SPUR REPORT
TRANSPORTATION

SPUR
REGIONAL
STRATEGY

The Future of Transportation

Harnessing private mobility services to support the public good

JULY 2020

This report is a component of the SPUR Regional Strategy, a vision for the future of the San Francisco Bay Area

spur.org/regionalstrategy

The SPUR Executive Board adopted this paper as SPUR policy on June 2, 2020.

Acknowledgements

Primary authors:
Arielle Fleisher, Stuart Cohen and Ratna Amin

Contributing Authors:
Zack Deutsch-Gross, Lindsey Kiner

Editor:
Allison Arieff

Thank you to the transportation agency staff members, technical experts and civic groups who provided information and reviewed drafts of this white paper. The ideas in this report were generated from more than four dozen interviews with transit and mobility experts and city planners. We thank them for lending their time and expertise. SPUR's Transportation Technical Committee and Regional Planning and Transportation Policy Board discussed and debated the recommendations in this white paper.

SPUR would like to thank the following individuals for their leadership, expertise and thoughtful review of drafts of this report.

Chris Brown
Tilly Chang
Chris Chou
Huma Husain
Darton Ito
Andy Koskinski
Traci Lee
Warren Logan
Kara Oberg
Chris Pangilinan
Debs Schrimmer
Molly Turner
Emily Castor Warren
Marla Westervelt

Thank you to the funders of the SPUR Regional Strategy:

Chan Zuckerberg Initiative
Clarence E. Heller Charitable Foundation
Curtis Infrastructure Initiative
Dignity Health
Facebook
Genentech
George Miller
Hellman Foundation
John S. and James L. Knight Foundation
Marin Community Foundation
Sage Foundation
Silicon Valley Community Foundation
Stanford University

Additional funding provided by AECOM, Fund for the Environment and Urban Life, Microsoft, Seed Fund, Stripe, Uber Technologies and Wells Fargo.

Cover photo by Sergio Ruiz

Contents

1. A Bold New Course for Urban Mobility **4**

2. Challenges to Capturing the Promise of Emerging Mobility **9**

3. SPUR's Framework for the Future of Emerging Mobility **16**

Strategy 1: Establish an effective planning and regulatory framework so that emerging mobility services support regional goals 16

Strategy 2: Transform transportation agencies into mobility agencies 29

Strategy 3: Retool the built environment and prices to support an effective, equitable transportation system 34

4. Conclusion **40**

1.
A Bold New Course for Urban Mobility

For more than half a century, our cities and their transportation systems were designed around the private automobile. Roads were engineered to maximize car capacity and speed, resulting in streets unsafe and unwelcoming to residents, pedestrians and bicyclists. New highways powered the construction of suburbs and exurbs, with long distances between homes, jobs and services. Buildings were surrounded by fields of parking, and walking, cycling and transit, once the norm, were relegated to the status of "alternative modes."

This auto-focused system supported incredible economic growth, but it also produced disastrous environmental and social impacts, including climate change, air pollution, high household expenses, social inequality, loss of farmland and open space, and it normalized staggering levels of injury and death. The transportation system that helped drive decades of growth has now become a barrier, and even a primary threat, to continued economic prosperity and sustainability. (Consider Sidebar of transportation GHGs)

In the last decade, however, transportation has undergone a seismic change, marked by technology-driven transportation services. With a smartphone (which didn't exist just 13 years ago), one can hail a ride, hop onto a bike or electric scooter, rent a car for just a few hours or instantly form a carpool. These new services, collectively known as "emerging mobility,"[1] are provided primarily by private companies. Increasingly, they are transforming how people move around.

Today, the pace of change in transportation is faster and more dramatic than at any time since the introduction of the automobile. That pace is accelerating due to abundant venture capital funding, intensive engagement from automotive companies, dramatic changes in battery technology and the development of all-in-one mobility apps that simplify the use of these new services. The most profound disruption, however, could come from the introduction of autonomous vehicles (AVs).

These new technologies and business models are coming at a time when a growing number of people are less interested in owning assets like cars. Together, these trends present an enormous opportunity to reimagine the Bay Area's transportation system by, for example, providing fast and easy access to trunk-line transit or filling transit gaps in low-density areas. If private sector innovation is channeled in the right direction, it could help us meet key regional goals on climate, social equity and economic prosperity.

1 Emerging mobility services include:
- Ride-hailing (aka transportation network companies or TNCs) such as Uber and Lyft.
- Shared cars such as Zipcar and GIG, as well as cars that you can rent by the hour or day from your neighbor on platforms like Getaround.
- Shared bikes and scooters from Lime, Jump, Lyft and others.
- Carpool apps such as Scoop and Waze Carpool.
- Microtransit services such as Via that use shared vans or small buses and have flexible routes and/or schedules.
- Driverless (automated) shuttles such as First Mile and Olli (which can now be made primarily with 3D printing).
- Shared on-demand helicopter rides with Uber Elevate.
- Trip aggregators, such as RideAmigos, that provide a range of commuter options in one app, including rewards from their company or jurisdiction for commuters who drive less.

Yet that direction is not assured. Ride-hailing, for example, has contributed to an overall growth in vehicle travel, carbon emissions and congestion.[2] When driverless AVs are combined with the ride-hailing business model, they may be able to offer very low prices and convenient service that will likely result in a tremendous number of additional trips. Waymo, an AV subsidiary of Alphabet, already provides driverless service in the Phoenix suburbs, and many other companies are readying their rollouts in California.[3] This may increase transportation access for people and reduce the need for parking, but at a tremendous cost of new carbon emissions, congestion and demand for more roads.

Current governmental structures, authorities, funding formulas and labor agreements are not designed to manage emerging mobility well. They tend to be rigid and slow to adapt, and are focused on managing transit and road systems that are already inadequate and straining under disrepair. Some regions are also replacing public transit with services by emerging mobility companies, although the new services may be more expensive or have other detrimental impacts on social and racial equity.[4] On top of these challenges, there will be long-lasting burdens on transportation budgets and ridership due to COVID-19.

This raises an urgent question: What does the public sector need to do to ensure that emerging mobility serves the public interest and helps us meet critical regional goals?

If emerging mobility services, especially those that encourage low-occupancy vehicle trips, do not have appropriate public regulation, partnerships and incentives, many of our transportation problems may deepen:

- The share of trips made by automobiles, particularly single-occupant vehicles, could increase, causing congestion to skyrocket.[5] These trends could accelerate once private autonomous vehicles become more popular — with people sleeping, watching a movie or working on their computers while "driving" solo.[6]
- Sprawling land use patterns could increase as autonomous vehicles reduce the perceived time costs of driving long distances, and with that, a willingness for long commutes.
- With greater competition and more congested streets, local transit systems could atrophy. Left with declining ridership and fewer resources, they could enter into a downward spiral that decreases service, without an affordable or sustainable alternative for many people.
- Access to benefits conferred by emerging mobility may not be available to those who need them the most. Services may be marketed in just one or two languages, people with limited income may not be able to afford them, and the physical locations of services may exclude communities of color, seniors and people with disabilities. At worst, people who are unbanked, have limited ways to connect to the internet, or have a disability that requires a special vehicle may have very limited access.
- The increase in car use and decrease in walking and biking could make cities less appealing and further degrade streets and the public realm. If the shift to emerging mobility does not focus on clean vehicles, it could create more local air pollution and accelerate dangerous climate disruption.[7]

2 The San Francisco County Transportation Authority estimated that TNC rides were responsible for a 51% increase in vehicle hours of delay between 2010 and 2016. See: https://www.sfcta.org/press-releases/report-finds-transportation-network-companies-caused-approximately-half-sfs

3 The California Public Utilities Commission has already approved several driverless pilot projects. See: https://www.cpuc.ca.gov/avcissued

4 For a framework to consider equity issues, see: https://www.transformca.org/transform-report/framework-equity-new-mobility

5 Congestion may increase especially in urban areas where TNCs may replace more efficient modes. See: Schaller Consulting, "Unsustainable? The growth of app-based ride services and traffic, travel and the future of New York City," February 27, 2017, http://schallerconsult.com/rideservices/unsustainable.pdf. Even in suburban areas, the growth in trips could cause more congestion. The potential for "connected vehicles" that reduce space between cars does exist, but it will be a long time until it is in service and will be confined to highway uses for the foreseeable future.

6 A regional survey of experts expected vehicle miles of travel will increase 5 percent to 40 percent in a future with autonomous vehicles; see full report at: https://mtc.ca.gov/sites/default/files/2018-06-25_Autonomous_Vehicles_Perspective_Paper.pdf

7 The impact on air pollution and climate emissions will be closely linked to the fuel source, efficiency and occupancy level of these vehicles. The report later discusses SB 1014

FIGURE 1
Storm King Highway, New York

In the 1920s, planners underestimated the impact of cars on cities, thinking of them as weekend leisure vehicles. But cars came to dominate for almost every type of trip. The automobile opened up more distant green spaces and was a critical precursor to suburban sprawl.

→ There could be tremendous economic dislocation, as millions of jobs in freight, transit and other middle-income fields are gutted. Without training, many of these workers would be relegated to low-paying gig work or could become permanently un- and underemployed.[8]

Some of these problems, such as greater congestion in cities, already exist. To find a way forward that avoids the pitfalls of the past, SPUR believes we will need strong public stewardship and governance of the entire transportation system — including privately operated services. Further, we need to find a way to address what often feels like a fundamental disconnect: that private sector transportation needs a return on investment while public sector transportation is a public good.

Setting Us on the Right Path

As the pace of change accelerates and the lines blur between different transportation modes and business models, we need to think in a whole new way about how to manage the future of mobility. There is incredible potential to harness the innovation and resources of the private sector, channeling it toward the public good. SPUR envisions a future where public transportation and private emerging mobility providers play to their respective strengths, function as a seamless network, provide access for people of all incomes, races, ages and abilities, and help us shift away from an overreliance on automobiles.

To meet this challenge, the public sector must have a clear vision of the future of mobility. It must also be open and agile in incorporating fast-changing technology and business models. While the pace of change is dizzying, the region must stay focused on three fundamentals as we reshape our transportation system.

1. Create people-centered streets and walkable places

The Bay Area stops creating car-centric, low-density places where it is hard to make trips by walking or transit. Protected bike and micromobility lanes become a regular feature of street space. Gathering, socializing and playing return to streets, which are reclaimed as public spaces. The number and severity of car crashes and

that looks to bend the curve on TNCs so that they have much lower emissions per passenger mile of travel.

8 Natalie Kitroeff, "Robots Could Replace 1.7 Million American Truckers in the Next Decade," *Los Angeles Times*, September 25, 2016, https://www.latimes.com/projects/la-fi-automated-trucks-labor-20160924/

pedestrian fatalities reduce dramatically. Public transit and emerging mobility combine to support compact, walkable neighborhoods where people live close to where they work, shop and play. Parking and driving costs better reflect their true costs, reducing the incentive to drive for every trip.

2. Tie the region together with high-quality transit

Fast, frequent, reliable public transit is prioritized where there are customers and land use policies to support it. These subways, commuter trains, buses with dedicated lanes and express buses running fast on managed highway lanes form the backbone of a seamless multimodal system. Focused investments improve transit's performance in an increasingly competitive landscape, one that will only become more competitive with autonomous vehicles. This commitment to transit demonstrates the understanding that cities don't have the street space to deal with a flood of new vehicles, whether they are driven by a new business model or a computer.

3. Harness emerging mobility to fill key gaps and support transit

On-demand transportation services — such as shuttles and e-bikes — provide cost-effective and reliable mobility. These emerging mobilities better connect people with public transit, serving as a first-mile, last-mile connection to transit stations or a way to get home late at night when transit stops.[9] These services, whether privately or publicly provided, are deployed to markets not currently served by transit and provide additional capacity when public transit is overcrowded. They are affordable and offer much-improved mobility for people of all incomes, ages and abilities. Improved access for the most vulnerable communities is prioritized. These services also provide redundancy and resiliency during crises, as was observed when transit service was cut due to COVID-19 and many essential workers started using shared bikes and scooters instead.[10]

In this optimistic future, emerging mobility services offer meaningful alternatives to driving, promote health and well-being, support a strong and fair economy, and encourage walking, biking and scooting. The share of trips made by driving solo steadily declines. With the decrease in personal vehicle ownership and less need for parking, more of our streets are transformed into great spaces for people.

Perhaps the most inspiring part of this vision is its potential to address the region's two long-term crises: social inequality and climate change. Less driving and cleaner vehicles helps us meet greenhouse gas emission reduction targets. New mobility options coupled with high-quality public transit reduce costs and provide greater access for communities that have been marginalized and disproportionately burdened by transportation, including people with low incomes, communities of color, people with disabilities, immigrants, elders and youth.[11] A seamless network of public and private providers, combined with a new, dedicated focus on providing homes at all income levels, can form the basis of a more sustainable Bay Area.

Achieving this vision won't be easy. The private companies leading this mobility revolution are in a highly competitive market. To survive, they tend to optimize for market share and return on investment rather than achieving societal goals. Furthermore, it is unclear whether any of the companies, from Uber and Lyft to

9 Joe Cortright, "What Drives Ride-Hailing: Parking, Drinking, Flying, Peaking, Pricing," *City Observatory*, 2018, http://cityobservatory.org/what-drives-ride-hailing-parking-drinking-flying-peaking-pricing/. See also San Francisco County Transportation Authority, "Emerging Mobility Evaluation Report," 2018, https://www.sfcta.org/sites/default/files/2019-02/Emerging%20Mobility%20Studies_11.pdf

10 See: https://usa.streetsblog.org/2020/04/15/how-essential-workers-can-get-free-bikes-during-covid-19/

11 Emerging mobility also offers the potential for healthier and safer communities. According to the Lawrence Berkeley National Laboratory, if the vehicles of the future were shared, electric and autonomous, we could reduce overall individual vehicle emissions by up to 90 percent. Since most car crashes are a result of driver error (driving too aggressively, too fast, while distracted, sleepy or inebriated), autonomous vehicles could also eliminate up to 90 percent of crashes and more than 25,000 fatalities annually. Stuart Cohen and Clarrissa Cabansagan, "A Framework for Equity in New Mobility," Transform, 2017, https://www.transformca.org/sites/default/files/A%20Framework%20for%20Equity%20in%20New%20Mobility_FINAL.pdf

bike-share providers, have found a truly sustainable business model, at least at significant scale and without autonomous vehicles in commercial use.

