# AUTONOMOUS VEHICLES *and* THE FUTURE OF PARKING

NELSON NYGAARD
PERKINS + WILL

# Our Vision

Much of the public discourse on autonomous vehicles (AVs) has focused on vehicle design and technology, but AVs have important implications for the design of cities. Nelson\Nygaard and Perkins+Will believe we must put people first in designing urban spaces. Our shared values guide our efforts to help clients respond to changes in how people get around in the context of rapid changes driven by technology.

In our work, we:

- Put people, not vehicles, first
- Help reduce carbon emissions
- Promote active mobility
- Encourage social interaction and reduce stratification
- Create vital urban places and streets for everyone
- Promote improved quality of life in the public realm
- Make the areas around transit vibrant places to give people easy access to travel choices
- Reduce the cost of public infrastructure and leverage responsible investment


NAVLY


Boots

# What's happening right now?

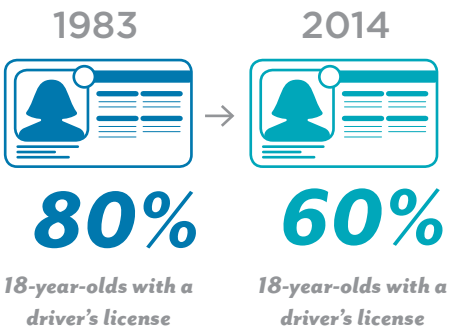
Autonomous vehicle technology is being tested and piloted on public streets today. But testing sites are limited, functionality must be increased, and public policies must be developed for AVs to achieve their purported benefits for safety, mobility, community, and the environment. What current behaviors and policies shed light on their future impacts, and how might we shape the future?

## Early signs of behavior change

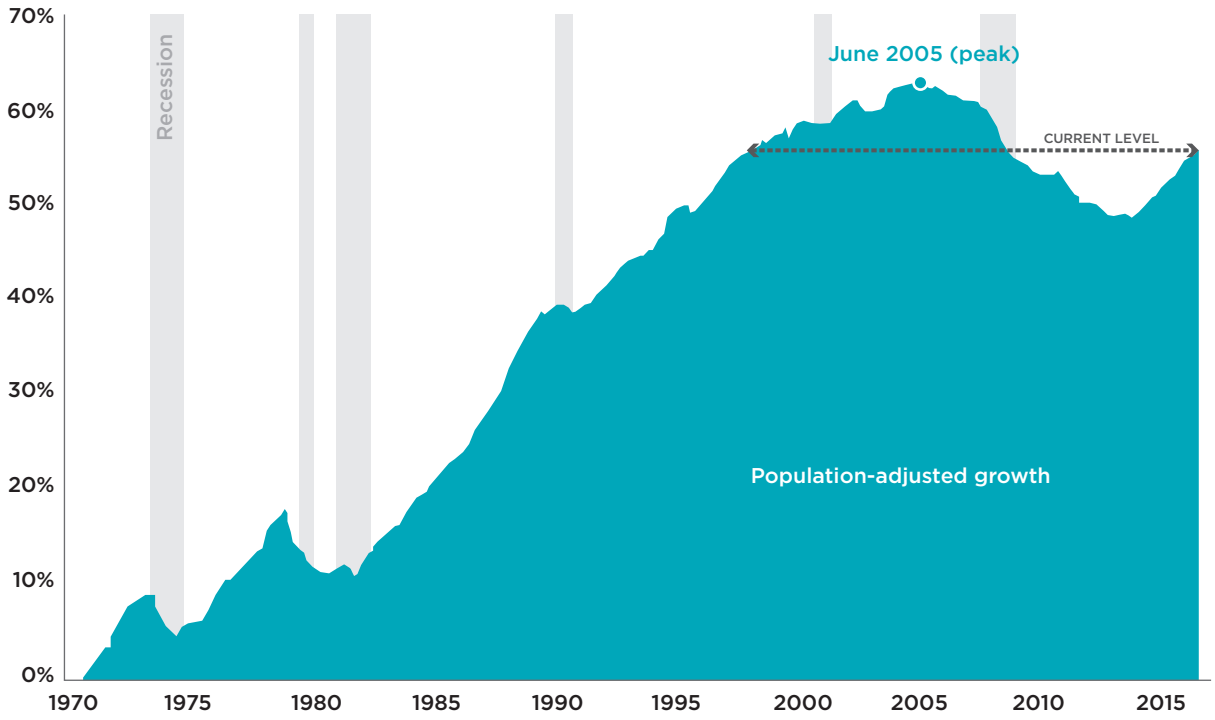
Demand for shared mobility is growing, as several indicators show.

