

# Emerging Technologies & Autonomous Vehicle Readiness Planning

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Georgia Planning Association Conference

Jekyll Island, GA

September 5, 2018



# Agenda



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U.S. Context

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U.S. Survey on Emerging Technologies & Autonomous Vehicle Readiness Planning

3

15 Strategies to Prepare for Emerging Technologies & Highly Autonomous Vehicles

# U.S. Context

Emerging Technologies

# Rapid Advancement in Autonomous Vehicles


**11** Largest Automakers

**2018 - 2021**

Fully Autonomous Vehicles on Highways



# Emerging Technology Initiatives

 Enacted Autonomous Vehicle Legislation<sup>1</sup>

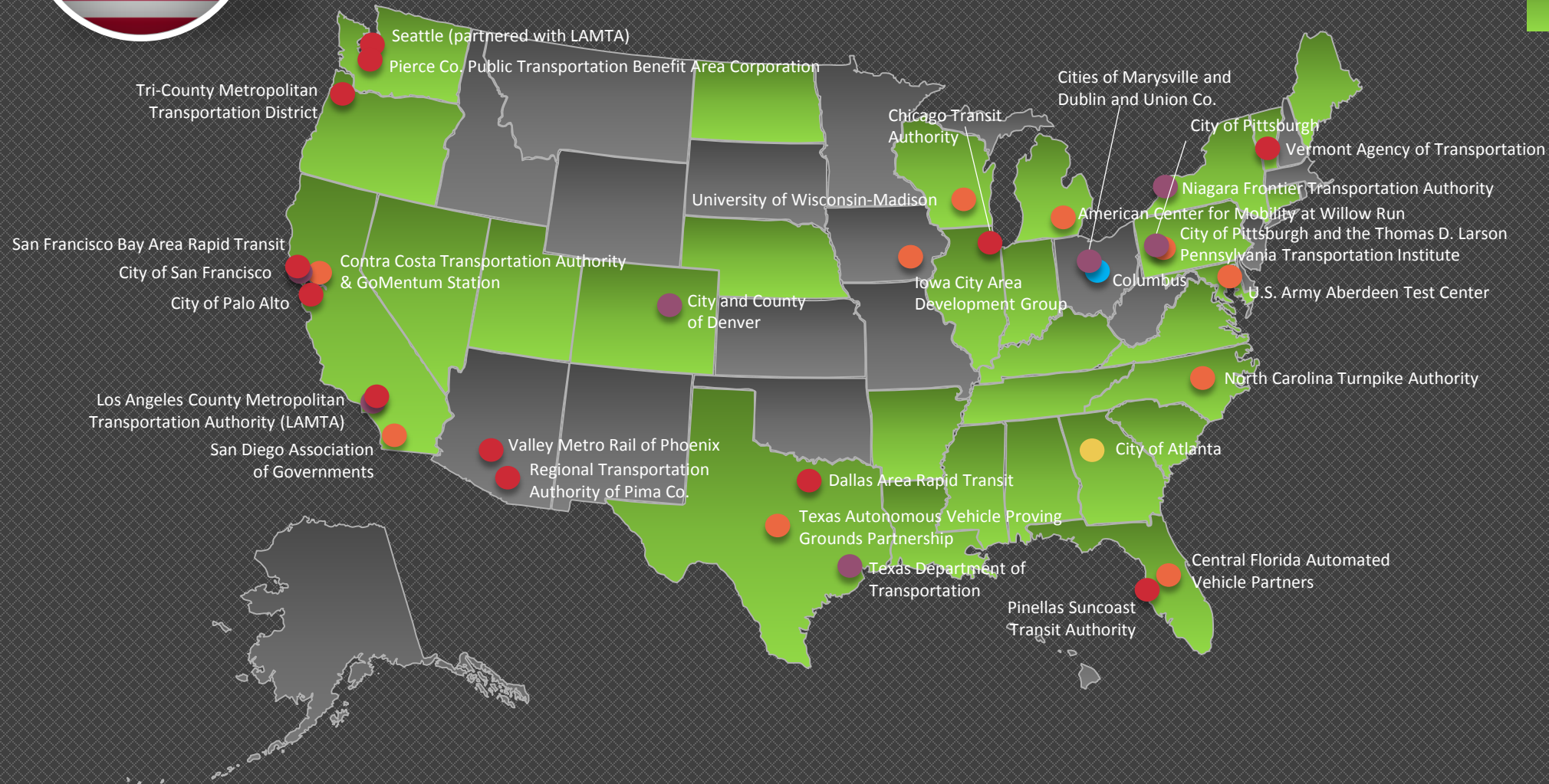
 USDOT Smart City Challenge Winner

 FHWA Advanced Transportation and Congestion Management Technologies Deployment (ATCMTD) Program