To shift the trajectory into a positive direction, planning agencies at every level need to reinvent themselves and revisit their roles in this broadening mobility context. They must shift away from a service vision organized around individual modes and toward integrated planning that is focused on the customer. The regulations and laws that govern cities and transit agencies must change from auto-oriented and rigid to multimodal and dynamic.

This report explores the potential upheaval and opportunities presented by emerging mobility and new business models. Chapter 2 explores challenges to realizing a future where emerging mobility helps our cities and the region reach social, economic and environmental goals. Chapter 3 includes a set of three detailed strategies for how the Bay Area's cities, transit agencies and regional organizations can guide us toward this preferable future.

Dedicated bus and bike lanes are just two of many strategies that can expand and improve mobility options.

Photo by Sergio Ruiz

2. Challenges to Capturing the Promise of Emerging Mobility

SPUR believes there is a path to capturing the benefits of emerging mobility for the public interest. However, building an integrated transportation system that is efficient, effective and equitable requires the public sector to tackle highly political decisions with broad economic consequences.

The Bay Area, home to some of the world's most innovative transportation companies, has fallen behind in planning for this future transportation system and experimenting with what it could look like. There are six key challenges for cities and transit agencies in directing the future of transportation to focus on access and mobility for all.

1. Emerging mobility providers prioritize customers and shareholders over the public at large

Private mobility providers are consumer transportation services owned and operated by private companies. As such, they tend to prioritize market share over the public at large, which can lead to unstable prices or services.[12] Most private mobility companies can enter and exit new markets with modest costs, relative to public transit service. While this flexibility can be a huge advantage — allowing them to rapidly increase mobility options in any given place — it also means they can easily abandon operations if the returns are not adequate, regulations become more favorable elsewhere or for other business reasons, leaving large transportation vacuums.[13] Prices can also be volatile, sometimes increasing quickly with little notice.

Since many emerging mobility companies prioritize markets that return a profit, their services may compete with, rather than complement, public transit and may provide limited options for lower-income communities, unbanked populations, people without smartphones and people with disabilities. Furthermore, private companies often don't have the capacity or skill sets in-house to work effectively with these communities.

2. Emerging mobility's newness complicates planning and policymaking

Because emerging mobility services are relatively new and are rapidly evolving, there are not yet well-established best practices for regulating private providers, developing public-private partnerships or identifying when

12 Several private mobility companies have leaders who are passionate about improving the world, and some even have grand mission statements. Some, like Via, are creating business models focused on integrating with transit and providing their technology to improve transit. Still, to survive in this emerging field, their primary commitment must be to their investors, shareholders and companies. Sharon Feigon, Colin Murphy and Taylor McAdam,"TCRP Research Report 196: Private Transit: Existing Services and Emerging Directions. 2018," Transport Research Board, 2018

13 Austin Walsh, "Lime to pull bikes, surprising San Mateo, South San Francisco and Burlingame officials," *The Daily Journal*, Feb. 20, 2019, https://www.smdailyjournal.com/news/local/lime-to-pull-bikes-surprising-san-mateo-south-san-francisco/article_3e391e54-34c9-11e9-b2c2-a7715af6b2c2.html

incentives or public subsidies may help achieve regional goals. There remains a lot of uncertainty around these new providers that complicates planning and policymaking. For example:

- Private transportation services' business models are evolving, and some of the most heavily used services are not yet profitable. It's unclear when and if markets can support several distinct companies per city and region.
- Recent significant price increases are leading city leaders to question the appeal of emerging mobility services that, until recently, seemed like they would be affordable, reliable options.[14]
- These services can go out of business with little or no notice.[15] Even when they remain solvent, they may stop providing services in a particular community if it is not profitable enough. It's not yet clear when the public sector should intervene to keep these services present once a community has started to rely on them.
- As cities and transit operators broker new types of contracts and consider how to shape and incentivize private transportation companies, they often do not have the right skill sets on staff to successfully execute these agreements nor the resources to properly manage and monitor the programs. There are very few experienced "mobility regulators" in transportation departments, which are typically filled with engineers and planners. Smaller cities often look to bigger cities and regional agencies for frameworks and templates, but the Bay Area and other large markets have yet to establish formal mechanisms for learning and sharing. Some cities impose rules and regulations without analyzing the impacts to prices, level of service or customer need.

It is difficult for transit agencies and cities to identify how to channel the benefits of emerging mobility services for the public good against a backdrop that is so uncertain, so unstable and constantly evolving.

The most far-reaching technological change that could affect our transportation system — connected and autonomous vehicles — is still in the research and testing stages. Predictions of when these vehicles will deploy vary considerably. Only a handful of cities in the Bay Area and beyond are actively preparing for AVs, considering them to be too far in the future to warrant attention when there are so many immediate needs.[16] Cities are also confused or worried about their ability to undertake active planning for AVs because the federal government may pass laws that preempt local regulation.

3. A patchwork approach to governance and regulation makes it difficult to channel the opportunities of emerging mobility

Historically, federal, state and local governments have had oversight over distinct aspects of transportation: federal over vehicle safety and components; states over driver licensing, vehicle registration and setting the rules of the road; and municipalities over street operations like signals, traffic control and parking. The current approach to regulating emerging mobility services continues this patchwork, with each level of government working with different goals, guidelines and motivations. We need a governance approach that captures the opportunities and risks presented by private mobility services and their effect on urban life, such as sprawl, congestion, emissions and public transportation ridership.

The city's role, particularly in the context of automobile regulation, is often overshadowed by federal and state

14 Alana Semuels, "I'm Back to Riding My Own Bike,' Higher Prices Threaten Silicon Valley's Mobility Revolution," *Time*, Aug. 9, 2019, https://time.com/5648510/uber-lyft-bike-scooter-subsidies/

15 For example, Car2Go abruptly shut down its car-sharing service in five US cities. Aaron Short, "Post Mortem: Car2Go is Car2Gone in 5 Cities," *Streetsblog*, Oct. 1, 2019, https://usa.streetsblog.org/2019/10/01/post-mortem-car2go-is-car2gone-in-5-cities. Similarly, three scooter companies temporarily suspended services in San Francisco when shelter-in-place orders started, even though they were deemed essential services and thus allowed to continue to operate. Spin continued operations. See: https://sf.curbed.com/2020/3/20/21167576/e-scooters-shelter-coronavirus-spin-san-francisco-sf

16 Yonah Freemark, Anne Hudson and Jinhua Zhao, "Are Cities Prepared for Autonomous Vehicles?" *Journal of the American Planning Association*, 85, no. 2, 2019, 133-151.

A ride-hailing vehicle blocks the path of a city bus: the current lack of coordination between private and public sector agencies often results in frustration.

laws.[17] This is most obvious with respect to ride-hailing services such as Uber and Lyft, which the CPUC regulates in California. ("Street-hailing" taxis, however, are managed by local jurisdictions.) The CPUC is focused on safety, licensing and accessibility to individuals with disabilities. Yet, to the frustration of some cities, the CPUC is less focused on externalities caused by ride-hailing services such as traffic congestion or sustainability.[18] This makes it difficult for cities to effectively integrate ride-hailing services into their fabric in alignment with their policy goals.

At the same time, cities are responsible for health and safety on their public rights-of-way and thus have some jurisdiction over shared bikes and scooters, as well as who has access to precious curb space. Cities use a variety of tools to regulate and shape micromobility, including permits to operate, limits on fleet size, operational safety standards, insurance requirements, data sharing mandates, fees, franchise and service agreements, performance objectives, private-public partnerships and, when all else fails, outright bans. These tools have been met with a mix of reactions, including concerns that the regulations are vague, insufficient or overly restrictive; are in service of the wrong goals; cede too much power to one entity or another; or overly protect existing industries. With 101 cities in the Bay Area, these variations are frustrating for private companies as they have to comply with a complex landscape of regulations and policies, increasing customer costs and limiting service.

One important question is what role the Metropolitan Transportation Commission (MTC) should play in regard to emerging mobility. MTC is the regional transportation planning agency for the nine-county San Francisco Bay Area and has broad responsibilities for trying to knit together the plans of the many cities, counties and transportation operators. However, MTC does not have regulatory or permitting authority over any kind of emerging mobility service.[19] In 2020, the State Legislature sought to clarify and strengthen MTC's role, but mostly as coordinator of public transit, not emerging mobility.

17 Freemark, Hudson and Zhao, "Are Cities Prepared for Autonomous Vehicles?" Freemark et al. found that cities anticipate state laws that will explicitly prohibit their ability to regulate AVs. As a result, it's made them reluctant to pursue AV policy. The authors argue a clearer division of responsibilities among different levels of government combined with state authorization for using municipal powers to help shape the arrival of AVs might help to alleviate such hesitation.

18 San Francisco County Transportation Authority, "The TNC Regulatory Landscape," 2018, https://www.sfcta.org/projects/tnc-regulatory-landscape

19 Kevin McCoy, Russell Glynn, William Lyons and James Andrew, "Integrating Shared Mobility into Multimodal Transportation Planning: Metropolitan Area Case Studies," USDOT, 2019, https://www.planning.dot.gov/documents/regional_shared_mobility_planning_caseStudies.pdf

Photo by Sergio Ruiz

4. Data can help with regulation and transportation planning, but collection has been haphazard and the cities are poorly equipped to use it

Data is sometimes considered the new gold in the mobility world. Emerging mobility companies benefit from keeping their corporate and customer data private, even when releasing some additional data (in a way that protects individual privacy) can be useful to the public sector for planning or regulatory oversight.[20]

Cities and transportation agencies, on the other hand, often want to maximize their access to data for planning, oversight and effective regulation. Data could allow cities to "see" where TNC vehicles are blocking bike lanes, how the services interact with public transit, if companies are keeping enough of them available in underserved neighborhoods and how well people with disabilities or minority populations are being served. Just as importantly, the data can help cities and transit agencies to analyze trips and assess if existing infrastructure is adequate or where design changes should be made.

However, what data should be shared, how and by whom, remains wildly controversial. Several private companies, especially Uber and Lyft, have pushed back on data-sharing with concerns ranging from giving away trade secrets and customer privacy to the public sector's capacity to safely manage and store data. Certain data provided to local governments may be subject to public records requests, which makes companies even more cautious. Researchers have found that even when data is anonymized, people can be reidentified from their routine travel patterns or by combining the data with information from other sources.[21] To that end, they often favor releasing aggregate data, but this may not serve planning efforts as well.[22]

There are also more general concerns about the precedent set by government requirements for broad access to corporate data. Even in the mobility space, the best mobility data sets are not necessarily owned by Uber or Lyft but by communications companies and tech companies like Apple, Google and Facebook. While this data is incomplete, some of it is being packaged into software by companies for easier use by planning agencies.[23]

With all of this complication, cities are eager for more clarity and uniformity, and, indeed, policy frameworks that govern mobility data sharing are emerging. Less than two years after Los Angeles developed an open-source tool known as MDS, more than 70 cities have started using it for their micromobility programs.[24] These cities mandate access to data from emerging mobility providers as a prerequisite to using public right-of-way. Ride-hailing companies and privacy advocates have pushed back on this mandate.

Finally, these mandates to share data don't address the problem that very few cities have the tools, staffing, practices or partnerships to safely collect and effectively analyze it.

5. Transportation agencies struggle to incorporate innovative technologies and services

Private mobility providers are filling gaps in the transportation system, creating new services focused on parking, carpooling, peer-to-peer car sharing, ride hailing, micromobility and on-demand bus rides. These gaps exist not

---

20 The complicated issue of data sharing and privacy is covered in Challenge #3 and Strategies 1.1 and 1.4.

21 For example, in 2014, a researcher requested anonymized taxi geolocation data from the NYC Taxi and Limousine Commission under freedom of information laws, mapped the data using MapQuest and was able identify the home addresses of people hailing taxis in front of the Hustler Club in New York City between midnight and 6 a.m.. Combining a home address with an address lookup website, Facebook and other sources, the researcher was able to find the "property value, ethnicity, relationship status, court records and even a profile picture" of an individual patron. See https://nacto.org/wp-content/uploads/2019/05/NACTO_IMLA_Managing-Mobility-Data.pdf

22 M. D'Agostino, P. Pellaton and A. Brown, "Mobility Data Sharing: Challenges and Policy Recommendations," 2019, UC Davis Institute of Transportation, https://escholarship.org/uc/item/4gw8g9ms

23 For example, Streetlight Data (https://www.streetlightdata.com/) and Replica (https://replicahq.com/).

24 In fall 2018, Los Angeles DOT launched an open-source data standard and software system known as Mobility Data Specification (MDS) as a standardized way for municipalities or other regulatory agencies to ingest, compare and analyze data from mobility service providers and to give municipalities the ability to express regulation in machine-readable formats. Since then, MDS has also come under fire from Uber, privacy advocates and others. See: https://www.citylab.com/transportation/2020/02/los-angeles-transportation-data-mobility-scooter-mds-uber/606178/

because the public sector is inherently incapable of creating new services but because it is not well designed to innovate.

As some transit operators consider blending their service with emerging mobility providers or adopting some of their new technologies, they face institutional, regulatory and labor barriers as well as funding restrictions.