- Young people are less likely than older generations to become licensed drivers[1] or to initiate auto loans.[2]
- Ride-hailing was the leading source of non-personal car travel in New York City between 2014 and 2016.[3]
- Six percent of ride-hailing users in San Francisco[4] would have made the same trip by private vehicle if ride-hailing did not exist; 48% of users in Pittsburgh[5] would have driven themselves, reflecting the impact of the local transportation ecosystem on choices.

***Between the 1980s and now, the rate of licensed drivers aged 18 has dropped 20%.[1]***



***Estimated Vehicle Miles Traveled (VMT) in the US[9]***




» Carshare membership increased 16-fold between 2006 and 2014, and the rate of increase is accelerating.[6]

» Carsharing members sell or forgo the purchase of 9 to 13 vehicles for each carshare vehicle available.[7]

» 30% to 55% of North American bike-share members report driving less.[8]

It's trendy to say millennials drive less, but that change is still happening at the margins.

» The growth in shared mobility use has occurred alongside transit ridership declines and increases in driving.

» Overall vehicle miles traveled per capita decreased after the Great Recession to a two-year low,[9] but has since increased with economic recovery and cheaper fuel prices.

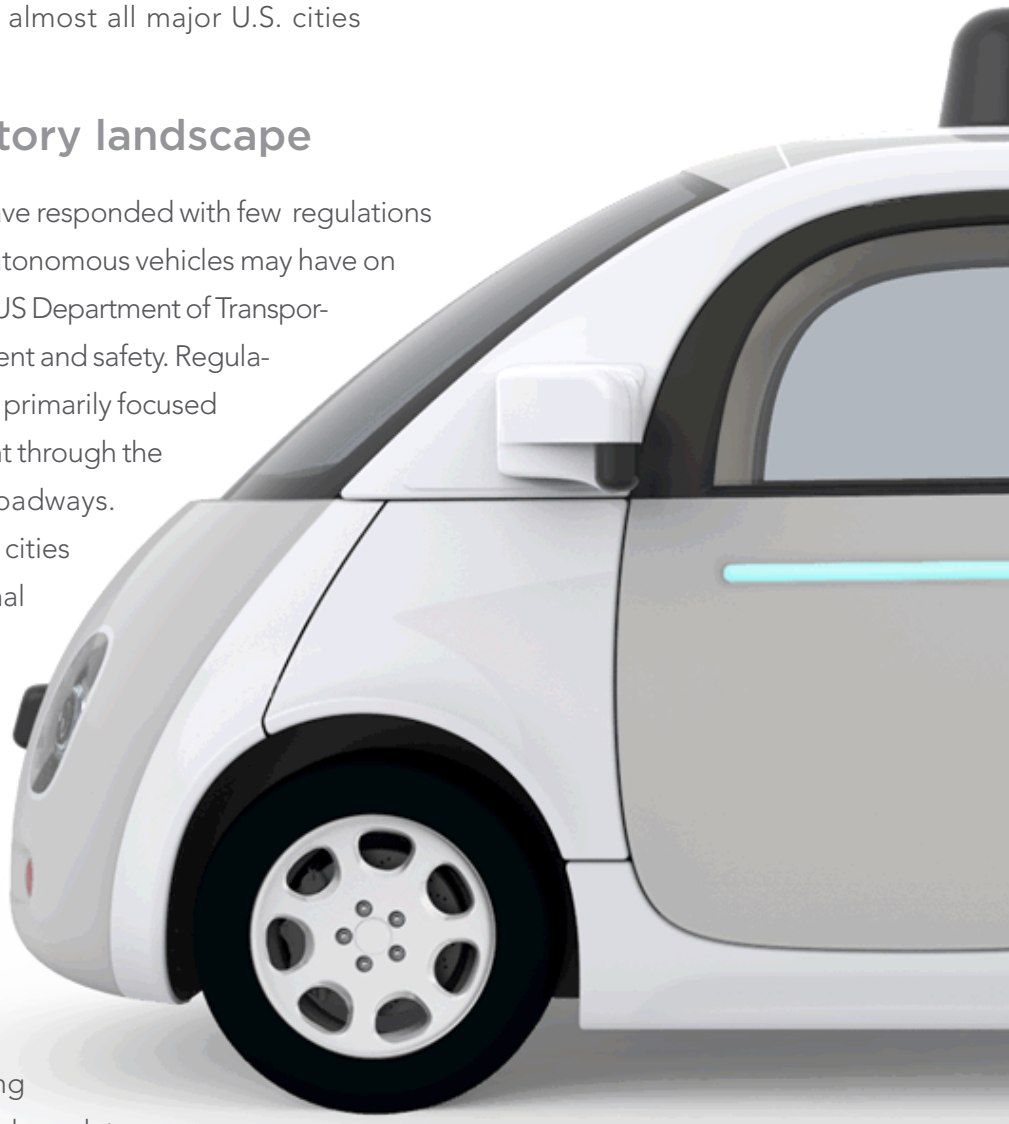
***A large number of bikeshare members report that they drive less than they used to.***

