	+	A7+
								Negative	-	A7-
		Air Quality	8	N/A	N/A	N/A	N/A	Positive	+	A8+
								Negative	-	A8-
			9	N/A	N/A	N/A	N/A	Positive	+	A9+

		Biking / Pedestrian						Negative	-	A9-
		Challenges	10	Accessibility / Equity	I	N/A	N/A	N/A	N/A	A10I
				Uncertainty	II					A10II
				Safety	III					A10III
				Rural/Urban	IV					A10IV
				Behavior	V					A10V
				Other stakeholders	VI					A10VI
				Money	VII					A10VII
				Politics	VIII					A10VIII
		Involvement (At least talking to)	11	Government	I	N/A	N/A	N/A	N/A	A11I
				University	II					A11II
				Private	III					A11III
				Community	IV					A11IV
				Planners	V					A11V
				Non-profits	VI					A11VI
				None	VII					A11VII
		Want to Talk to	12	Yes	I	Government	a	N/A	N/A	A12Ia
						University	b			A12Ib
						Private	c			A12Ic
						Community	d			A12Id
						Planners	e			A12Ie
				No	II	N/A	N/A	N/A	N/A	A12II
		Scales	13	Price / Tax	I	federal	a	N/A	N/A	A13Ia
						regional	b			A13Ib
						state	c			A13Ic
						local	d			A13Id
				Planning / ROW	II	federal	a	N/A	N/A	A13IIa
						regional	b			A13IIb
						state	c			A13IIc

						local	d			A13IId
				Incentives	III	federal	a	N/A	N/A	A13IIIa
						regional	b			A13IIIb
						state	c			A13IIIc
						local	d			A13IIId
				Regulations	IV	federal	a	N/A	N/A	A13IVa
						regional	b			A13IVb
						state	c			A13IVc
						local	d			A13IVd
		Equity	14	N/A	N/A	N/A	N/A	Positive	+	A14+
								Negative	-	A14-
		Parking	15	N/A	N/A	N/A	N/A	Positive	+	A15+
								Negative	-	A15-
		Sprawl	16	N/A	N/A	N/A	N/A	Positive	+	A16+
								Negative	-	A16-

ROW = Right of Way