# How Might Connected and Automated Vehicles Change Public Transportation?

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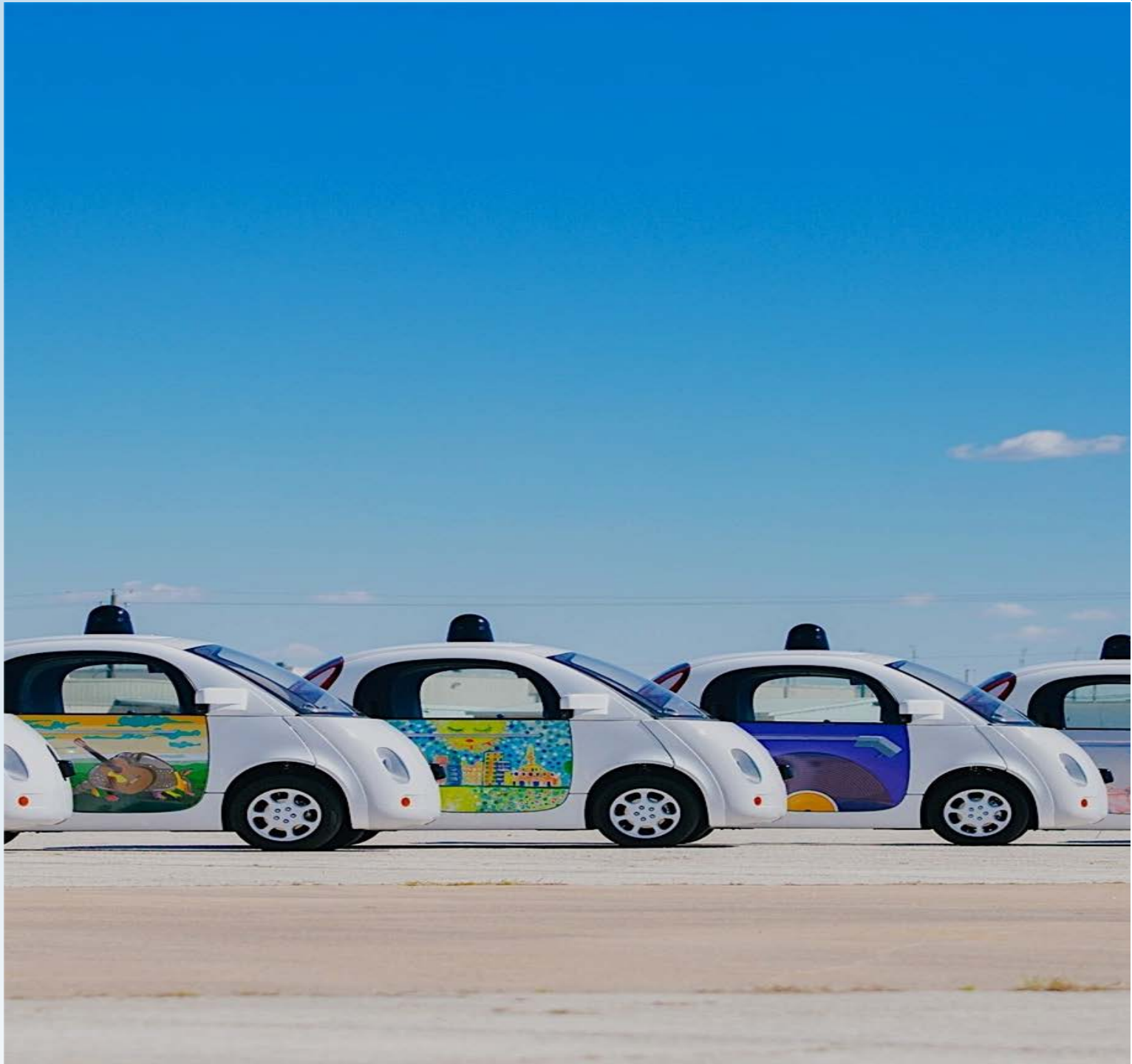
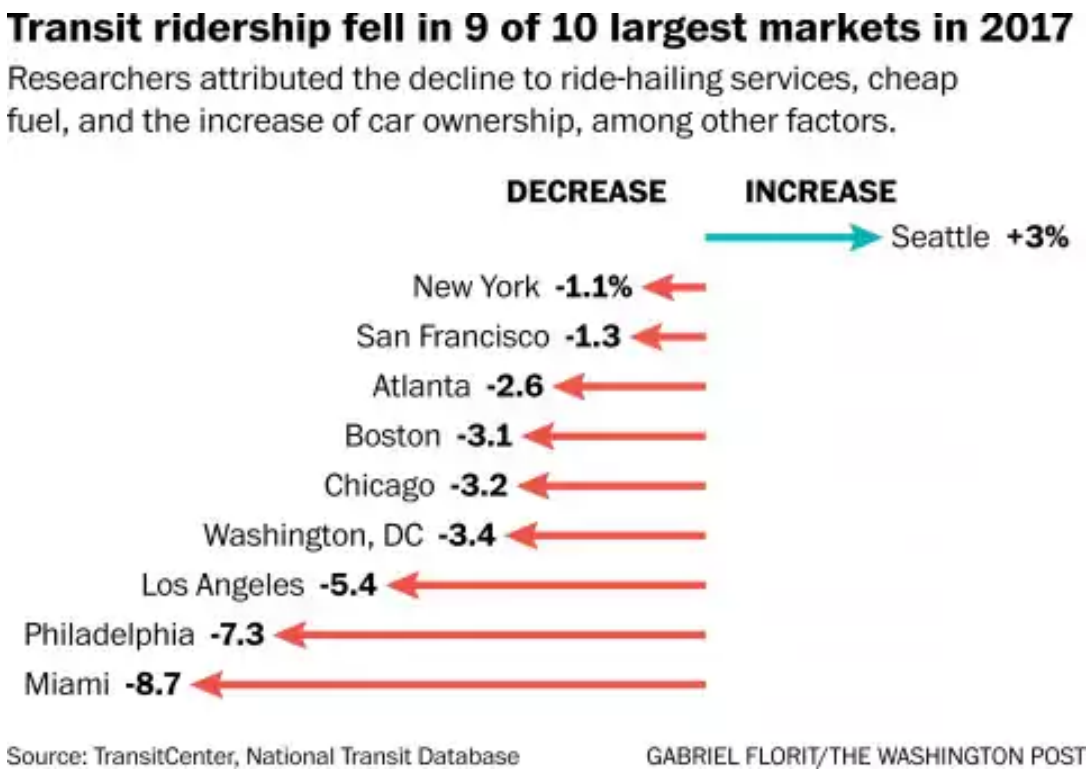
# Are these competition or complementary to public transportation?