Transit operators are primarily structured to plan, construct, operate and maintain bus, rail and (sometimes) paratransit services. Many face challenges in showing they can increase ridership while dealing with difficult budgets, complicated operations and more. In addition, the public sector is designed and expected to be stable; this is one of its greatest assets. Experimentation, risk and failure may be celebrated in startups but are often frowned upon in the public sector. But that stability is a disadvantage when it can't accommodate change.

Union contracts can also financially and politically inhibit agencies from forming agreements with emerging mobility providers.[25] Work rules, for example, often don't allow workers to shift into different roles or to split their shifts.

Many planners and operations staff have a hard time staying connected with all activities related to emerging mobility, as it has not necessarily been built into their work plans. All of the constraints placed on transit operators may be the source of much of their reticence toward collaborating with new transportation services.[26] Finally, the patchwork approach to emerging mobility complicates the potential for integration with public transit. The limitations on innovation have made it so cities and transit agencies are too often caught flat-footed, falling behind when they should be shaping this new era of transportation.

That said, several Bay Area agencies are working hard to overcome these barriers to innovation. Contra Costa Transportation Authority has set up a testing site for AVs and new technologies called GoMentum Station, and it is also piloting autonomous shuttle programs. Along with Solano County and other counties, CCTA is having some success partnering with ride-share apps like RideAmigos and Scoop. Other agencies have set up pilot projects, such as BART's work with the carpool app Scoop to increase the number of people sharing rides to BART parking lots.[27]

These efforts are exciting, yet without regional coordination, evaluation or funding, the Bay Area will struggle to break down barriers to innovation quickly enough.

6. The region's public transit system is strained and struggling

Today's transportation system is both inefficient and inequitable. Public transit has only captured a small part of the market, carrying just 3 percent of all trips and 12 percent of work trips in the region.[28]

Explanations for this abound: Buses are stuck in traffic; transit funding has not kept pace with inflation; people are working from home. The region's fragmented approach to transit governance has resulted in a disjointed system that is challenging to navigate. Emerging mobility — especially TNCs and shared bikes and scooters — are outcompeting transit, offering more tailored, user-friendly, convenient ways to get around at an attractive price.[29] Transit is also struggling because we continue to create car-centric, low-density, unwalkable places where it's hard for fixed-route services to be successful.

Poor transit service is particularly burdensome for the most vulnerable populations, including seniors, youths

25 Shin-pei Tsay and Zak Accuardi, "Private Mobility, Public Interest," TransitCenter, September 2016.

26 For example, the San Francisco Municipal Transportation Agency's Private Transit Vehicle regulations state that new routes should complement Muni service, not replicate it. See: SFMTA, Private Transit Vehicle Permitting, https://www.sfmta.com/projects/private-transit-vehicle-permitting Program for Private Transit

27 BART has now transitioned from Scoop and is using the information from those pilots to roll out its own carpool service.

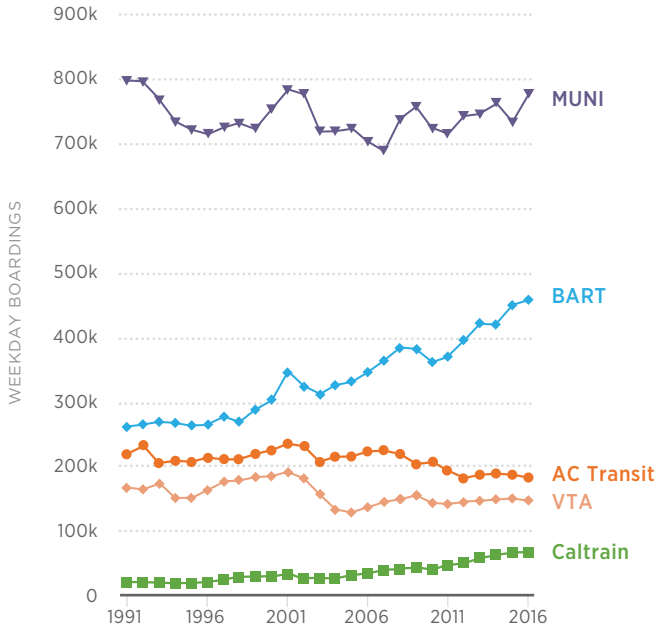
28 MTC Statistical Summary of Bay Area Transit Operators Fiscal Years 2011–12 through 2015–16, https://mtc.ca.gov/file/81176/search-result

29 M. Manville, B. Taylor and E. Blumenberg, "Falling Transit Ridership: California and Southern California," Southern California Association of Governments, January 2018.

FIGURE 2:

Daily Transit Ridership by Operator

Daily ridership is down for local systems and up for commuter rail.



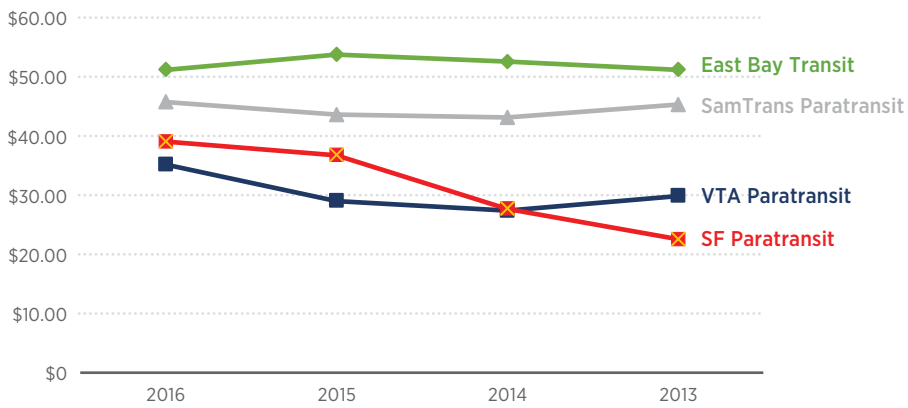
and people with low incomes. They may choose a more reliable mode — such as an automobile — rather than gamble with a late or slow-moving bus or train, even though the financial burden is high.[30]

Transit agencies have more problems than just falling ridership: They deal with operator shortages, rising health care costs, crumbling infrastructure, insufficient funding and delays in completing new projects. Bay Area transit operators have racked up $166 billion of overdue state-of-good-repair needs.[31] As baby boomers age, demand-responsive paratransit services for elderly and disabled people are dramatically increasing in both operating cost and demand (see Figure 3).

FIGURE 3:

The High Costs of Demand-Responsive Transit

Paratransit costs per passenger are much more expensive than fixed-route transit.



30 Access to a car can make a powerful difference in the lives of low-income individuals. Evelyn Blumenberg and Gregory Pierce, "Car Access and Long-Term Poverty Exposure: Evidence from the Moving to Opportunity (MTO) Experiment," *Journal of Transport Geography*, 65, December 2017, pages 92–100. Blumenberg and Pierce specifically focus on low-income householders participating in the federal Moving to Opportunity (MTO) program. The U.S. Housing and Urban Development department designed the landmark MTO Experiment for Fair Housing Voucher Program to help low-income households move out of and stay out of concentrated poverty. Research shows automobile access reduces poverty exposure for low-income households.

31 Plan Bay Area 2040: Final Transit Operating and Capital Needs and Revenue Assessment, http://2040.planbayarea.org/sites/default/files/2017-07/Transit_Op-Capital_Needs_Asses_DPBA2040_Supplemental%20Report_7-2017.pdf

Cars have been given an outsize portion of the scarcest resource in our cities — space — forcing transit to sit in traffic. But across the region, investments and policies to get buses out of traffic have been a tall order. Efforts to implement protected bus-only lanes have been met with significant and severe pushback from parties with an interest in maintaining the status quo.

All of these factors were at play before COVID-19. The pandemic has hit the transit industry especially hard. Ridership and fares have plummeted, along with funding from sales taxes and other sources. Frontline staff are being exposed to the virus, with many deaths reported, and there are high new costs for disinfecting and for protective equipment. In the longer term, it's possible that many riders will not return to public transit at all, while others may increase their use of telecommuting, cycling, carpooling or other modes. Without more investments and policies that support fast, frequent and seamless transit, the Bay Area will be hard-pressed to deliver a transit network that is needed for a mixed-mobility future.

3. SPUR's Framework for the Future of Emerging Mobility

Accurately predicting future technologies and customer trends is nearly impossible. The outlook and financial future for both private and public sector mobility has changed dramatically even during the writing of this report. Still, we can position the Bay Area for success by adopting more adaptive systems and policies that are consistent with our values.

SPUR has identified three strategies for realizing the potential of emerging mobility services and maximizing public benefit. Implementing these recommendations will require political courage, significant investment and a long-term view. But we believe these steps are essential to ensuring emerging mobility services and new technologies provide access and mobility for everyone, help meet climate targets and positively shape how cities and the entire region grow.

Strategy 1

Establish an effective planning and regulatory framework so that emerging mobility services support regional goals

The Bay Area is an exceedingly complex region. There is one regional transportation agency, 9 counties (each with at least one transportation agency), 27 transit operators and 101 cities. Only a few of the largest cities have a dedicated department of transportation that has the capacity to focus on emerging mobility. It is no surprise, therefore, that the integration of emerging mobility at a regional scale has mostly been ad hoc and haphazard.

To avoid increasing fragmentation, the Bay Area needs a coherent and flexible planning structure. The framework that follows, developed for the U.S. Department of Transportation, can help visualize how emerging mobility may fit into the regional transportation planning process.[32] This schematic is similar to standard transportation planning. What is different is the need to coordinate and regulate private actors, the speed at which innovations are emerging and the lack of data on effectiveness.

Determining the right role for each agency in the region and agreeing on how to work together to achieve common goals is the most immediate challenge. Unless we create a system that is flexible, adaptable and able

32 From the U.S. DOT report, "Integrating Shared Mobility into Multimodal Transportation Planning: Improving Regional Performance to Meet Public Goals," February 2018, https://www.planning.dot.gov/documents/SharedMobility_Whitepaper_02-2018.pdf

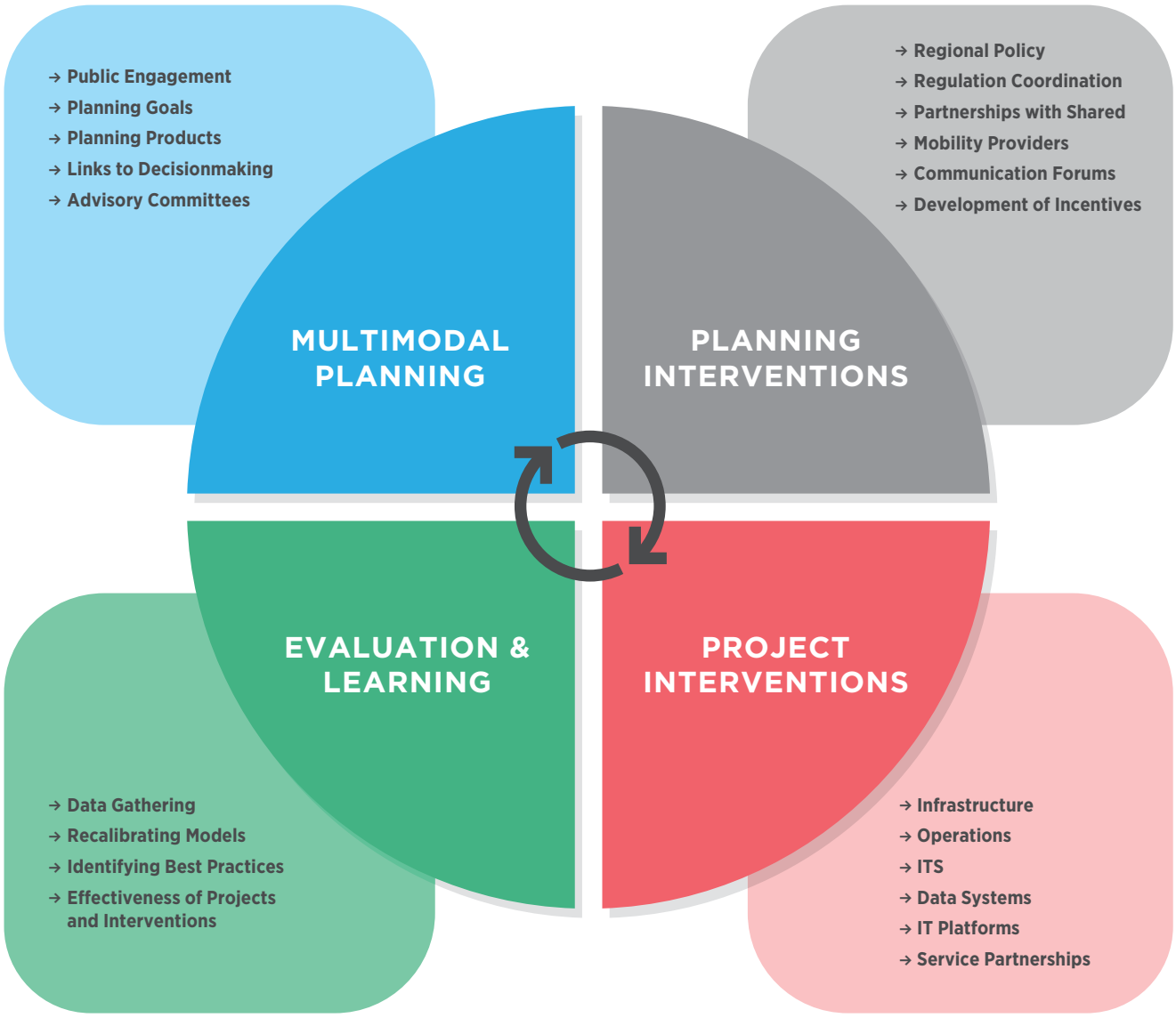


FIGURE 4

U.S. DOT's Conceptual Framework for Visualizing Shared Mobility Integration with Regional Multimodal Planning Process

Partnerships can create pilot programs, useful for determining how shared mobility can support public efforts as well as producing data and opportunities for learning, evaluation and future planning efforts.