» Youth travel declined significantly between 1995 and 2009, and during that time the portion of young people who don't drive grew, but this decline is largely explained by economic factors rather than by a new preference for shared modes.[10]

» Transit ridership declined in almost all major U.S. cities in 2016.[11]

## Transitioning regulatory landscape

So far, national and local officials have responded with few regulations to address the potential impacts autonomous vehicles may have on mobility choices. Regulation by the US Department of Transportation (USDOT) focuses on equipment and safety. Regulation by states has been limited and primarily focused on encouraging industry investment through the allowance on testing of public roadways. NACTO issued policy guidance to cities in 2016; a 2015 study by the National League of Cities found that only 6% of cities' long-range transportation plans[12] acknowledged the prospect of autonomous vehicles for their city.



## Appetite for policy change

Still, there are early signs of municipal support for policies seeking to reduce parking supply. One local regulatory tool that could significantly influence how AVs are adopted in urban environments is setting parking policies. Efforts to replace minimum parking policies with maximums and establish TDM ordinances continue to gain steam in cities across the country. But many development financiers are still skeptical. Showing more evidence of changes in travel behavior will be key to driving these effective policies forward.

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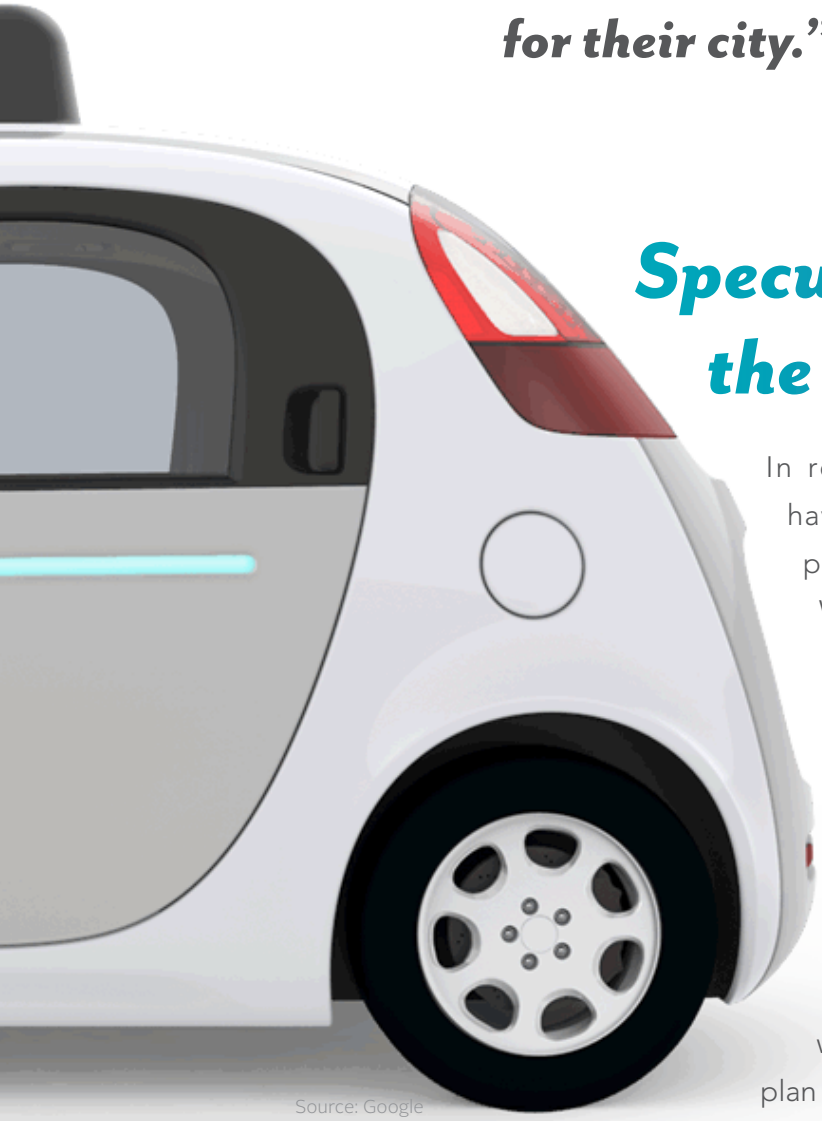