 FTA Mobility on Demand (MOD) Sandbox Program

 USDOT Autonomous Vehicle Proving Ground

 Safer Roads Challenge Living Lab



<sup>1</sup> <http://www.ncsl.org/research/transportation/autonomous-vehicles-self-driving-vehicles-enacted-legislation.aspx>



- Las Vegas, NV
- “M City,” MI
- Denver, CO
- San Ramon, CA
- Arlington, TX
- Gainesville, FL

# U.S. Survey on Emerging Technologies & Autonomous Vehicle Readiness Planning

Overview and Results

# NATIONAL SURVEY ON EMERGING TECHNOLOGIES & AUTONOMOUS VEHICLE READINESS PLANNING AND STRATEGIES TO PREPARE FOR THE CHANGING TRANSPORTATION LANDSCAPE

## Survey Overview

- Conducted March - April 2018
- United States
- Fully funded by Modern Mobility Partners, LLC
- Readiness Planning Focus

The Emerging Technologies & Autonomous Vehicle Readiness Planning survey was conducted during March - April 2018 by Modern Mobility Partners, LLC. The purpose was to gain an understanding of the level of preparedness transportation and land use planning agencies at the local, regional, and state levels have for emerging technologies and highly autonomous vehicles (HAVs). In addition, the intent was to bring an awareness of the different layers of impacts that emerging technologies and HAVs will have on the transportation landscape and provide considerations for potential readiness activities.



**26%** of respondents stated they fully understand the implications of HAVs and their role in helping their organization prepare.

**91%** of respondents stated that at some point in time, emerging technologies and/or HAVs will impact their day-to-day job activities.

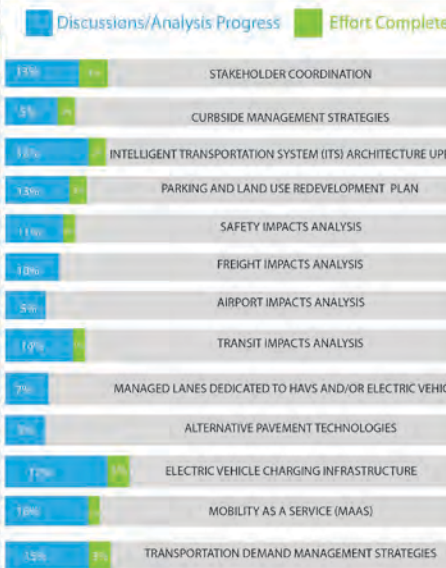
**65%** believe that we should start preparing for HAVs within the next 3 years



8% did not answer



Organization or firm has developed the following types of initiatives, programs, projects and/or analyses in response to or in anticipation of emerging technologies and HAVs:



**15 Strategies to Prepare for Emerging Technologies and HAVs**

- Regional Stakeholder Coordination
- Mobility as a Service (MaaS)
- Transportation Demand Management Plan / Update
- Curbside Management Plan
- Parking / Land Use Redevelopment Plan
- Long Range Transportation Plan
- Alternative Pavement Technologies Evaluation
- Electric Vehicle Charging Infrastructure
- Regional ITS Architecture
- HAV Managed Lane Study
- Safety Impacts Analysis
- Transit Impacts Analysis
- Freight Impacts Analysis
- Airport Impacts Analysis
- Emerging Technologies HAV Readiness Plan

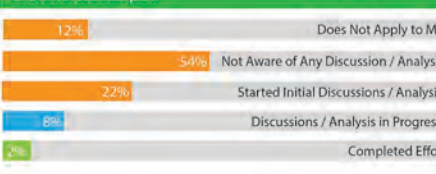


Organization has accounted for emerging technologies and/or HAVs in long-range transportation plan:

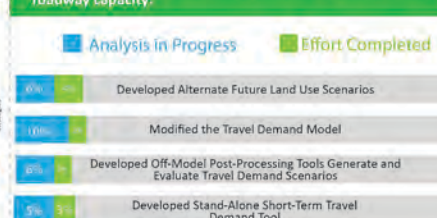


Analysis in Progress Effort Completed

Organization or firm has conducted an overarching emerging technologies and HAVs readiness plan:



Organization or firm has developed tools or processes to evaluate the impacts of ride-hailing companies and/or HAVs on roadway capacity:



Analysis in Progress Effort Completed



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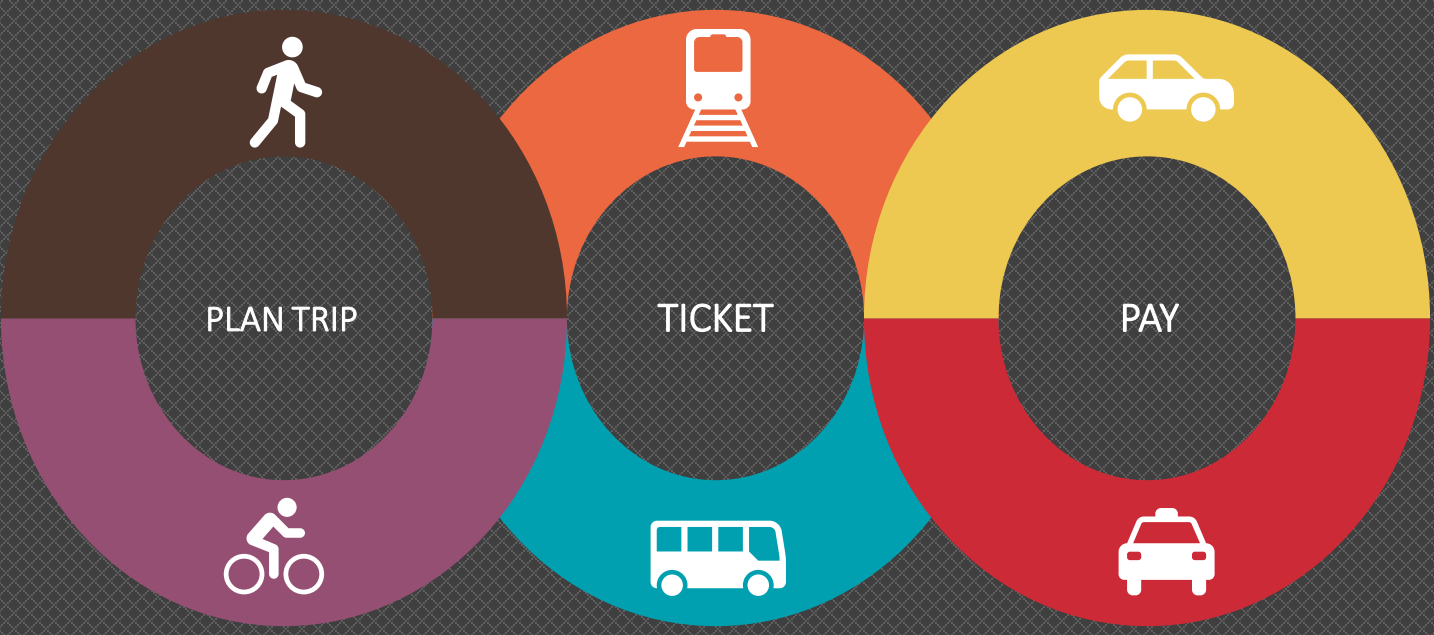
# 15 Strategies

Preparing for Emerging Technologies & Highly Autonomous Vehicles (HAVs)



1.

# Regional stakeholder coordination



2.

# Mobility as a service (Maas) Plan



2.

Mobility as  
a service  
(Maas) Plan



2.

# Mobility as a service (Maas) Plan (Cont'd)



3.