Source: Reprinted from McCoy et al., (2018)

to connect the four main areas listed in Figure 4, the promise of emerging mobility to create a shift away from excess auto dependency will be lost.

Recommendation 1.1

Elevate MTC's coordinating role while supporting county agencies to develop a mixed-mobility future

Who: MTC, CTAs

Mixed mobility is still nascent. MTC, county transportation, cities and transit operators have an opportunity to create a coordinated system before fragmentation becomes entrenched, as it has with our 27+ transit providers. SPUR believes that MTC should play a more prominent role. Yet MTC lacks regulatory or permitting authority over emerging mobility services, and there is not consensus that it should have such authority, so there is clearly a need for greater investment in coordination and experimentation.

Given the large number of roles that need to be filled, Recommendation 1.2 calls for the creation of a Bay Area Mobility Innovation Lab (BayMIL) that would serve some of the functions outlined in Figure 4. (While BayMIL could be housed at MTC, it does not need to be.) In addition, the county transportation agencies and cities have an important role to play in developing or implementing more localized partnerships.

In this emerging mobility coordination role, MTC could be responsible for the following functions:

- **Update regional transportation goals and incentivize other agencies to align with them.** MTC has a well-rounded set of regional goals and performance indicators it uses to guide transportation and land use planning. This includes the state's target of a 19% reduction in per-capita CO_2 emissions from cars and light trucks by 2035.[33] A key equity goal is for a 10% reduction in the share of lower-income residents' household income consumed by transportation and housing.[34] Yet cities, county transportation agencies (CTAs), transit providers and the state have their own, sometimes conflicting, goals. It is particularly important to have the CTAs, whose countywide plans help form the basis for the regional plan, come into much closer alignment with regional goals.[35]
- **Bring public and private transportation services together** under a common platform for routing, booking and paying for trips, sometimes known as "Mobility as a Service" (see p. 20) or MaaS. MTC would not have to host the platform but could set standards for the integration of different providers (see Recommendation 1.3).
- **Create forums for dialogue and collaboration** among the public sector, the private sector and the general public. These forums could also be a way for public agencies to share best practices, discuss challenges and develop coordinated strategies for working with mobility companies.[36] Both sectors would work together to develop approaches for data processing and standards.
- **Support and fund pilots, partnership and experimentation.** The pilot approach — form a question, test

33 Targets set by the California Air Resource Board as part of SB 375 include emissions from passenger vehicles and light trucks and are expressed as a percent change in per capita greenhouse gas emissions relative to 2005.

34 For the full set of performance targets see: http://2040.planbayarea.org/sites/default/files/2017-07/Performance%20Assessment%20Report_PBA2040_7-2017_0.pdf

35 This could result in state legislation that requires countywide transportation plans to reference MTC's goals as the guide for investments.

36 The public sector can support private companies in engaging with communities to understand their needs and then translate those needs to beneficial outcomes that align with business models. For example, as several scooter-share companies moved to enter the market in Detroit, city staff wanted to ensure that the companies shared the city's concerns about equitable service delivery. As part of a process called "diligent customer discovery," the city set up a roundtable discussion among residents and scooter providers to ensure the residents' concerns were communicated directly to both the city and the service providers. Stephen Goldsmith and Matt Leger, "Mobility and the Connected City: Effectively Managing Connected Mobility Marketplaces," Harvard Kennedy School Ash Center for Democratic Governance and Innovation, 2020.

and evaluate — is well-suited to helping cities and transit operators address the current dynamism in urban transportation. MTC has funded and partnered on a variety of emerging mobility efforts, as have some transit and county transportation agencies. But these need to happen at a greater scale and with more coordination.

MTC, working with BayMIL, could help guide a regional program that provides financial support and technical assistance to CTAs, transit operators and cities to test new mobility solutions in exchange for data and reporting on engagement, methods and outcomes.

This approach offers the opportunity to try new ideas in different markets, under different conditions and with a common evaluation framework. For example, pilots could be designed to:

- Understand how much emerging mobility services cost to deliver, before they are scaled up.
- Learn how best to promote emerging mobility services to underserved communities.
- Assess how emerging mobility impacts transit ridership, drive-alone rates, vehicle ownership and other key indicators.
- Experiment with different infrastructure choices, such as how to manage curb space in a way that is more equitable and efficient.
- Refine and develop new contracting models.

BayMIL should require pilots to be framed around regional goals and have clear learning objectives and evaluation metrics since it may take several iterations to achieve success.

→ **Make new planning tools and technical assistance more widely available.** New planning tools are being developed that can help manage emerging mobility services. Others can help reimagine how emerging mobility could interact with the broader transportation network. For example, some web-based tools allow planners to create scenarios that illustrate possible configurations of a street and the curb. With these tools, planners can engage the community in understanding ways to accommodate emerging mobility, from the placement of bike-share parking to TNC passenger drop-off zones. MTC could take a leading role in ensuring collaboration between transit operators and cities and counties by purchasing and distributing software product licenses as well as providing trainings for these new planning tools.

Greater regional coordination of emerging mobility has many potential benefits. It enables a more customer-friendly experience and offers operational efficiencies, for both public agencies and private companies. In addition, when negotiating with private companies, the entire region will have more bargaining power than an individual city.[37] These private companies, in turn, may be more willing and able to meet more demanding equity and accessibility requirements if they don't have to negotiate a host of city-specific requirements. Ultimately, the mobility marketplace will be most stable and able to encourage innovation when there is consistency across municipal boundaries. This may be especially important as the region and private mobility providers all work to cope with and recover from the tremendous disruption of COVID-19.

MTC's contract with Lyft's subsidiary Motivate to operate Bay Wheels, a bike-share system operating in five Bay Area cities, is an example of the benefits of a regional approach, as well as some of the challenges. The bike-share system — the pricing structure, parking requirements, low-income program and user experience — is the

37 Kevin McCoy, Russell Glynn, William Lyons and James Andrew, "Integrating Shared Mobility into Multimodal Transportation Planning: Metropolitan Area Case Studies," USDOT, 2019, https://www.planning.dot.gov/documents/regional_shared_mobility_planning_caseStudies.pdf

same in all five participating cities. This helps support a monthly and annual subscription model and increases overall use of the bikes.

One of the benefits of scale was Lyft's Bike Share for All program, which offered $5 memberships for low-income residents for their first year (then continued deep discounts) in all cities. MTC also provided funding to the nonprofit TransForm to coordinate an outreach program by the three largest bicycle coalitions and community-based organizations. As a result, Bay Wheels had the highest percentage of low-income membership in the country, more than 20 percent.[38] Yet at times cities have felt hamstrung by the contract, for example, when Lyft pulled their bikes because of mechanical issues and when the company suddenly increased the price of e-bike rentals.

Recommendation 1.2
Develop a Bay Area Mobility Innovation Lab

Who: MTC

While MTC should play a much larger role in emerging mobility, the organization's regional role is already growing as it merges with the Association of Bay Area Governments, initiates a Bay Area Housing Finance Authority, coordinates a regional expansion of express lanes and much more. There is a real concern about MTC's capacity to take on so many initiatives at once. That is why SPUR recommends that MTC, working closely with counties, cities and transit operators, universities and employer associations, develop a Bay Area Mobility Innovation Lab (BayMIL). BayMIL would incubate new ideas, encourage creativity and facilitate direct collaboration and communication among the public and private sectors, university researchers, entrepreneurs, startups and others.

SPUR believes it is critical that the BayMIL is scaled at the regional level, whether it is housed at MTC or elsewhere. Most smaller cities and transit operators do not have the bandwidth or skill sets to experiment and develop new systems on their own. BayMIL can provide the direct support they need to innovate. BayMIL would also work closely with the larger cities, county transportation agencies and transit operators that are already experimenting with emerging mobility.

There are several ways BayMIL could spur effective, coordinated innovation:

- **Develop an unsolicited proposal review process.** BayMIL can create a structured process where private companies can pitch new ideas for improving mobility. These ideas would be evaluated to identify potential partners and, if they align with the broader goals for the transportation system, consider them for public funding. LA Metro's Office of Extraordinary Innovation designed such a process to encourage new ideas for how Metro designs, finances, delivers and builds its services.[39]
- **Lead innovation challenges.** MTC could run regular innovation challenges to encourage startups and the greater business community to work through specific transportation problems, pitch solutions and build products to trial and scale. For example, Transport for New South Wales launched a "Safety after Dark"

38 See more detailed information at: https://www.transformca.org/landing-page/ford-gobike-model-equitable-bike-share-access-us-thanks-community-engagement

39 See: LA Metro Office of Extraordinary Innovation, https://www.metro.net/projects/oei/partnerships-ups/

innovation challenge focused on safety for women traveling on public transit at night and is offering mentorship, technical assistance and seed funding to the winning teams.[40]

- **Support workforce development.** Employment in the transportation field is already changing quickly, as evidenced by the decimation of the ossified taxi industry when the dynamic, customer-friendly, venture-capital-subsidized TNCs took to the streets. With widening inequality in the region, and with the better jobs in emerging mobility requiring at least some training, BayMIL can help lead or support workforce development efforts. Some companies offer training and employment ladders, especially to low-income communities of color.[41] Yet a workforce development program that is supported or led by the public sector can have a broader scope, targeting benefits to the most vulnerable communities as well as specific populations such as residents returning from incarceration.
- **Establish Urban Proving Zones.** To support and grow innovative transportation solutions, cities and congestion management agencies (CMAs), in partnership with other key stakeholders, could establish Urban Proving Zones. Introducing new services in these areas specifically selected for testing and evaluation can help regulators, companies and cities gain insights about how those services interact with each other as well as with existing transportation patterns and infrastructure.[42] This would be especially helpful if a handful of diverse geographic and socioeconomic areas were chosen. One way to structure the effort would be to allow companies that agree to a set of objective minimum requirements, such as insurance coverage requirements, contractual terms and data-sharing expectations, to pilot their ideas without having to go through a competitive proposal or permitting process.[43] Zones could allow companies to demonstrate how their services contribute to achieving public goals.[44]
- **Develop common evaluation frameworks, model regulations and more.** BayMIL and MTC should collaborate with local jurisdictions and other stakeholders to design a set of common elements across the region for emerging mobility services, ranging from procurement procedures to common signage.
- **Autonomous vehicle pilots in the public interest.** Pilots involving autonomous vehicles could also be an important focus, given the profound impact AVs are expected to have on our transportation system. This should include autonomous high-capacity vehicles such as full-size buses that, without public intervention and funding, might be developed much later than personal AVs.[45] Pilots on smaller passenger platforms, such as 6 to 8 passenger AV shuttles, will also be important to see how autonomous transit can serve different markets. The impact may be especially profound on serving communities of concern, access to trunk-line transit, low-density areas and late-night trips.

40 See: Safety After Dark Innovation Challenge, https://future.transport.nsw.gov.au/technology/roadmap-in-delivery/transport-digital-accelerator/safety-after-dark

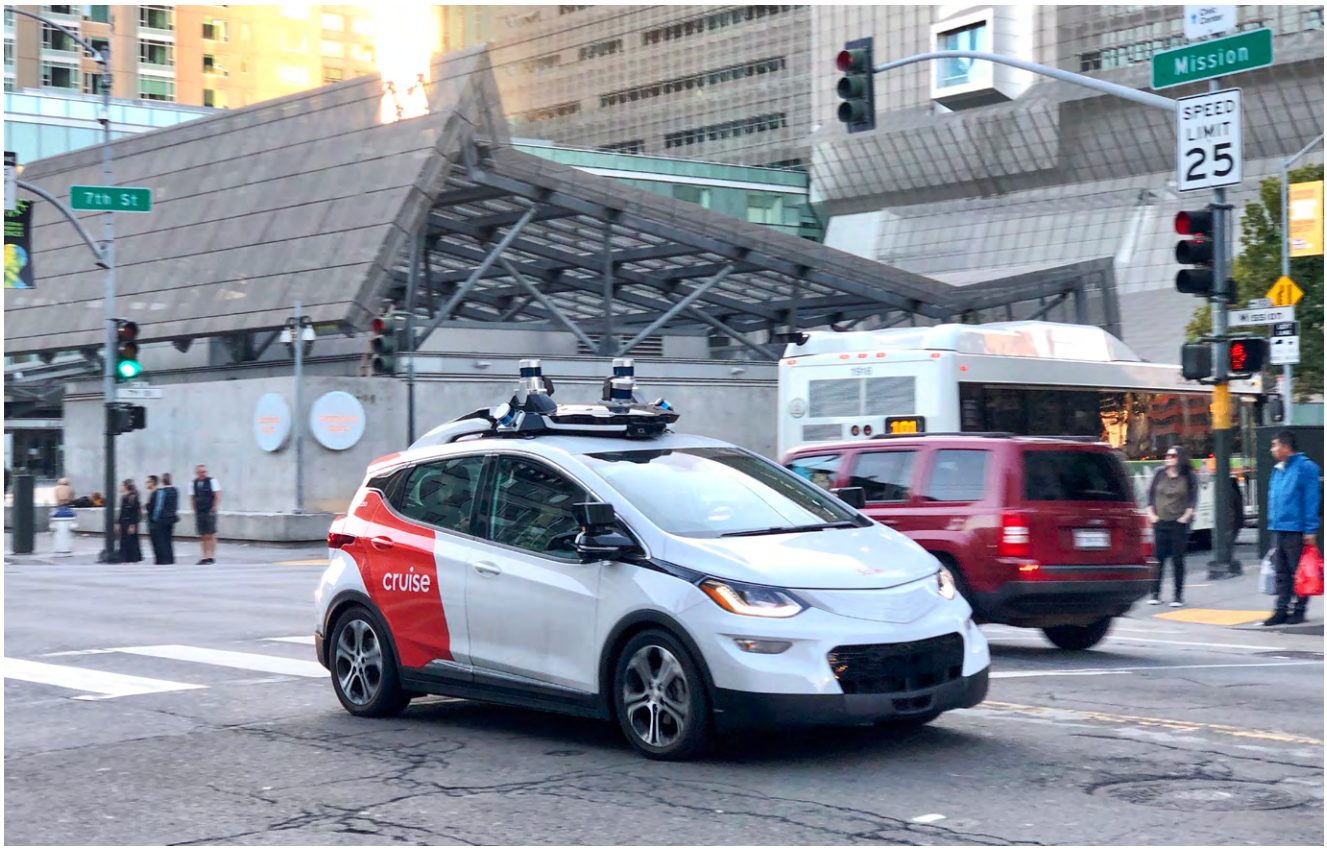
41 Scoot provided a very good example of this, though they were bought by Bird.