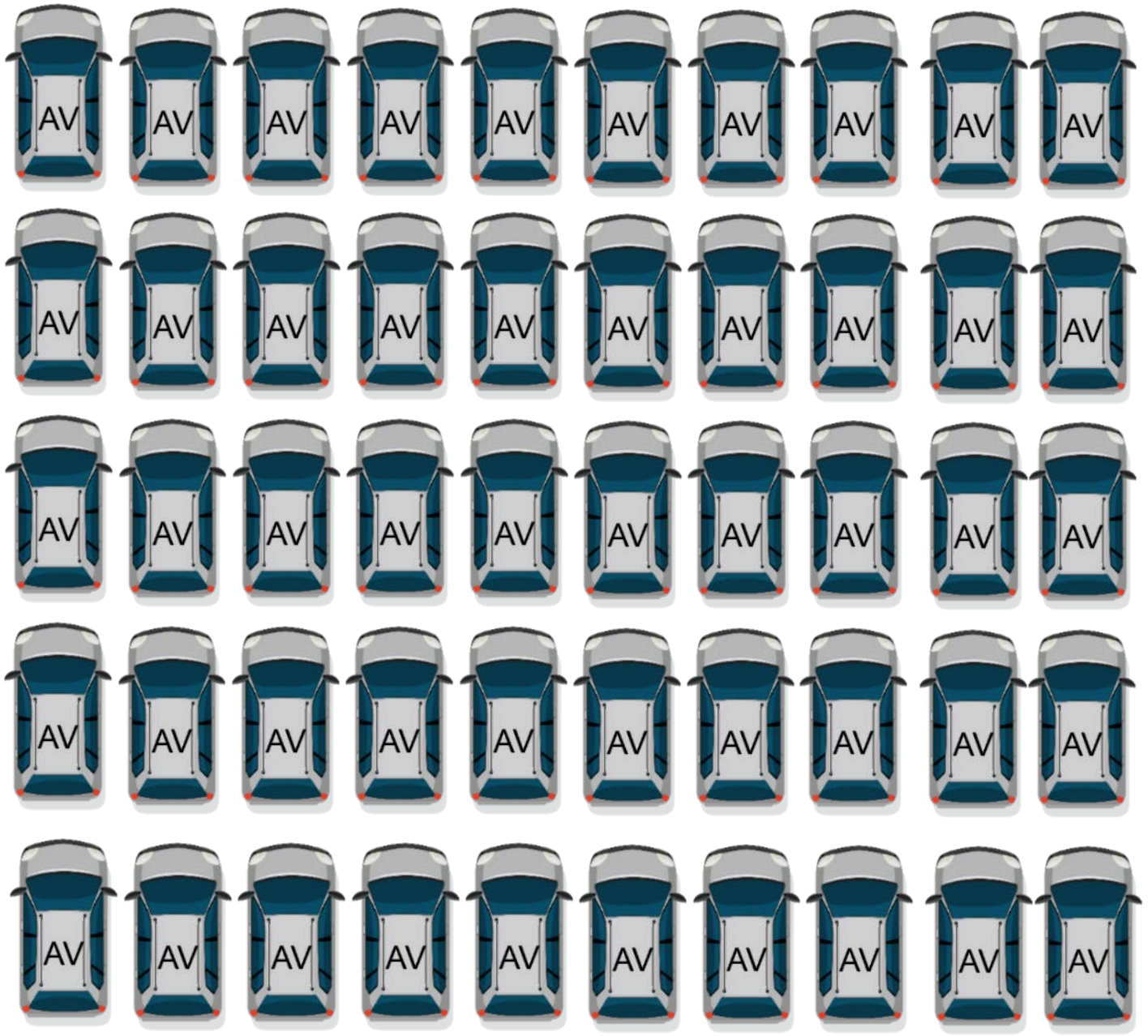
# Transit Ridership Decline




Researchers concluded factors such as lower fuel costs, increased teleworking, higher car ownership and the rise of alternatives such as Uber and Lyft are pulling people off trains and buses at record levels.

*Washington Post, March 2018*

# Physical Street Space


AV

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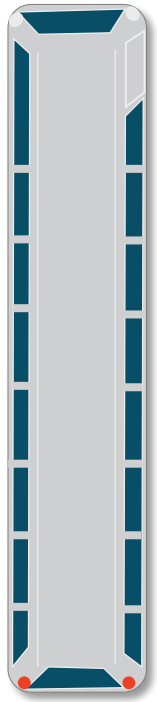