# Transportation Demand Management (TDM) Plan/Update



## Historical

Transit,  
Carpool,  
Vanpool, Bike,  
Flexible Work  
Hours,  
Teleworking



## Current

Transit,  
Ridehailing, Bike  
Share, Car Share,  
Flexible Work  
Hours,  
Teleworking



## Near Future

Mobility as a  
Service (Maas)



## Long-Term

Autonomous  
cars, policies to  
discourage  
"zombie cars"

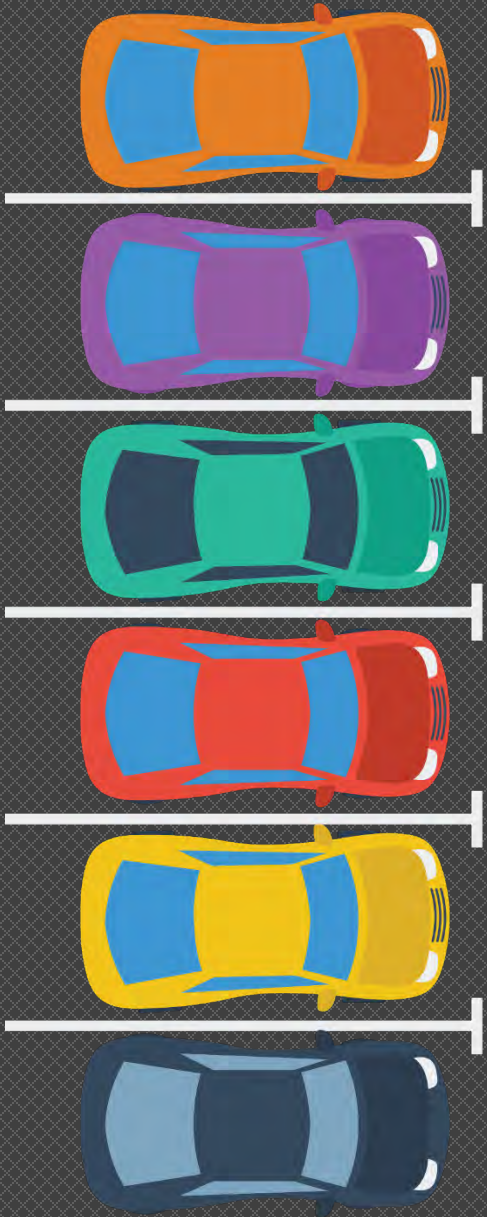


4.

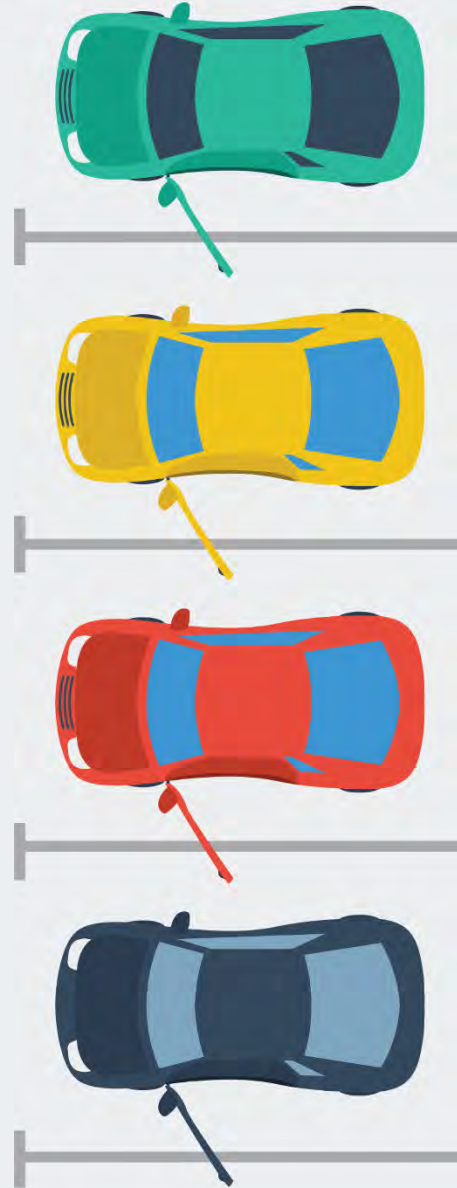
## Curbside Management Plan

- Passenger and package loading zones
- Re-purpose on-street parking
- Curbside flex zones