42 D. Pankratz, K. Nuttall, W. Eggers and M. Turley, "Regulating the Future of Mobility: Balancing Innovation and the Public Good in Autonomous Vehicles, Shared Mobility, and Beyond," Deloitte Insights, December 20, 2018, page 14.

43 Urban Movement Labs, spearheaded by the mayor of Los Angeles, is creating a network of Urban Proving Grounds where innovative transportation solutions can be tested and measured against their positive impacts on people's everyday lives, from making streets safer to air cleaner to making commutes quicker. See: https://www.urbanmovementlabs.com/programs-projects/

44 For example, the U.K. Department of Transport put up £90 million ($112 million) of capital funding to create four Future Transport Zones at a scale to demonstrate new mobility services, modes and models. The zones will create a functioning marketplace for mobility, combining new and traditional modes of transportation, for example, piloting transportation innovations like e-scooters and e-cargo bikes, on-demand buses, and and using drones for medical deliveries. The primary goal is to provide real-world testing environments, allowing experts to work with local bodies such as councils, hospitals, airports and universities to test innovative ways to transport people and goods. See U.K. Department of Transport, "New transport tech to be tested in biggest shake-up of laws in a generation," 2020, https://www.gov.uk/government/news/new-transport-tech-to-be-tested-in-biggest-shake-up-of-laws-in-a-generation

45 Nelson\Nygaard, "Transit & Emerging Technologies," https://umjp9n8g2j2ft5j5637up17u-wpengine.netdna-ssl.com/wp-content/uploads/2019/02/Transit-and-Emerging-Technologies.pdf



By bringing key players together, BayMIL can ensure that new ideas help agencies deliver on their service delivery and mobility goals rather than distracting them from those priorities.[46]

Autonomous vehciles are expected to have a profound impact on our transportation systems.

Photo by Sergio Ruiz

46 TransitCenter, "Private Mobility, Public Interest: How public agencies can work with emerging mobility providers," 2016.

Recommendation 1.3

Steward an interface for public and private transportation services to offer users a range of mobility options (MaaS)

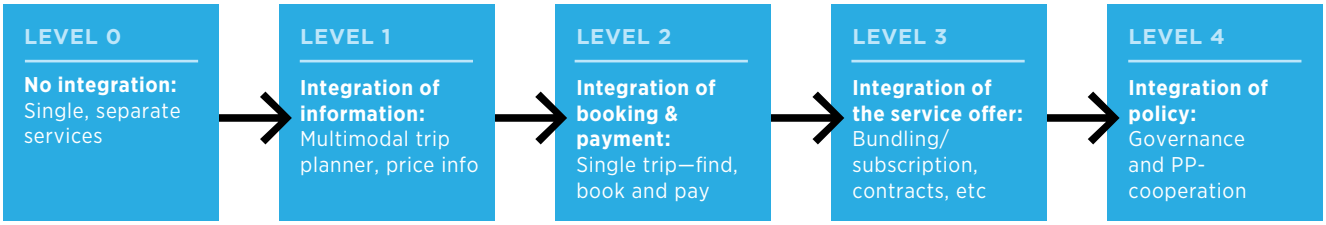
Who: MTC, transit operators, private mobility providers

MTC and BayMIL can play vital regional roles to coordinate emerging mobility, but how could all of these new services actually attract riders, especially those currently driving solo, rather than just add confusion at the plethora of choices?

That is where the critical role of Mobility as a Service comes in. MaaS most often refers to a trip planning and payment app that supports the seamless, easy use of a broad range of mobility solutions. Some MaaS apps can personalize trips based on the owner's preferences, include both public and private services and even adjust recommended routes or a mix of mobility modes in real time as conditions change. For some people, MaaS also describes a philosophy, a shift away from relying on privately owned automobiles toward using a broad range of mobility solutions that are consumed "as a service" or "as a subscription."

In the U.S., early versions of MaaS exist in the form of multimodal trip planners like Google Maps and the smartphone app Transit. Based on the typology created by Jana Sochor et al. (see Figure 5), this represents the most basic level of MaaS, Level 1.

FIGURE 5
A MaaS Typology



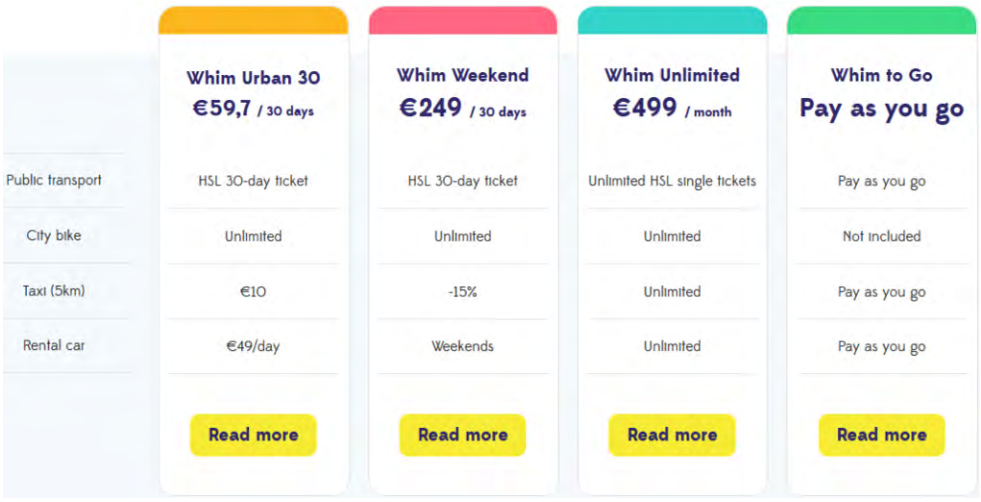
Source: Jana Sochor, Hans Arby and MariAnne Karlsson, "The topology of Mobility as a Service: A tool for understanding effects on business and society, user behavior, and technical requirements," Paper No. EU-SP1013, 2017 ITS World Congress, Montreal

Level 2 builds on the information aggregators by allowing customers to book and pay for their trip within the app. Uber and Lyft already have bikes and scooters available and are partnering with transit agencies, for example, in Las Vegas and Denver, to allow planning and ticket purchases within their apps. Cities and regions are also working with apps like Transit and Citymapper to reach this level.

Level 3 includes the option to purchase a subscription to different packages of services, offered at different price points. This was pioneered by Whim, a service in Helsinki that can be used à la carte or through three monthly plans that come with unlimited rides on local transit, ferries and commuter trains in the city's service area (as seen in Figure 6).

Level 4 of MaaS is the "holy grail": integrating the system with public policy and governance structures. This would include targeting incentives to help meet regional goals on climate and social equity, for example, via the Safety Net Mobility Package described in Recommendation 3.3.

FIGURE 6
Whim offers monthly service plans as well as an à la carte option. It is a tremendous technical achievement, but it is questionable whether the "Unlimited" package, which includes unlimited taxi rides (of under three miles) and rental cars, will help meet sustainability and quality-of-life goals.



MaaS clearly creates some exciting opportunities. By making it easier for people to plan and pay for a trip, it could help reduce reliance on private cars with the concomitant benefits of reduced household costs, reduced greenhouse gas emissions, less space needed for parking, etc.

At the same time, if not introduced with the intent of reaching regional goals like reducing the share of single-occupancy trips and supporting public transit, MaaS could exacerbate existing problems. Commercial MaaS subscription packages, for example, may be designed in a way that actually promotes driving. The Whim monthly "Unlimited" package pictured in Figure 6, which includes unlimited taxi rides (of under three miles) and rental cars — may just induce people to take more car trips in order to recover their sunk monthly cost.

In addition, competing MaaS apps can reduce the ability for seamless travel, as not all possible choices will be on any single app. And if each MaaS platform has its own carpool features (assuming those features aren't connected to each other), then the incredible potential to promote efficient shared ride hailing or real-time carpooling and shuttles will be greatly diminished. Finally, nothing precludes commercial MaaS operators from favoring their own solutions and sidelining public transportation.

Implementing MaaS effectively in the Bay Area, where there is a plethora of public and private mobility operators, will be especially complicated. Governance, not technology, is the key challenge.[47] SPUR believes MTC should take a central role in stewarding the process. To move MaaS forward, MTC should take the following actions:

- → **Develop a framework and strategy to guide the adoption of MaaS.** The public sector must establish a vision and a framework for MaaS that prioritizes choice and competition, meets regional goals for access and sustainability, works for people of all income levels and abilities, guarantees privacy and data security, and maintains a fair and open market. MaaS should build on the public transit nucleus by offering regular transit riders new services that extend their access. This can show more car commuters that public transportation can be a practical and desirable option, especially when mixed with a range of mobility services.
- → **Bring everyone to the table.** Realizing the potential of MaaS requires new forms of public-private partnerships in which private companies will play a larger role in the creation of public value. New organizational models

47 American Public Transportation Association, "Being Mobility-as-a-Service (MaaS) Ready," https://www.apta.com/wp-content/uploads/MaaS_European_Study_Mission-Final-Report_10-2019.pdf

Source: whimapp.com

that support greater collaboration will be needed. Government should develop working groups where transit operators, mobility providers, private companies and large institutions like universities can discuss opportunities to work together.[48]

- **Establish a role for Clipper.** The Clipper Executive Board — made up of representatives from MTC, the six largest transit agencies and two smaller operators — should embrace a forward-thinking MaaS vision with a larger, more prominent role for Clipper. Clipper and FasTrak together could become the core of the payment system on the new MaaS platform, much as the Oyster card is becoming the payment system for London's MaaS initiative/platform. This can be the basis for what has been called a "mobility wallet" that simplifies payments and will also make it easier to have a Safety Net Mobility Package (See recommendation 3.3).
- **Steward the development of a digital back-end platform for mobility services.** MaaS requires a digital platform that integrates end-to-end trip planning, booking, electronic ticketing and payment services across all modes of transportation, public or private. To facilitate the development of MaaS and offer a frictionless customer experience, MTC should build on an open architecture platform to allow significant innovation to occur on it. As mentioned, it would ideally be linked to Clipper.
- **Streamline and integrate transit fares.** The region's disjointed fare policy, lack of coordinated fare products and lack of revenue-sharing agreements will make it very difficult for public transit operators to participate in MaaS schemes. The 35,000 business rules that run the Clipper system discourage software developers from building solutions that will work across transit operators, and make it harder to develop loyalty programs that reward frequent transit use regardless of operator. Only a handful of multi-operator passes are available, and there is no such thing as a pass that includes transit-adjacent services like bike sharing or car sharing. A well-integrated public transportation system, as outlined in SPUR's 2019 report Solving the Bay Area's Fare Policy Problem, is crucial to the success of MaaS.

By "steward" we mean that MTC, working with transit operators, should manage the platform; it does not have to build, operate or maintain it. There are many ways to achieve this. Vienna, Austria, has been experimenting with a system and believes the customer-facing front end (the MaaS app, so to speak) can be in the hands of a public or private operator and the back end in the public realm.[49] By managing the back end, the public sector could design the rules and expectations for private mobility providers to participate, set incentives to ensure individual choices result in a net public benefit and advance local policy priorities, and have greater access to the data in a way that could help inform future transportation planning.

It is crucial to remember that even when designed to support regional goals, MaaS is not a panacea. It will only shift more people toward active transportation, public transit and shared rides if those modes are safe, affordable and efficient for many more trips than they are today.

48 For example, the European Union created the MaaS Alliance, a public-private partnership to facilitate information sharing and consider legal and technical issues, the user experience and social impact of MaaS. Forums like the MaaS Alliance are enabling players across the ecosystems to collaborate, share best practices and spur the development of MaaS in a way that works for transit operators and riders.

49 American Public Transportation Association, "Being Mobility-as-a-Service (MaaS) Ready."

Recommendation 1.4

Support the California Public Utilities Commission's efforts to regulate ride-hailing companies and autonomous vehicle fleets

Who: CPUC, California Legislature

While regulation of some modes, such as bike or car share, are left to local governments, the CPUC has regulated most aspects of ride hailing as well as companies that are developing autonomous vehicle passenger fleets since their inception.[50] For TNCs, the CPUC regulates operations, vehicle inspections and safety, background checks, insurance, accessibility, registration fees and more.

The CPUC is the most logical place to manage ride-hailing and AV services for four key reasons:

1. It ensures that big structural parts of the regulatory system do not change when a trip crosses a city or county boundaries;
2. The CPUC can be given authority to implement rules tied to statewide policies such as the law to shift TNCs to use more electric vehicles and increase their proportion of shared trips;[51]
3. The CPUC has experience managing low-income household subsidy programs through its work with utilities;[52] and
4. The CPUC is accustomed to regulatory and enforcement roles, unlike transportation planning agencies. If ride-hailing services end up as a monopoly or oligopoly, then these services may need to be regulated like CPUC regulates PG&E and other utilities.