# Salesforce Tower, Indianapolis

- 49 Stories
- 905,000 Square Feet
- As many as 5,000 daily occupants

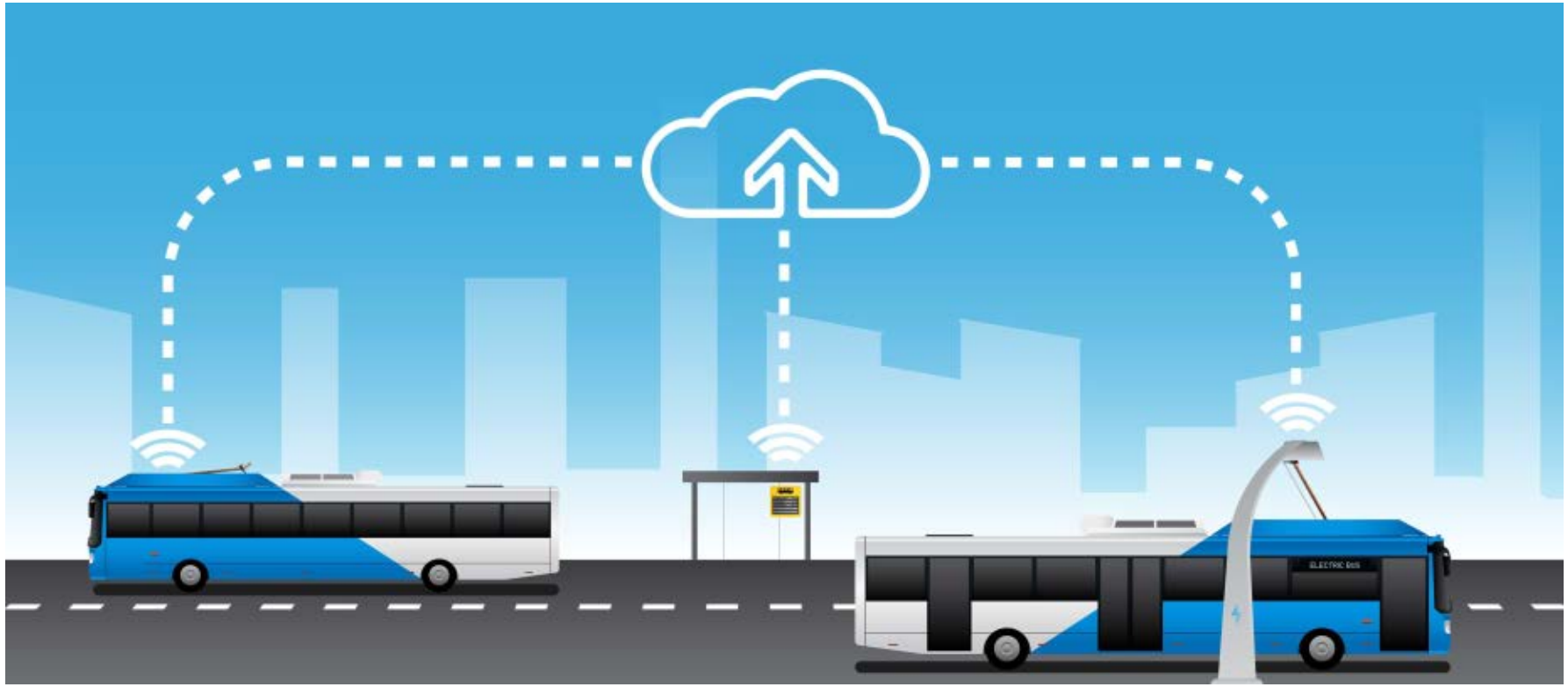
# What happens at 5:00pm when 5,000 people catch their driverless taxi?

# How Can Connectivity and Automation Benefit Transit?

— Potential Safety and Reliability Benefits

— Reduced Congestion and Increased Throughput

— Opportunity to Improve Accessibility for All



# Potential Safety and Reliability Benefits


# Safety Impacts, Potential Benefits

- Bus-related crashes due to human error caused $87 billion worth of damages in 2013.
  - *Estimated 95 percent of crashes due to human error*
- Driver assistance programs
  - *Improve smooth acceleration / deceleration*
  - *Provide automatic braking*
  - *Pedestrian collision avoidance*
  - *Curb avoidance, precision docking, narrow lane/shoulder help*
  - *Vehicle platooning*
- Reliability
  - *Vehicles tracking connection times and distances*
  - *Dedicated curb space for boarding and alighting*
  - *Function more fluidly in public spaces*