## Self-Parking Cars



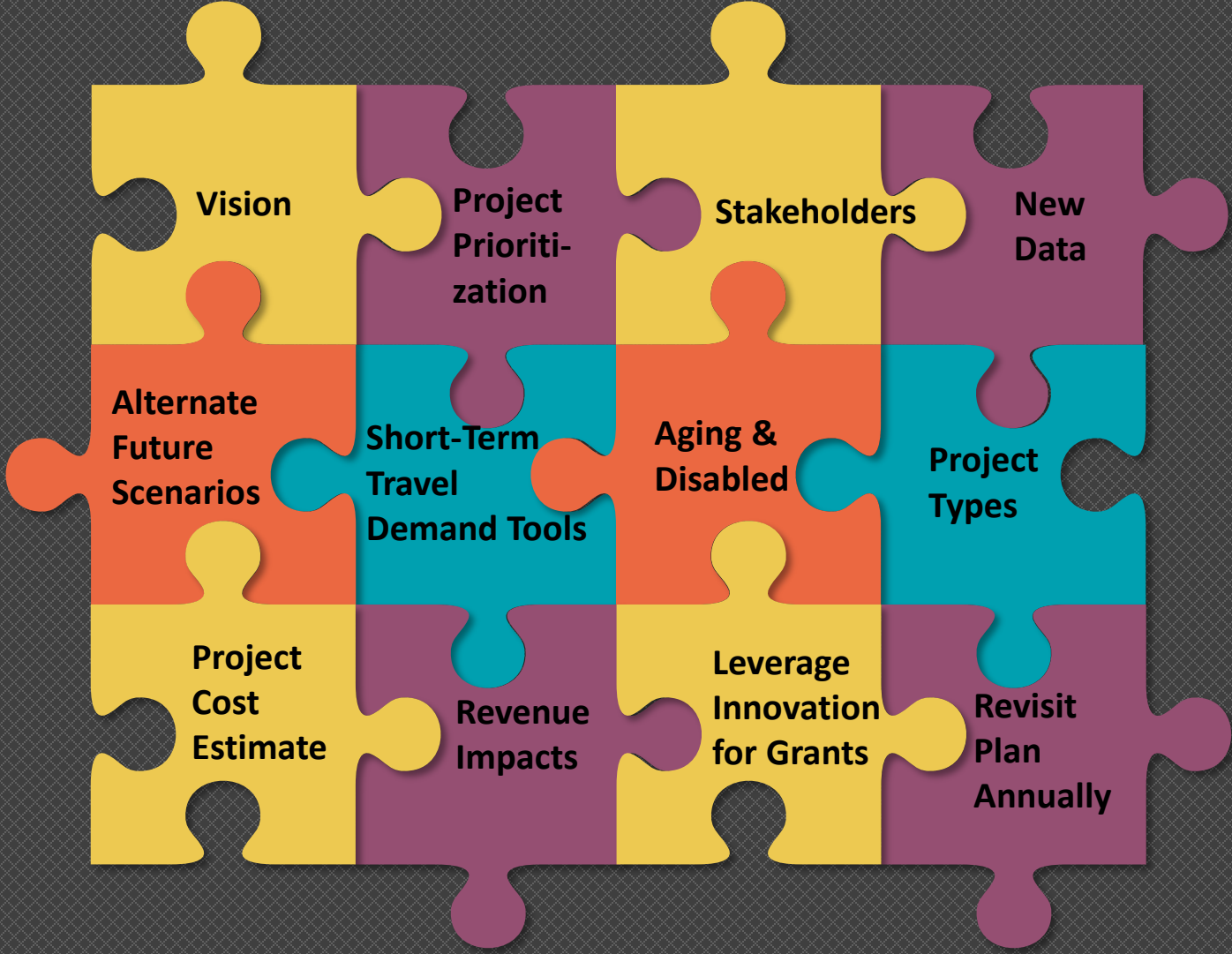
## Cars With Driver



5.

Parking /  
Land Use  
Redevelopment  
Plan





6.

# Long Range Transportation Plan

A photograph of a winding road with solar panels embedded in the pavement. The road is illuminated with a bright yellow glow, suggesting it is generating solar energy. The road curves through a landscape with trees and a rocky hillside in the background. A yellow circle containing the number '7.' is positioned in the upper right corner of the image.

7.

# Alternative Pavement Technologies Evaluation

- Generate solar energy
- Charge electric vehicles
- Provide Wifi
- Provide connected vehicle advanced warning increasing time for human intervention
- Monitor pavement conditions
- Prevent icing

Photo Source: Solar Roadways

Electric  
e-charging  
lane



8.