There are also drawbacks, however, to having the CPUC provide oversight. The CPUC is primarily concerned with vehicle and consumer protection and safety, and less focused on the impacts of ride hailing on issues like congestion or urban design. As a result, it has allowed spatially inefficient ride-hailing services to grow in our densest, most urban places — directly competing with public transit and increasing congestion that degrades transit speed — without addressing ways to mitigate the problems. San Francisco had to seek (and ultimately received) state authority to tax TNCs in AB 1184 and passed a dedicated per-ride tax in 2019 (Prop D). In addition, with a state as large and diverse as California, there is much greater knowledge of impacts at the local and regional level.

It is unlikely that the CPUC will be stripped of its regulatory authority. A better approach is to strengthen and resource the CPUC so it has the capacity to actually implement its existing policies and regulations as well as to support its role in regulating AVs and TNCs. To succeed in a way that genuinely acknowledges the full impacts of ride hailing on cities and people, the CPUC will need make several key changes:

→ **Adopt goals and metrics.** The CPUC should adopt goals consistent with or derived from the state's climate and equity goals, as well as goals previously enacted by the legislature, peer agencies with complementary

50 The Department of Motor Vehicles oversees AV testing and deployment, but the CPUC oversees AVs that will be used to pick up passengers as well as the regulating and permitting ride-hailing companies. This stems from the CPUC's regulatory authority over the transportation of passengers for compensation, e.g., taxis and shuttles. Street-hailing taxis, on the other hand, are exempt from CPUC regulation when these services are licensed or regulated by local ordinance. See: San Francisco County Transportation Authority, "The TNC Regulatory Landscape," 2018, https://www.sfcta.org/projects/tnc-regulatory-landscape

51 SB 1014, authored by State Senator Nancy Skinner, was signed into law in 2018 and directs the California Air Resources Board and the California Public Utilities Commission to adopt and implement two targets: to increase the deployment of zero-emission vehicles (ZEVs) by TNCs and to reduce greenhouse gas emissions per passenger mile (to incentivize a higher number of passengers per TNC vehicle trip, with the intent to reduce congestion, VMT and tailpipe emissions).

52 That said, the CPUC does so through its rate regulation authority. It allows utilities to charge higher rates to most users in order to subsidize low-income rate payers. As of now, the CPUC doesn't regulate rates of ride-hailing companies.

jurisdiction and the CPUC itself. These goals should guide the CPUC's regulatory approach to ride hailing and AVs, as well as its decisions around what data needs to be collected. When necessary, the legislature can step in to require specific goals, as it did in 2018.[53]

- **Tailor regulations to markets.** The scope and impact of ride hailing and AVs varies across geographies. To that end, rather than develop regulations for the state writ large, the CPUC should tailor its regulations to markets (for example, dense urban, semi-urban, suburban and rural). Goals could reflect variations in markets, including developing pathways for disadvantaged communities to improve their access. CPUC has already introduced such a variation as part of implementing the TNC Access for All Act; the maximum response time allowed for wheelchair users varies by location, based on the actual response time for non-wheelchair users.
- **Expand staff expertise.** To successfully consider the differing impacts of ride hailing and AVs on different markets, the CPUC will need to be better resourced with urban planners and transportation professionals. It will also need to develop systems for continuous collaboration with cities so that it is developing regulations alongside people with expertise on urban issues.
- **Mandate significant data sharing.** The CPUC currently requires data sharing from both TNCs and AV operators that give rides to commercial passengers. It recently made a change to provide dramatically more information to cities.[54] Companies participating in the CPUC's Drivered AV Passenger Service must provide information such as total vehicle miles traveled during passenger service, total electric vehicle miles, time between passenger trips, vehicle occupancy and wheelchair-accessible rides that are requested, fulfilled and unfulfilled.[55] This is a start. Yet there are clearly other indicators, such as collisions with cyclists and pedestrians, that should be collected and released to allow stakeholders to get a more complete view of how AVs can help us meet transportation goals and the best paths to managing their expansion. San Francisco agencies have provided detailed recommendations on how the CPUC can collect and release more granular data to better inform transportation planning and mobility regulation at the local level while protecting personal privacy.[56]

Recommendation 1.5

Establish regulations that steer emerging mobility toward public goals

Who: Cities, MTC, CPUC

A future where the streets are populated with a healthy mix of efficient, sustainable and equitable mobility services requires the public sector to have a strong hand in defining and crafting regulations. The key is not to squash innovation or the financial viability of companies that can benefit the public.

When feasible, regulations should focus on performance outcomes. That model gives private mobility companies the flexibility to define their business models and structures — provided their actions deliver on public goals such as safety, equity, sustainability and access. San Francisco took this approach when renewing scooter permits in 2019. Simply requiring an equity outreach program did not lead to sufficient low-income

53 This was the case with SB 1014, a law that requires CARB and the CPUC to set greenhouse gas emissions targets for TNCs and requires TNCs to develop emissions reduction plans that can meet those targets. https://ww2.arb.ca.gov/our-work/programs/clean-miles-standard/about.

54 The CPUC recently reversed a long-standing policy of extraordinary secrecy, voting to rescind an obscure footnote that granted sweeping confidentiality to safety reports that must be filed by Uber, Lyft and other ride-hailing companies about accidents and assaults connected with their services across the state. See: Seth Rosenfeld, "Uber, Lyft Lose Shield on Safety Reports as California Regulator Rescinds Secrecy Rule," *San Francisco Public Press*, Mar. 12, 2020, https://sfpublicpress.org/news/2020-03/uber-lyft-lose-shield-on-safety-reports-as-california-regulator-rescinds-secrecy-rule

55 See CPUC website, "Quarterly Pilot Service Data Reports," https://www.cpuc.ca.gov/avcpilotdata/

56 See "Opening Comments of the SFMTA, SFCTA, SF City Atty. Office and SFO to Phase III.C Scoping Memo and Ruling ig Assigned Commissioner," https://www.sfmta.com/reports/tnc-rulemaking-proceedings-sfmta-comments

members after the first six months, so the city made an expansion of the scooter fleet contingent on reaching a certain number of low-income memberships.[57]

As these services are nascent and best practices are evolving, regulations should allow for changes and updates. Regulations for a particular category, such as micromobility, should be both mode and vendor agnostic so that new rules don't need to be created every time a new service launches. SFMTA took a big step toward unifying and streamlining its mobility permit programs with the "permit harmonization" effort, which aims to foster innovation through a clear path for new mobility services, standardize processes to administer, monitor and enforce, and coordinate data reporting to understand impacts on transportation networks.[58]

Outcome-based regulation allows private companies to explore different methods for achieving public goals without inhibiting innovation through overly prescriptive requirements. Certain services, like scooter share and bike share, are an order of magnitude cleaner and safer (for others) than the personal car and are more likely to help cities meet their sustainability and equity goals. The more people walk, bike and use shared services, and use them safely, the better it will be for everyone. On the other hand, the consequences of ride hailing in the densest places in the region are much more significant and pernicious,[59] as might be the consequences of AVs if they are not shared and end up encouraging sprawl.

A successful framework for regulating emerging mobility in pursuit of regional goals should consider the following questions:

- Does the service improve mobility and access for residents in an equitable way? What constituents or parts of cities are benefiting?
- Does the service improve quality of life for users by filling gaps in the public transit network or offering meaningful improvements in convenience, quality of experience, or cost or time savings?
- Does it provide ADA-compliant services that are similar to its other services?
- Does the service complement or, even better, support transit ridership?
- Does the service help or hinder achievement of our mode-shift and emissions reduction goals?
- Does the service improve efficient utilization of street space?
- Does the service promote public health and safety (e.g., by increasing physical activity or reducing injuries and deaths from collisions)
- Do the workers providing the service have the wages, benefits and rights (e.g., the ability to organize) that our community believes are fundamental?

Achieving all of these goals is a tall order for any service, public or private. If a service can help, it may be considered for receiving subsidies, as discussed in Recommendation 2.3.

SPUR acknowledges that regulations on TNC, bike and scooter companies are more onerous than those placed on private automobiles. The DMV has never turned someone away from registering their car by citing too many cars clogging city streets, while cities like San Francisco have placed such limitations on scooters.[60] The end

57 Some felt that the required number of memberships to meet the equity criteria were too onerous, but that is why flexibility is needed in this rapidly evolving landscape. See: https://www.sfexaminer.com/the-city/sf-will-allow-e-scooter-fleet-to-double-if-scoot-skip-recruit-more-low-income-customers/

58 The program defined all shared mobility vehicles subject to this permit process as "mobility device or devices, capable of carrying 10 or more people, separately or together." See: https://www.sfmta.com/sites/default/files/reports-and-documents/2019/10/11-5-19_item_12_mobility_permit_harmonization_-_slide_presentation.pdf

59 For example, a Union of Concerned Scientists study found significant deadheading, i.e., miles driven with no passengers in the car, and other aspects of ride hailing that can increase climate pollution. Don Anair, Jeremy Martin, Maria Cecilia Pinto de Moura and Joshua Goldman. "Ride-Hailings Climate Risks: Steering a Growing Industry toward a Clean Transportation Future," Union of Concerned Scientists, 2020.

60 Andrew Salzberg video, https://loebfellowship.gsd.harvard.edu/fellows-alumni/fellows-search/andrewsalzberg/

goal should be to regulate behaviors that are common across the transportation systems, whether the mode or service is publicly or privately provided or a personal car.

One of the most obvious and hotly debated discrepancies is on pricing — as cities move to put fees on TNCs but don't have the political coalition to price congestion caused by private vehicles. Still, it can be useful to focus on achievable, tactical policy victories while building the coalitions needed for bigger change. The recommendations in Strategy 3 focus on more ambitious ways to reduce overdependence on the automobile.

Strategy 2

Transform transportation agencies into mobility agencies

Cities, CMAs and transit agencies should be open to the new ways of enabling mobility that market analyses and customer research reveal. This will require rethinking agency missions, breaking down barriers to collaboration with emerging mobility providers and being open to transforming business models. It's important that cities, CMAs and transit agencies not let their initial (and often negative) experience with emerging mobility services define their interactions going forward, given the potential benefits of these services.[61] Culture change at public agencies will underpin successful adoption of this entire strategy.

Recommendation 2.1

Revisit transit's core mission and identify how emerging mobility can better serve customers and support effective transit

The Bay Area has made a significant investment in public transit, and many new projects are planned or under way. Yet the region is nowhere near providing transit service that is competitive with driving for most trips, and ridership has started to decline. Emerging mobility providers are creating an even more competitive environment. With sufficient planning and resources, however, these same technologies and more flexible modes can be a boon for public agencies.

Transit operators need to start by clarifying their purpose. Some Bay Area transit agencies have already started to look at solutions like flexible transit using smaller vehicles. Yet we need a more expansive and optimistic view of what publicly provided transportation can be. King County Metro, the primary public transportation provider in the Seattle region, and LA Metro have changed their monikers and are now calling themselves mobility agencies, reflecting their interest in the entire toolbox of mobility solutions. It is time to accelerate change and innovation in Bay Area transit as well.

SPUR believes it is critical to concentrate public resources on providing high-quality, frequent bus or rail service on the busiest corridors to create a strong backbone network with seamless connections throughout the region.[62] One benefit of exploring and piloting emerging mobility services is that access may be able

61 Rasheq Zarif, Derek Pankratz and Ben Kelman, "Small Is Beautiful: Making Micromobility Work for Citizens, Cities, and Service Providers," Deloitte Insights, 2019.

62 Nothing comes close to the service provided by rapid transit on an exclusive right-of-way, including subways, elevated trains, bus rapid transit with dedicated lanes, red-carpet lanes and highway-based express buses with dedicated lanes. At the route level, factors like density, frequency and linearity of route can make or break ridership. Core or backbone routes tend to have the highest ridership in the region, serving high- to moderate-density, linear corridors. For example, SamTrans Route ECR, which runs on the dense El Camino Real corridor in San Mateo County, had 11,580 daily passengers in 2016 and operates about every 15 minutes during peak hours. In contrast, SamTrans Route 251, a nonlinear route between the Hillsdale Mall and Foster City, has 300 daily passengers and runs less frequently in a lower-density area.

to be delivered to certain markets at a lower cost, allowing transit service from lower-performing routes to be reallocated to the backbone transit network. The outcome should be better mobility options overall, not concentrating resources in one area at the expense of another.[63]

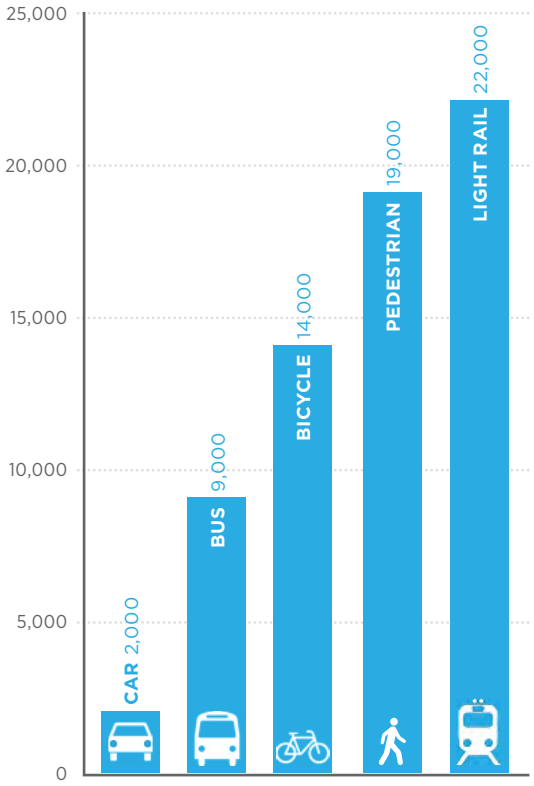


FIGURE 7

Reallocating Street Space Can Move More People

Number of people an 11.5-foot-wide lane can convey per hour

Some transportation modes can move far more people than others using the same size lane. Allocating more space for biking or transit can move more people than designating lanes exclusively for cars.