# Reduced Congestion and Increased Throughput

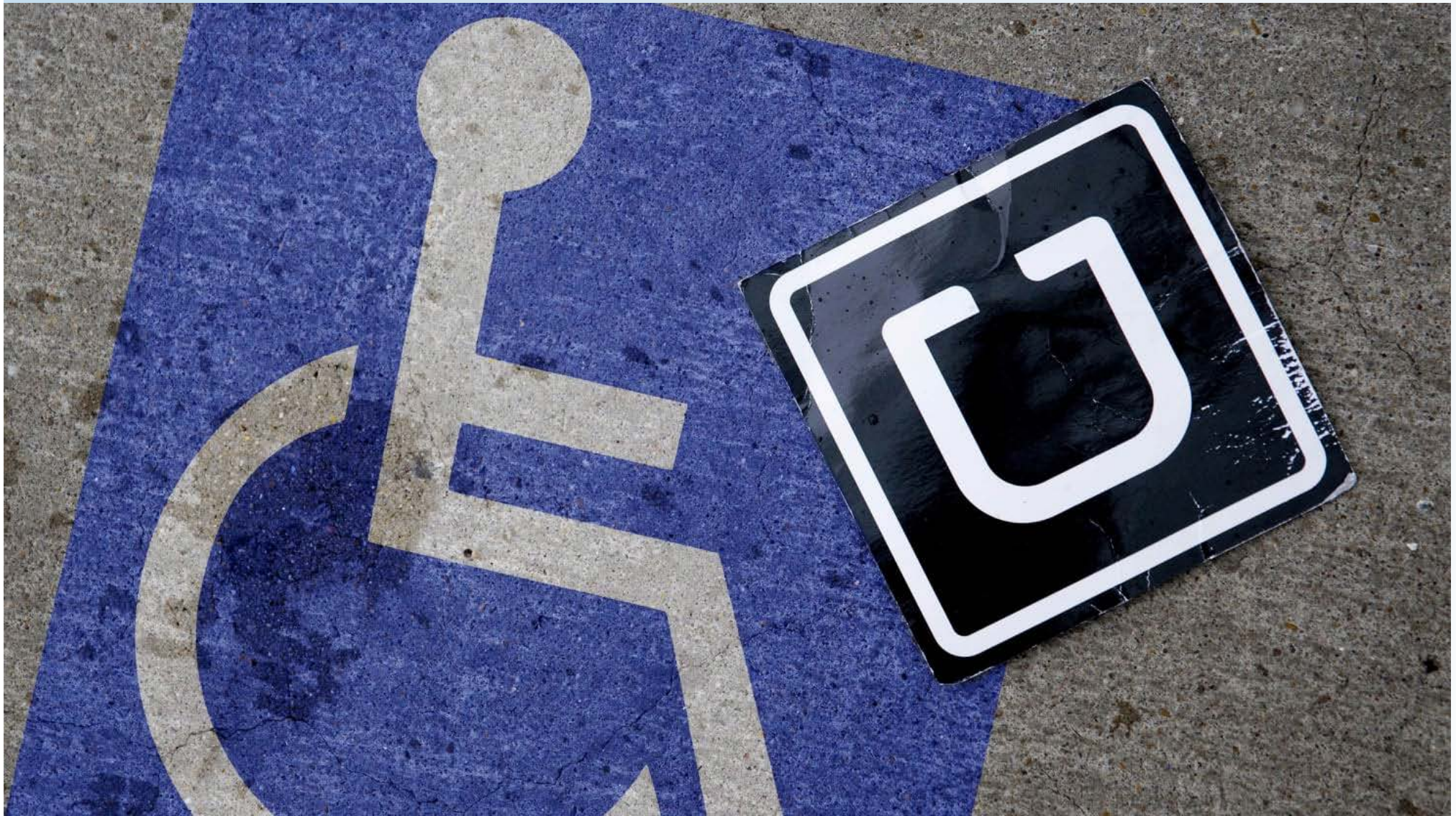
# Role of C/AV in Transit


- First mile/last mile
- Circulator services
- Fixed-route/fixed guideway driverless vehicles
- Platooning BRT
- Paratransit
- Micro-transit
- Alternative technology for signal priority