Source: Google

# Speculation about the future

In recent months, writers and technologists have written in often glowing terms about the promise of autonomous vehicle technology. When ordinary people might begin to reap the benefits and whether the technology will live up to these thinkers' lofty hopes are open questions. Nelson\Nygaard and Perkins+Will are continually analyzing the latest news from the automotive and technology industries to understand what it might mean for the future of mobility and the built environment. We know that both the timeline and method of adoption will have important implications for how our clients plan for the future.

## When might the technology be in widespread use?

Autonomous vehicles hit streets for testing in several U.S. cities in 2016, but it will still be several years before AVs are officially on the market and available for widespread consumer use. Ford Motor Company, for example, expects to have its first autonomous vehicle on the market by 2021.[13]

Travel behavior is highly unlikely to change overnight. Prognosticators from several fields have come up with a range of estimates for when autonomous vehicles will be in widespread use. These estimates vary based on assessments of the state of the technology, regulatory hurdles, and adoption timelines for past technologies, among other factors. Most estimates put 70% to 90% adoption sometime between 2035 and 2055.[14] As with any attempt to predict the future, all of these estimates are subject to significant error.

## How might the technology be adopted?

How the technology is adopted will have major implications for its impact on the built environment. There are two likely models.

Shared mobility model:

- Vehicles are owned, operated, and maintained by mobility companies.
- Consumers gain access to the vehicles through a subscription or through per-mile fees.
- Vehicle sizes could range from two or four seats to vans or minibuses.
- AV services could be bundled with other mobility options like transit and shared bikes in monthly subscription packages. Initial models of this concept, called "mobility as a service," are already being piloted with existing mobility technologies around the world.

Personal mobility model:

- Vehicles are generally purchased or leased by private individuals, though the vehicles can be made available for use by others through car sharing or rental schemes.
- Consumers fuel/power and maintain vehicles.
- Car owners generally only use their vehicles for limited periods of the day. Pending regulation and fee systems, AVs could travel to pick up deliveries or other people while owners are not using them.

There are a number of signs pointing to shared adoption. Some believe that autonomous vehicle technology will be expensive and complicated

to maintain. Some of the companies that are investing in autonomous vehicle technology already specialize in shared mobility (e.g. Lyft and Uber), and others have recently begun experimenting with shared mobility service offerings (e.g. Ford and BMW).

Other signs point to personal mobility adoption. Some of the early leaders in testing and deploying the technology are traditional car companies, and some early marketing materials envision a more traditional model.[15]

## What are the implications for parking demand (and thus supply)?

If automobiles become **shared mobility resources** that are on the road, rather than in a parking lot, for most of the day, parking demand might dramatically decrease.