One of the most important ways to maximize the opportunity offered by emerging mobility services is to integrate them into planning so that projects are conceived, planned and delivered considering all transportation options on an area-wide basis and considering all modes at once. (See sidebar on page 28, "Evaluating Markets for Transit and Emerging Mobility.")

Bay Area agencies can also work together to develop a typology of markets to identify the different niches where various mobility services can thrive. Such an analysis can help identify the threshold densities or other conditions — such as service quality, efficiency, cost competitiveness and user satisfaction — at which different modes are the most efficient. These typologies should be periodically updated as more projects are piloted and evaluated.

Transit operators should also pilot autonomous services and, over time, transition more service to very frequent autonomous transit on major routes.[64] A strong core transit network will remain a necessary feature of urban transportation, and the cost savings from automation may make it feasible to have even more frequent trunk-line routes and for service to suburban corridors to be more cost-effective.[65]

63 Given our inability to expand the road system to accommodate more cars, this should also be true in the post-COVID-19 recovery.

64 Transit operators across the globe are testing AV shuttles and buses. For an example from Europe, see Sam Mehmet, "Autonomous on-demand buses to be tested in five European cities," Intelligent Transport, Mar. 10, 2020, https://www.intelligenttransport.com/transport-news/97063/autonomous-on-demand-buses-to-be-tested-in-five-european-cities/

65 Nelson\Nygaard and Perkins + Will, "Autonomous Vehicles and the Future of Transit," https://umjp9n8g2j2ft5j5637up17u-wpengine.netdna-ssl.com/wp-content/uploads/2018/10/Our_Views_on_Autonomous_Vehicles_and_The_Future_of_Transit_COMP-1.pdf

Source: Graphic by Zack Dinh, data from Botma & Papendrecht, Traffic Operation of Bicycle Traffic, 1991, from http://trid.trb.org/view/365588

Evaluating Markets for Transit and Emerging Mobility

Some consulting firms and a few tech startups are using Big Data to give detailed information about where and when people are traveling, and then analyzing the information to identify the most effective ways to shift people away from driving alone. The most sophisticated studies account for urban design characteristics such as parking cost, as well as demographic characteristics. These studies can be done at various scales and have the potential both to grow transit ridership and to identify where the public sector could support emerging mobility services to shift people from solo driving.

Napa Valley Transportation Authority, for example, hired consulting firm Fehr & Peers to conduct a travel behavior study of all trips related to employment, residents and visitors. The primary data set was based on mobile devices, which was then combined with recent traffic counts to make it even more robust. It included commuters coming into the county and residents leaving for work. The study's scale was broad enough to inform investments in the countywide plan but detailed enough to help modify transit routes or identify areas where more walk and bicycle trips are feasible or carpooling (and thus carpool apps) would work best.

Another study conducted by Fehr & Peers, the State Route 37 (SR 37) Travel Behavior and Transit Feasibility Study,[66] is even more focused on analyzing the potential for transit — broadly defined to mean luring people out of their private vehicles — in a specific corridor. SR 37 is a critical 21-mile east-west expressway in the North Bay, touching four counties as it connects Novato to Vallejo. The corridor has growing congestion, with most trips in single-occupancy vehicles. Land uses are dispersed along the route, meaning there is limited potential for fixed-route transit, making it an excellent candidate for tech-enabled, flexible-route options.

The SR 37 study used Big Data analytics to identify and quantify auto travel demands and the origin-destination and demographic characteristics of auto travelers along the corridor. The study then identified "transit serve-able" auto travel markets — places where there are large groups of commuters traveling from a common origin to a common destination. After looking at both fixed-route transit and a wide range of emerging mobility modes for these markets, the study identified several opportunities:

- → Operating two potential routes for fixed-route express bus service[67]
- → Expanding specific park-and-ride lots to promote carpooling
- → Subsidizing TNCs for first- and last-mile connections to transit, but not for long trips
- → Increasing the presence of a commuter management platform called RideAmigos that aggregates multiple mobility options and offers rewards for non-solo auto trips[68]

Importantly, the study noted that all of the goals of getting people out of vehicles would do better with pricing of the expressway and with HOV lanes (or transit-on-shoulder).

While the SR 37 study was taking place, some of the North Bay transportation agencies had commissioned a separate engineering study to identify the potential route, stations and costs of a new heavy-rail commuter link parallel to State Route 37. The initial capital cost estimate exceeded $1.2 billion for a train that would provide no more than 10 round-trips per day.[69] The rail study — focused on engineering feasibility and costs — was presented to agencies with the greatest optimism for its future, even though the separate SR 37 Transit Feasibility Study concluded that the corridor could barely support two infrequent commuter buses.[70]

There is a growing movement to fund the rail, despite the meager demand for such a service or a desire for dense, transit-oriented development to generate ridership and make the investment worthwhile. This example makes clear how difficult it is to have even well-executed data analysis shape smart spending on transportation investments.

66 https://www.nvta.ca.gov/sites/default/files/SR37_Travel_Behavior_Transit_Feasibility_5-3-2019.pdf

67 The total capital and operating costs were also identified, estimating the services would need 5,000 riders per month to meet a 20 percent farebox recovery.

68 Three agencies along the corridor were already in contract with RideAmigos, and the study recommended that they discuss options to tailor a section of the software platform specifically to SR 37 corridor users. Through discussions with RideAmigos staff, it was determined that most of these options were configurable within the current platform at no additional cost.

69 SMART Sonoma-Marin Area Rail Transit District Passenger Rail Service Study: Novato to Suisun City, May 2019, https://scta.ca.gov/wp-content/uploads/2019/09/SMART-Passenger-Rail-Service-Novato-to-Suisun-City-Report_reduced.pdf

70 PDF presentation of SMART Passenger Rail Service: Novato to Suisun City Feasibility Study, May 1, 2019, http://sonomamarintrain.org/sites/default/files/Board/COC%20Documents/Suisun%20Feasability%20Report%20Presentation_05.01.2019.pdf. The presentation included a slide that asked "Is a rail corridor line feasible?" followed by a tremendous all-caps "YES."

Recommendation 2.2

Evaluate the potential to incorporate new technologies into public agency fleets and operations

Who: Transit operators, cities

In addition to directly funding emerging mobility providers, a growing number of public agencies are incorporating emerging modes and technologies directly into their operations. One of the most compelling reasons to do so is stability: Private companies — from Chariot (microtransit) to Ofo bike share — have shut down operations with little or no notice.

Public operation of any type of emerging mobility service, whether cities operating bike share or transit operators running microtransit service, requires the public sector to assume a different and expanded set of responsibilities. These include operations and maintenance for the new mode, robust marketing and outreach, user experience design and evaluation, new types of partnerships and procurement models.

Several emerging mobility services in the Bay Area are (or have been) publicly provided. For example, AC Transit, SamTrans, VTA and Marin Transit have operated and funded their own microtransit services as pilot projects, relying on the private sector primarily to provide the routing software. These pilots have had varying degrees of success with respect to ridership and scalability; some have been discontinued, while others, like AC Transit's Flex service, were a success and are continuing. Fully 94 percent of Flex riders preferred that service over fixed-route transit, and 70 percent said they would take AC Transit more if Flex services were expanded.[71]

The mixed results of these pilots should not be taken as an indication that the public sector should not operate an emerging mobility service, but rather that it's crucial to commit to ongoing refinement and to implementing lessons learned. At the very least, these lessons can provide insights for transit operators into how they can combine the best of public transit with the best of the private sector's cutting-edge technology.

Recommendation 2.3

Subsidize privately run mobility services that contribute to the effectiveness of the transportation system

Who: Every level of government

Public transit services in the United States are subsidized with public dollars to provide affordable, efficient, accessible and sustainable transportation options to everyone. Emerging mobility services should likewise be eligible for capital or operating subsidies, provided they can also meet these objectives.

Increasingly, public agencies are contracting with private companies to provide a transportation service in exchange for an operating subsidy. For example, Seattle's King County Metro Transit contracts with Via to provide first- and last-mile connections to certain light-rail stations for the same price as a bus ride. The vehicles are branded with the Via and King County Metro Transit logos; rides can be paid for using the region's fare payment system (Orca), and they include free, seamless transfers.

Another way to help create a more financially viable model without a direct subsidy is to offer an exclusive

71 http://www.actransit.org/annualreport/

right to operate in a given area. For example, in the case of the Bay Wheels bike-share contract, participating cities allowed a private operator to have an exclusive right to operate bike share because it meant that, at no cost to taxpayers, the Bay Area would have one of the largest bike-share systems in the United States. These contracts can allow for the economy of scale and predictability that is necessary for a company to offer more widespread service and/or comply with requirements such as low-income fares while remaining financially viable. Yet it can also stifle innovation and competition so should be done for a time-limited horizon, require a strong rationale and be competitively bid.

In some instances, investor-funded companies' obligation to get a financial return on their investments may result in outcomes that are out of step with the public interest. For example, Lyft, which operates Bay Wheels, had to remove all e-bikes because of a brake issue and then again due to battery problems, significantly reducing available bikes. Soon after, Lyft increased the price of e-bikes over their conventional pedal bikes. In other cases, private mobility providers have pulled out of markets altogether, sometimes with little more than a day's notice.

With the growth in emerging mobility, the public sector is likely to confront these situations more often and will need to figure out when it is worth providing funding for a service that helps meet regional goals but requires a subsidy to break even. The public sector must exercise caution before subsidizing services that threaten to leave a market or change their product, price or form. If a product is a good, or good enough, idea, it may come back in time, especially if the service's costs decrease due to advances in technology or new economies of scale. Funding should also be allocated to services that support rather than compete with backbone transit lines.[72]

Public agencies should be systematic in their assessment of when to partner financially with an emerging mobility company to ensure the decisions are not overly politicized and meet public values. Frameworks must be developed to help the public sector decide when to support and sustain a private mobility service. One set of questions can focus on whether the investment will help meet transportation system goals, while the other set of questions can focus on cost-effectiveness and whether the return on investment is worthwhile.

The public sector also has to determine and be very clear about what it expects from companies in which it invests public dollars, such as what data to share, equitable service coverage, fares and labor standards. Ultimately, buses and trains are the best tools for many trips. But, especially in cases where new services can be demonstrated to provide greater benefits to the public at a lower cost, traditional fixed-route transit's monopoly on public operating dollars should not hold.[73]

Recommendation 2.4

Build the skill sets to manage for the future of mobility

Who: MTC, cities, transit agencies, private mobility providers

Both the public and private sectors must build cross-competencies to collaborate and understand each other's strengths. Public agencies are often structured to resist iterative experimentation and rapid adoption of new technologies; therefore, retraining may be required to help staff successfully plan and manage a technology-enabled mixed-mobility future. Planners and policymakers don't need to develop the software, design the

72 It may be instructive to look at how regulations and incentives are devised in others arenas such as subsidies for home solar projects that decrease predictably as a certain scale is reached.

73 Ideally the costs and benefits should be broadly defined, including the benefits of equitable access and the health and environmental impacts. See Shin-pei Tsay and Zak Accuardi, "Private Mobility, Public Interest," TransitCenter, September 2016,. https://transitcenter.org/publication/private-mobility-public-interest/

interfaces, operate every vehicle or control each shared bike, but they need to have enough understanding to prepare for and navigate the new technologies and business models, and potentially oversee interfaces between different mobility providers.

Some of the skill sets the public sector should focus on are agile contracting and procurement, risk/indemnity, data analytics, customer experience research and developing adaptive regulations. These skills will help planners and policymakers navigate new mobility as well as help them improve on transit basics, such as better bus shelters, effective transit maps, easier-to-navigate stations and route optimization. The private sector, on the other hand, can use additional skill sets in outreach to diverse communities, removing barriers to service for those with physical, sensory or mental disabilities, and transportation planning and policy.

Strategy 3

Retool the built environment and prices to support an effective, equitable transportation system

To maximize the benefits and minimize the potential harms of emerging mobility, we must make fundamental changes to the built environment. Cities need to modify streets and transportation prices to discourage solo driving and support transit and active transportation. Cities must also shift growth to compact, mixed-used development with affordable housing. Counties, MTC and the state need to help scale that housing with major investments and strong requirements. Only with this mix of changes can we achieve our public health and environmental goals, create vibrant public places and foster a strong economy that benefits everyone.

Recommendation 3.1

Make streets work for active transportation and give priority to transit

Who: Cities, Caltrans

SPUR's vision for the Bay Area transportation system is one that makes alternatives to driving far more accessible and appealing. Streets should be redesigned to give priority to people on bikes, scooters, skateboards, single-wheel devices controlled by leaning and whatever small and sustainable micromobility devices we'll be riding in the future. The growing use and attractiveness of small personal mobility devices, like scooters, points to a strong market that could grow significantly with the right infrastructure and supportive policies. The tremendous potential of shared micromobility has attracted billions of dollars in venture capital.[74] After all, about half of all car trips are under three miles — a distance that could easily be covered by walking, bicycling or scooting.[75] These new systems, especially those with electric boost, can greatly increase the range people consider feasible and the overall use of alternatives to the car.

Of all the big investments that MTC studied as part of Plan Bay Area 2050, creating safe walking and micromobility networks was one of the most cost-effective. It created the largest mode shift of any investment

74 The scooter company Bird reached a $1 billion valuation faster than any company in history, in just about a year. https://qz.com/1305719/electric-scooter-company-bird-is-the-fastest-startup-ever-to-become-a-unicorn/

75 https://cal.streetsblog.org/2019/09/16/bikes-and-scooters-could-replace-a-lot-of-car-trips-in-u-s-cities/

and, importantly, worked well in all three future scenarios it analyzed.[76] To create safer streets and support emerging models like bike share in reaching their potential, we need:

- → A significant infusion of funding for infrastructure and educational programs
- → A willingness of cities to prioritize complete networks of protected bicycling/micromobility lanes
- → A focus on the corridors that have the most potential for mode shift, as well as those that currently have the most injuries, which are disproportionately in low-income communities of color.