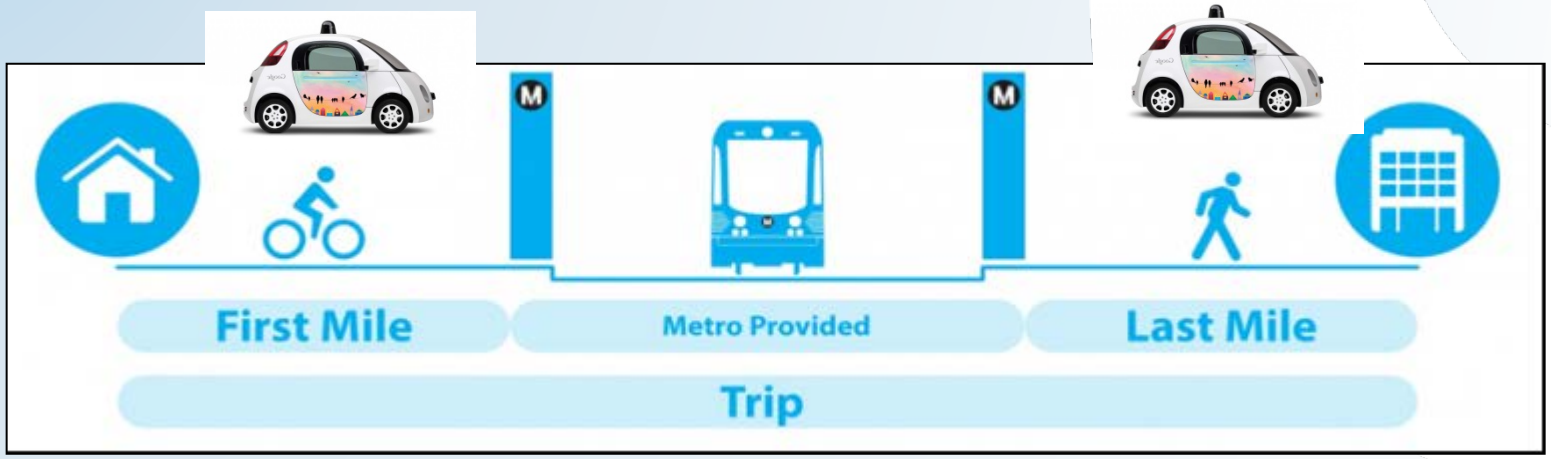
# Potential Benefits

- Increase throughput at fixed-route transit stations
- Shared autonomous vehicles could carry 6 to 16 passengers.
  - *Reduce overall congestion*
  - *One-third reduction in emissions,*
  - *37 percent less vehicle miles*
  - *50 percent reduction in cost of trips,*
  - *95 percent reduction in need for parking space*
- Research simulation of first/last mile trips
  - *Reduce fleet size for station throughput 53 percent.*
- Parking demand at stations could decrease
- Geofences for congestion pricing
- Reimagining buses
  - *Real-time commuter information*
  - *Interaction with local businesses*
  - *Appointment wait times and reservation systems*

# Opportunity to Improve Accessibility for All



# Equity : Opportunities




Reliable, efficient, affordable access for all

# Equity : Opportunities



Right Size Vehicles

# Equity:
## Possibilities

### *Access to opportunity*

Location or neighborhood is one of most important factors in determining income potential (and lifespan)

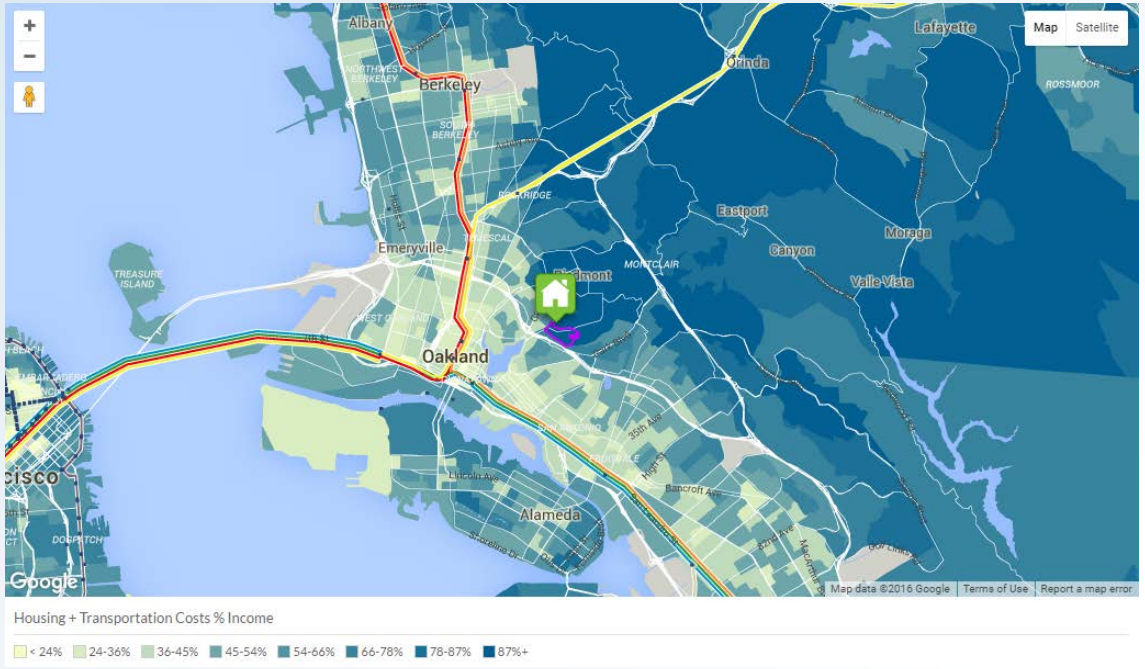
- Would likely increase if subsidized in disconnected neighborhoods—even more if connected to high quality transit
- Would likely decrease if AV permeation causes disinvestment in transit, increased sprawl, or is cost prohibitive for low income residents