- The owners and managers of fleets of autonomous vehicles would store and maintain them in a limited number of centralized facilities, in much the same way as public transit vehicles are stored and maintained today.
- One speculative estimate is that parking demand would decrease by 80% in a scenario in which 100% of our vehicle fleet is shared.[16]

If automobiles continue to be **private mobility resources**, parking demand might drop far less dramatically, though the space required to store private vehicles still might shrink.

- If drivers can exit their cars at the front doors of buildings and send the cars off to park themselves, requirements for vehicle and human circulation space in parking facilities might drop significantly. Audi is exploring the ways in which parking facility design might change in a fully autonomous future in which vehicles continue to park right at a destination.[17]
- Parking facilities might also simply relocate – the high value of land in dense urban areas might push parking facilities to the urban fringes if regulations and fees do not discourage the operation of autonomous vehicles without passengers.

## How to sort through the uncertainty

Nelson\Nygaard is known for innovative planning work, coupled with an approach that is thoughtful and practical. Perkins+Will is known for innovative design that programs flexibility and adaptability into the DNA of buildings and urban spaces. Some people's ambitions for autonomous vehicle technology are alluring, but before assuming the mobility system of the future is fait accompli, it is critical to take a sober look at what the trends really say and how much of the speculation to believe. Nelson\Nygaard and Perkins+Will are doing just that.

The best way to prepare for an uncertain future is to deploy some of the cost-effective access strategies that Nelson\Nygaard has been developing and recommending to clients for years. Transportation programs that think about access by all modes and encourage the use of the most efficient—taking transit, biking, and walking—leave the most flexibility for future adaptation.

We bring strong grounding in the world we want to create—one in which the needs and interests of people and the vibrant places they inhabit come first. Being thoughtful about the outcomes we want to see can help us develop the policies and infrastructure investments that will shape the future of our transportation system and built environment.



# Our approach

Nelson\Nygaard and Perkins+Will collaborate to identify specific policy and urban design approaches to help our clients be effective in creating cities and mobility ecosystems that are consistent with our firms' shared values. Key initiatives we're currently working on:

## Street design guidelines and curb management for an AV future

We develop  street design guidelines for a rapidly changing mobility system, relying on our shared vision for the future to lead the design process.

How might curb space allocation and right-of-way guidelines incorporate flexibility to allow for uncertainty in future travel behavior and available transportation options? We've explored this question through:

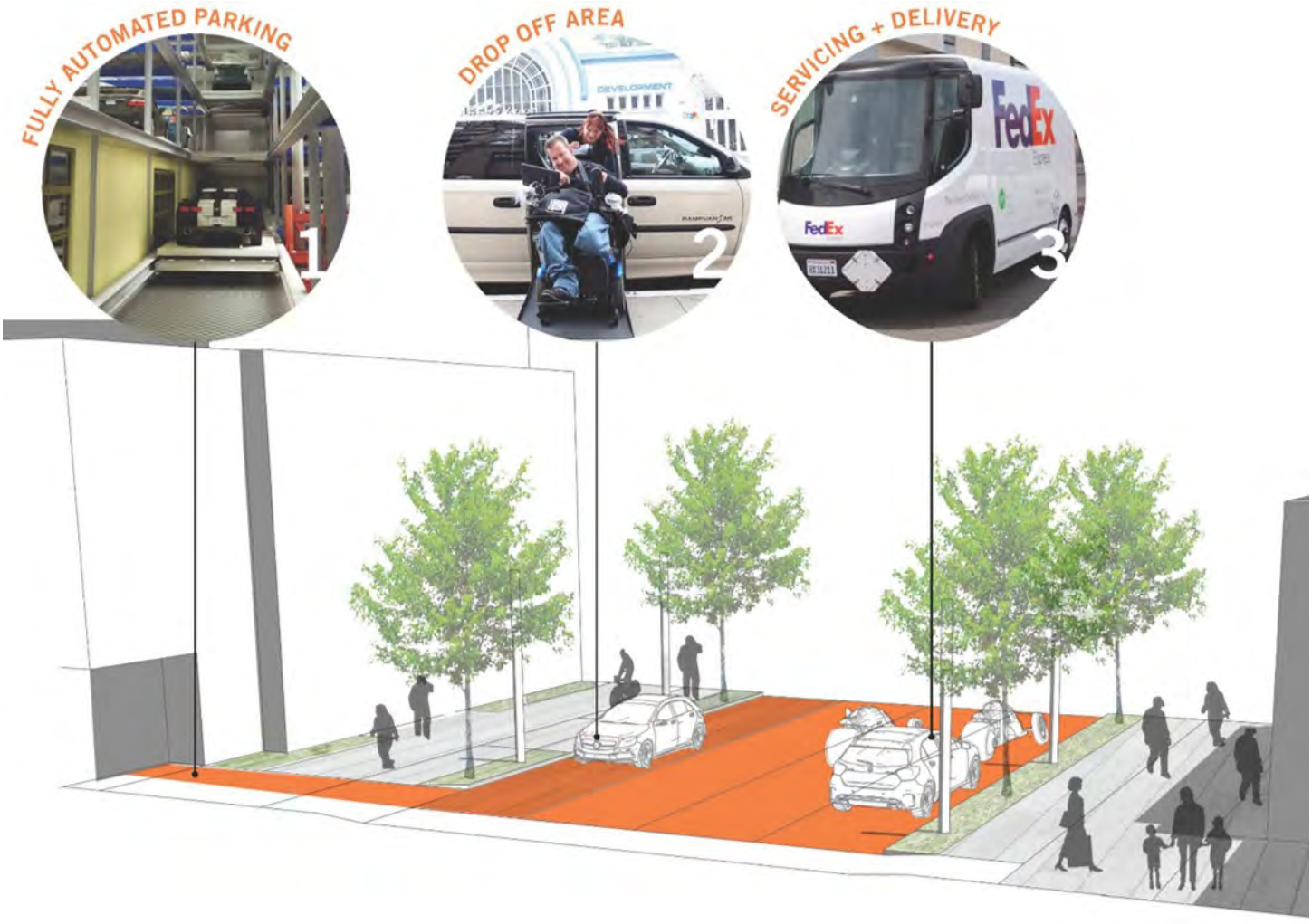
- 4th Street, San Francisco Redesign Exploration
- BART Curb and Shuttle Management Guidelines
- NACTO Street Design Guidelines

## Performance metrics for a world without private auto ownership

We develop performance metrics and performance targets that align with quality of life goals, respond to changing behavior and land development contexts, and leverage the richer datasets that are increasingly available.

What are your community's goals, and how might performance metrics that are aligned with those goals guide you there? We've explored this question through:

- Oakland and San Jose Transportation Impact Analysis Reform
- North Bayshore (Mountain View, CA) Specific Plan and Tasman East (Santa Clara, CA) Trip Generation Standards and Transportation Demand Management (TDM) Programs
- Santana Row (San Jose) and Mission Rock (San Francisco) TDM Plan Performance Standards and Monitoring Programs




## Parking garage design and contingency planning

We help clients consider whether a new parking structure would be a cost-effective way to provide access to a site or area. If the answer is yes, we help clients explore whether building a temporary or adaptable structure might help mitigate the long-term risk of reduced parking demand.

What is the most cost-effective way to provide access to your site or district in both the short and long-term? We've explored this question through:

» Potrero Power Plant (San Francisco) Transportation Program Development

## Municipal revenue models and parking management

We take a new approach to the economic impacts of future mobility. How might municipalities leverage changing mobility choices to address projected shortfalls in parking-generated revenues and encourage sustainable transportation? We are currently collaborating with parking industry leaders and current clients to develop new sustainable funding sources. We have also helped clients and the broader parking industry explore this question through:

- Parking Industry Exhibition, Chicago, March 2017
- City of New Haven, CT Parking Reform Plan
- City of Santa Rosa, CA Parking Management Plan



# Our Initiatives and Leadership

We are guided by the most up-to-date research on changing mobility behavior, available technologies, and public policy innovation. Our firms have established two initiatives to engage our planners and architects across all business practice areas.

- Nelson\Nygaard's Emerging Mobility Initiative: nelsonnygaard.com/category/expertise/emerging-mobility
- Perkins+Will's Mobility Lab: research.perkinswill.com/labs/mobility


Source: SDOT

# Endnotes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