In addition, we must focus on prioritizing transit and very-high-occupancy vehicles. To move transit efficiently and attract many more riders, we need to identify and rapidly build out dedicated rights-of-way for light rail, bus rapid transit and privately operated high-occupancy vehicles. Transit agencies could also seek to shift to autonomous transit vehicles – many smaller autonomous shuttles are already working in controlled environments and dedicated lanes. This would help to justify additional dedicated lanes, which create an excellent operating environment for autonomous vehicles.[77]

In places where dedicated lanes are not feasible, cities and transit agencies should work together to put in controls that keep traffic lights green for transit vehicles and to install short passing-lane segments that allow buses to jump the queue at traffic lights. High-capacity transit stops should also be transformed into mobility hubs where private and public modes can cluster to connect more riders to transit and improve customer service.

Recommendation 3.2
Manage curbs and their many uses

Who: Cities

There is an increasingly fierce battle over incredibly valuable real estate — the curb. Long a mundane and undermanaged part of the built environment, this space between the sidewalk and the traffic lanes has traditionally been used for parking, bus stops, fire hydrants and freight unloading. Today, the massive growth of ride-hailing drop-offs and pickups (which often take place in the middle of busy streets or bike lanes) and e-commerce deliveries is wreaking havoc in urban areas. In addition, residents are demanding more places to socialize, with parklets sometimes replacing street parking. Curbs can also accommodate bike share pods, house street trees or become bioswales that collect runoff. The needs are evolving so quickly that city planners are struggling to keep pace.

Like streets, curbs are public assets, so their allocation needs to serve the public interest. Some cities have policies to help guide decision-making about the curb space, such as Seattle and San Francisco, which replaced the term “car parking” with “storage for vehicles.”[78]

Yet most cities don’t even have a single clear map or database that can tell them what a curb is currently used for. Some cities conduct annual surveys of parking usage, or might study a few blocks intensively, but curb use information is often on paper scattered across different departments. A first step, therefore, is to develop digital maps that allow cities to understand what they currently use their curbs for and to keep this information

76 We will also need to focus on safe intersections, with shorter crossing distances, better lighting, slower vehicle speeds, traffic calming such as bulb-outs on neighborhood streets and many other changes to truly realize the potential of emerging modes.

77 For a good example of how autonomous rapid transit (ART) can compete with other transit and support land use change, see Joe Distefano and Peter Calthorpe, “Revolutionizing Transit and Solving the Silicon Valley Housing Crisis,” January 17, 2018, https://urbanfootprint.com/revolutionizing-transit-while-solving-the-housing-crisis/#new%20mobility

78 https://www.sfmta.com/sites/default/files/reports-and-documents/2020/02/curb_management_strategy_report.pdf

Figure 7
A screenshot of Coord's San Francisco map of different curb uses.

up-to-date. Private companies are developing mapping tools that can dramatically ease the transition. Some provide free and open-access tools as well as methods to greatly simplify the input process and put it online for the public to see.[79] MTC or the proposed BayMIL could purchase these tools, help cities coordinate and provide policy guidance, which may help cities make decisions that are efficient but not always politically popular.

The curb has value. While some cities have come to rely on revenue from parking meters and tickets, loading zones are almost never priced, and short-term rental of a space to store a private vehicle is not always the best use. The National Association of City Transportation Officials (NACTO) urges cities to "choose measurement over myths."[80] NACTO provides a few examples: A bikeshare station can support 40 riders per day; a food truck can serve 100 meals and generate $800 to $1,800 per day; a passenger pickup and drop-off zone can serve 100 passengers per day; a parklet can see 100 visitors per day and generate a 10 percent to 20 percent revenue boost to local businesses. With such an inefficient system to price the curb, there is a market niche for tech tools to both price and design the curb.

As emerging mobility expands and cities recognize the incredible value in curbs, there will be several key steps to harnessing the curb:

- → Develop a set of policy priorities.
- → Implement policies in clear and fair ways, and ensure they don't become so burdensome that they hinder innovation.
- → Map current uses and engage the community in envisioning the varied uses.[81]
- → Identify future trends, such as the potential to reduce parking demand with the growing use of emerging mobility, from bike and scooter share to TNCs.
- → Create flexible and adaptive regulations; for example, allow parking during the day but turn some curb space into drop-off zones in the busy evening and weekend hours (or vice versa, depending on the uses).[82]

79 Two well-known curb databases are Coord and one produced by SharedStreets called curbLR.

80 National Association of City Transportation Officials, "Curb Appeal: Curbside Management Strategies for Improving Transit Reliability," November 2017, nacto.org/wp-content/uploads/2017/11/NACTO-Curb-Appeal-Curbside-Management.pdf

81 Remix has an excellent tool for visualizing streets and the use of the curb at: https://www.remix.com/solutions/streets

82 When San Francisco installed bike lanes on Valencia Street, the lanes became the default place for TNCs to pull over and pick up or discharge passengers. After community outcry, Lyft voluntarily worked with the city to install a feature in the Lyft app that only allows the pickups or drop-offs in safer locations on side streets, a mechanism that is increasingly used. Lyft provided a useful blog to discuss the initial trial: https://medium.com/sharing-the-ride-with-lyft/creating-a-safer-valencia-street-54c25a75b753

- Prioritize safety and Vision Zero policies to protect cyclists and pedestrians.
- Consider new tools that allow the curb to be virtually assigned to various users and priced based on time of day or need.[83]

San Francisco recently took a major step on this path when it adopted the Curb Management Strategy, a road map for the SFMTA to manage and allocate the city's limited and valuable curb space in a way that responds to current needs and anticipates future demands.

TNCs may already be reducing the need for car parking and easing us toward a transition to AVs that, especially if they are shared, may allow thousands of parking spaces and garages to be converted to better uses. How cities manage this transition and value their curb space will send important signals to private-sector providers and to the public as to which modes are encouraged and prioritized.[84]

In Seattle, a comprehensive plan for streets, sidewalks and curbs.

In 2016, Seattle developed a comprehensive plan for allocating the public right-of-way, identifying three types of zones: the pedestrian realm (sidewalks, bus shelters, sidewalk cafes, etc.); the Travelway, used for mobility; and the Flex Zone, instead of the curb or parking lane. The city's DOT then outlined six primary functions of the right-of-way. In residential areas, the priorities are defined in the following way:

- **Mobility** prioritizes moving people and goods; for example, general travel lanes or turning lanes, but also dedicated transit and bike lanes, or sidewalks.
- **Access for people** prioritizes space for people arriving at their destination or transferring between different ways of getting around; for example, transit stops, bike parking, passenger pickup and drop-off areas or short-term parking.
- **Access for commerce** prioritizes space for commercial goods and services to reach customers and markets; for example, commercial vehicle loading zones.
- **Greening** prioritizes space for environmental benefit and green space such as rain gardens to help with stormwater management or for street trees, community gardens and planters.
- **Activation** prioritizes spaces for social and community activity such as food trucks, street festivals or public art.
- **Storage** provides space for vehicle storage, including bus layovers, long-term parking or construction staging areas.

With this framework, Seattle created a plan that anticipates about 1,300 fewer parking spaces and hundreds fewer loading zones, with significant growth in bike and bus lanes as well as a sixfold increase in street activation and greening.[85]

83 One example is curbFlow: https://www.curbflow.com/

84 https://www.lgc.org/newsletter/managing-your-curb-space/

85 Tracy Krawcyzk, "From Curb Space to Flex Zone," presentation given October 30, 2017, https://nacto.org/wp-content/uploads/2017/09/Tracy_Krawczyk_Seattle.pdf

Recommendation 3.3
Create a Safety Net Mobility Package

Who: MTC

Transportation is the second largest expense, after housing, for people with low incomes, in part because the limited reach of our public transit system has pushed many of the most vulnerable in our region into the high cost of car ownership and use. But the flexibility of emerging mobility options, especially when combined with public transit, has the potential to help more people live car-free or car-light.

MTC, already gaining valuable experience from its means-based transit fares pilot projects, should expand on that and lead development of a broader Safety Net Mobility Package to solve the transportation needs of people with low incomes, communities of color and individuals with disabilities. The package would include the pricing, payment methods and services that ensure individuals and communities have affordable access to a wide range of mobility options, from scooters to bike shares to transit.

A core component of the mobility package would be a comprehensive transportation subsidy. The subsidy could be placed in a single account or "mobility wallet" that could be used to pay for public transit trips and bridge tolls, as well as trips on private mobility providers. A single mobility account not only offers convenience but also provides a way for people without bank accounts to pay for services that traditionally require debit or credit cards. A single account would also be easier to administer: MTC's means-based fare study found that providing people with a straight cash subsidy they could use on any transit service (called "Cash on Clipper") was the easiest option to administer.[86]

It is the government's responsibility to support reliable transportation access, and the subsidy could be funded through a combination of local, state and federal funds. Fees or taxes collected from emerging mobility services could also support it. The package needs to ensure access to smartphones, multilingual services, easy-to-use apps, ambassadors who provide training and other services that enable people to take advantage of their mobility options.

Recommendation 3.4
Set prices to promote efficiency and equity

Who: State Legislature, MTC, large cities

One of the reasons we drive so much is the price. Driving and parking seem far cheaper than they are, as many of the costs are hidden in annual payments for insurance, in sales taxes to maintain roads and in parking that is subsidized by employers or included in the high cost of housing. These hidden costs don't even consider the external costs of driving — congestion that costs drivers and bus riders time, pollution that disproportionately impacts communities of color, collisions that result in injury and death and so on.

SPUR believes that shifting transportation prices to reflect these hidden and external costs is vital to meeting environmental, economic and social goals. Since these prices are so firmly embedded, it will take a panoply of changes, such as:

86 In 2015, MTC launched a study to determine if a transit fare program based on household income would be feasible and effective. See: https://mtc.ca.gov/our-work/plans-projects/other-plans/means-based-fare-study

- Enabling cities to implement tolls or area pricing in congested downtowns, like the scheme San Francisco is considering.
- Allowing counties, regions and the state to work together to enact all-lane tolling when and where it makes sense. For example, I-80 between the Bay Area and Sacramento is often congested, has a transit alternative (Amtrak's Capital Corridor line), and tolling this trip is not likely to shift drivers off the highway and into communities.
- Realigning taxation so that most fees are eventually replaced by a statewide "road user charge," sometimes referred to as a vehicle miles traveled (VMT) fee. This can include congestion pricing and discounts to those who drive cleaner vehicles.[87]
- Requiring that apartment buildings and condos as well as commercial properties sell or lease parking spaces separately.[88] Having residents and businesses pay for the parking they need will reduce the oversupply of parking we currently have in many places in the Bay Area.
- Taxing the parking spaces of Bay Area employers over a certain size and/or require they charge a daily minimum for parking. Employers could charge variable rates or waive fees for low-income workers.
- Considering the unique role of ride-hail trips in each of the above policy options. For example, for trips without time- and cost-competitive transit alternatives, pricing driving may simply nudge people from driving alone to ride hailing. Depending on the context, this could actually increase cars on the road and the social costs that come with them. In such cases, trip caps or shared ride-hail policies may need to be implemented.

As we shift pricing, it will be essential to ensure the new prices, and the money that is raised, create overall benefits for low-income communities, communities of color and vulnerable populations such as seniors and individuals with disabilities. For that, the region should engage communities to co-define equity outcomes. Strategies to advance equity in pricing include directly giving money back to low-income travelers in the form of cash or new transit passes, funding new or improved service for communities and prioritizing zero-emission transit vehicles for areas burdened by pollution.

Streets should be designed for people not cars.

Photo by Sergio Ruiz

87 Green Light: Next Generation Road User Charging for a Healthier, More Livable London: https://www.centreforlondon.org/publication/road-user-charging/

88 This is adopted SPUR policy in San Francisco: https://www.spur.org/publications/spur-report/2006-06-01/reducing-housing-costs-rethinking-parking-requirements

4. Conclusion

Each new transportation invention — from the steam train to the automobile — has brought with it convenience, economic growth and transformative change. Today's emerging mobility services and new technologies are likely to be similarly transformative. Emerging mobility could exacerbate the failings of our current transportation system or it could offer a profusion of coordinated, focused choices that finally allow us to shift away from auto-centric roads and communities.

Yet current governmental structures and funding formulas are not set up to effectively incorporate these new services, so it is essential that the public sector develop more robust roles as facilitator, regulator and enabler of emerging mobility.

The importance of these roles and the need to quickly implement recommendations in this report were amplified by events taking place as the report was finalized in June 2020. Most directly, COVID-19 had crippled the Bay Area's transit system, with ridership plummeting as much as 90 percent. In response, we saw SFMTA leaders redesign the transit system in a matter of days.

At the same time, protests over the horrific and senseless death of George Floyd were awakening the country to our society's entrenched racism. An inequitable transportation system, focused on quickly moving car commuters at peak hours, is just one way that communities have been marginalized and disproportionately burdened. As we move forward on the recommendations herein, communities of color, immigrants and people with different abilities must be prioritized for benefits or we risk widening the inequality gap.

Looking ahead, SPUR will work with other stakeholders, leaders and the community to ensure the public sector plays this active role while also harnessing the creativity, resources and innovation of the private sector. Together we can create a transportation system with significantly fewer car trips, lower greenhouse gas emissions, improved quality of life and increased access and affordability for the region's most vulnerable residents.

SPUR

Ideas + action for a better city

654 Mission Street
San Francisco, CA 94105
(415) 781-8726
info@spur.org

SPUR promotes good planning and good government through research, education and advocacy.

We are a member-supported nonprofit organization. Join us.

www.spur.org