# Equity:
## Possibilities

## *Combined cost of housing and transportation*

Housing and transportation index (HUD and DOT) demonstrates that combined cost of housing and transportation is higher outside of urban centers.

- *If not shared use and/or shared ride, could increase cost of transportation burden*



# How to Get There?

# Objectives

Environmental Sustainability

Equitable Access

Improved Infrastructure

Health Benefits

Increased Efficiency

# Methods

Planning for people, not cars

Inclusion and engagement, not just outreach

Access at the forefront

Systemic analysis, including externalities and co-benefits

Outcome and objective driven

Partnerships and flexibility

Ensuring affordability and efficiency

# FIVE PILLARS

## Connected

Moves as part of **system** ..in time, multi-modal

DATA: The key to new network management – people and freight

## Automated

FULLY automated – can **move when empty**

HIGHLY automated – needs a « driver »


## Electric

Ideally **electric** or other future energy source

## Shared

Increased interest in shared fleets and use of "**mobility as a service**"

The key to **place-making** benefits

# Planning from Values

## TEN GUIDING PRINCIPLES

### Collaboration

Emerging Mobility Services and Technology providers and the City must engage and collaborate with each other and the community to improve the city and its transportation system.

### Safety

Emerging Mobility Services and Technologies must be consistent with the City and County of San Francisco's goal for achieving Vision Zero, reducing conflicts, and ensuring public safety and security.

### Transit

Emerging Mobility Services and Technologies must support, rather than compete with public transit services, must account for the operational needs of public transit and encourage use of high-occupancy modes.

### Congestion

Emerging Mobility Services and Technologies must consider the effects on traffic congestion, including the resulting impacts on road safety, modal choices, emergency vehicle response time, transit performance and reliability.

### Sustainability

Emerging Mobility Services and Technologies must support sustainability, including helping to meet the city's greenhouse gas (GHG) emissions reduction goals, promote use of all non-auto modes, and support efforts to increase the resiliency of the transportation system.

### Equitable Access

Emerging Mobility Services and Technologies must promote equitable access to services. All people, regardless of age, race, color, gender, sexual orientation and identity, national origin, religion, or any other protected category, should benefit from Emerging Mobility Services and Technologies, and groups who have historically lacked access to mobility benefits must be prioritized and should benefit most.

### Accountability

Emerging Mobility Services and Technologies providers must share relevant data so that the City and the public can effectively evaluate the services' benefits to and impacts on the transportation system and determine whether the services reflect the goals of San Francisco.

### Labor

Emerging Mobility Services and Technologies must ensure fairness in pay and labor policies and practices. Emerging Mobility Services and Technologies should support San Francisco's local hire principles, promote equitable job training opportunities, and maximize procurement of goods and services from disadvantaged business enterprises.

### Disabled Access

Emerging Mobility Services and Technologies must be inclusive of persons with disabilities. Those who require accessible vehicles, physical access points, services, and technologies are entitled to receive the same or comparable level of access as persons without disabilities.

### Financial Impact

Emerging Mobility Services and Technologies must promote a positive financial impact on the City's infrastructure investments and delivery of publicly-provided transportation services.

EMERGING MOBILITY SERVICES AND TECHNOLOGIES NEWSLETTER

Table 9: Labor Principle Evaluation Results

| | EVALUATION CRITERIA | BIKE SHARE | SCOOTER SHARE | CAR SHARE | RIDE SHARE | RIDE HAIL | MICRO TRANSIT | COURIER NETWORK SERVICES |
|---|---|---|---|---|---|---|---|---|
| | OUTCOME METRIC | | | | | | | |
| 1 | EMPLOYEE/CONTRACTOR EARNINGS<br>Mobility service operator net hourly median earnings minus job-related expenses | ? | ? | ? | ? | ? | $20 | ? |
| 2 | EMPLOYEE/CONTRACTOR BENEFITS<br>Net value of mobility service operator (whether employees and/or contractors) benefits, including medical, dental, and retirement benefits | ? | ? | ? | ? | ? | ? | ? |
| | POLICY AND DESIGN FEATURES | | | | | | | |
| 3 | FAIR PAY<br>Level of transparency to service operator (employee/contractor) in hourly rate, net of job-related expenses | 🟡 | ? | 🟢 | 🟢 | 🔴 | 🟢 | 🟡 |
| 4 | OPPORTUNITY FOR ENTRY<br>Hiring policy statement encourages women, people of color, and people with disabilities to apply (permanent employees and contractors). | 🟢 | 🔴 | 🟡 | 🟡 | 🟢 | 🟢 | 🟡 |
| 5 | DISADVANTAGED BUSINESS ENTERPRISES AND LOCAL BUSINESS ENTERPRISES<br>Company is a registered Disadvantaged Business Enterprise (DBE) or Local Business Enterprise (LBE) | 🔴 | 🔴 | 🔴 | 🔴 | 🔴 | 🔴 | 🔴 |
| 6 | DISADVANTAGED BUSINESS ENTERPRISES AND LOCAL BUSINESS ENTERPRISES<br>Company prioritizes contracting with DBEs and LBEs | 🟡 | 🔴 | 🟡 | 🔴 | 🔴 | 🔴 | 🔴 |
| 7 | OPPORTUNITIES FOR ENTRY<br>Hiring process does not use non job-related characteristics, including educational attainment, as a barrier to employment. | 🟡 | 🟢 | 🟡 | 🟢 | 🟡 | 🟢 | 🟡 |

## RECOMMENDATION 5: PRIORITIZE

**Support Public Transit and Prioritize Transit**

The Transportation Authority and the SFMTA should continue to support the expansion of transit-priority facilities. The Transportation Authority and the SFMTA should collaborate in developing a series of studies related to rights-of-way prioritization, vehicle miles traveled, financial impacts, and cost-recovery. To support these studies, the Transportation Authority and the SFMTA should conduct pilot programs that improve first and last mile connectivity to transit stations.

Continue to Support Expansion of Transit-Priority Treatments

The Transportation Authority and SFMTA should continue to support the expansion and enforcement of transit priority lanes, signals and other transit priority treatments to ensure public transit service is prioritized on city rights-of-way.

Conduct a Customer experience study

The SFMTA and the Transportation Authority should study the customer experience and attractiveness of emerging mobility services and technologies in comparison to public transit service. Topics may include customer service, customer feedback, payment methods/types, vehicle tracking, information sharing, and routing etc. The study would identify lessons learned and opportunities to improve aspects of public transit service and connect results to the SFMTA "Next Generation Customer Information System" development effort.

Conduct a Right-of-Way Prioritization Study

The Transportation Authority and the SFMTA should develop a right-of-way prioritization study. The study could identify methods to reduce modal conflicts, increase transit efficiency and prioritize the efficient movement of people. This plan should consider the City's emerging mobility principles, climate action goals and Transit First policy. The right-of-way study should also identify corridors to prioritize walking, bicycling and transit similar to the Better Market Street Plan and should be coordinated with ConnectSF's Streets and Freeways Study.

Conduct a Financial Impact Study

The SFMTA should conduct a Financial Impact study on

study will inform potential emerging mobility permit systems, impact fees, and business taxes, as well as any necessary authorizing legislation.

Pilot First and Last Mile Connections to Transit

The Transportation Authority and the SFMTA should explore methods to incentivize traveling to major transit hubs such as BART stations, Caltrain among others. This pilot should consider curb management strategies adjacent to these transit hubs that may facilitate pickups and drop offs. Additionally, this pilot should identify methods of discouraging competition with mass transit within, to and from San Francisco.

School Transportation

The Transportation Authority, San Francisco Department of Rec and Parks, and San Francisco Unified School District should develop opportunities for emerging mobility services to provide shared mobility options for San Francisco youth to travel to and from home, school and after school programs. .


*"Does your car have any idea why my car pulled it over?"*

# Thank you

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https://www.wsp.com/en-GL/sectors/connected-and-automated-vehicles