Electric Vehicle  
Charging  
Infrastructure



Emerging  
Technologies



Interoperability



Cross-  
Jurisdictional

9.

Regional  
Intelligent  
Transportation  
Systems (ITS)  
Architecture

Autonomous Car



Normal Car

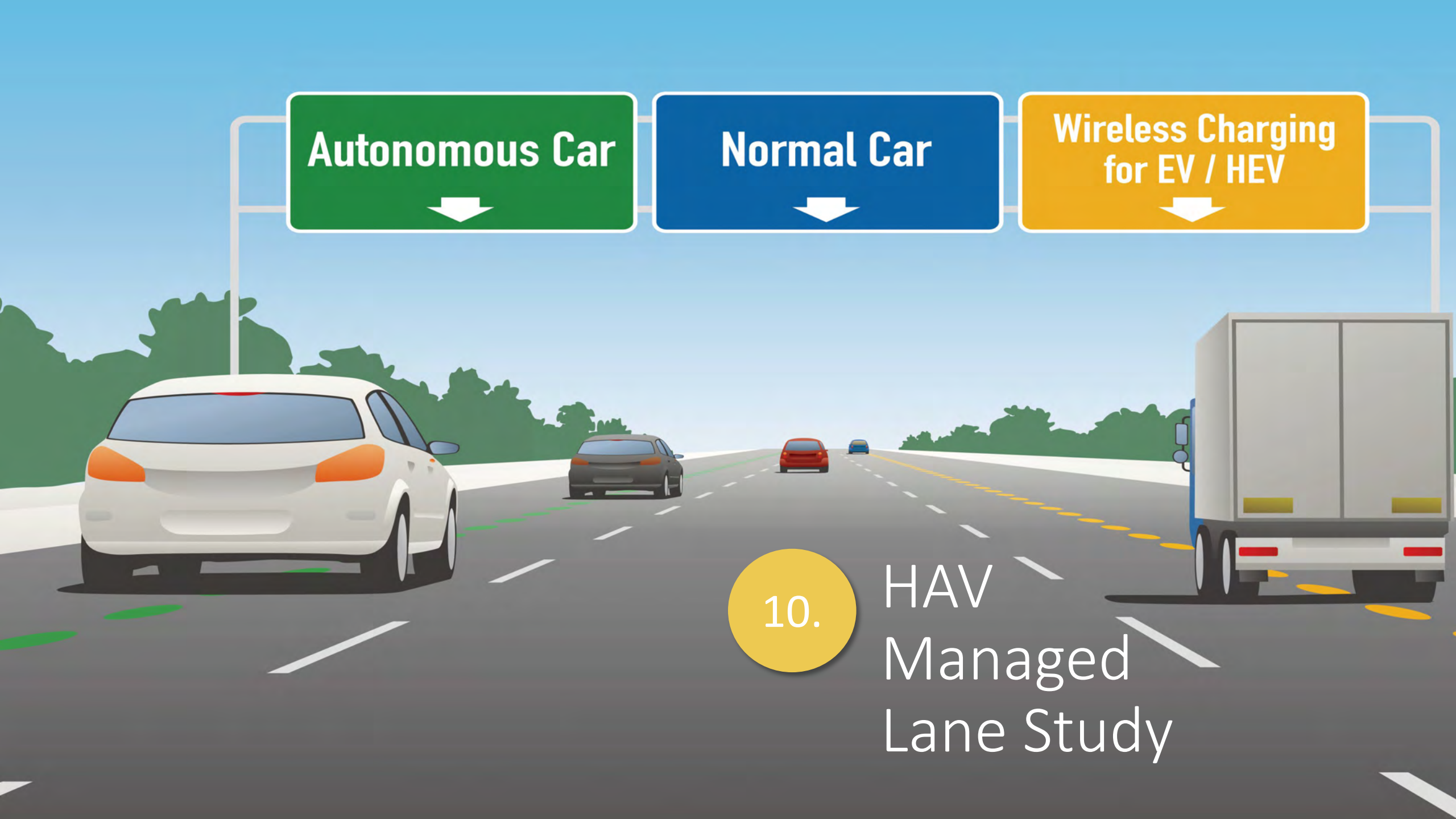


Wireless Charging  
for EV / HEV



10.

HAV  
Managed  
Lane Study



# 11. Safety Impacts Analysis



Mix of Self-Driving and Human-Driven Vehicles



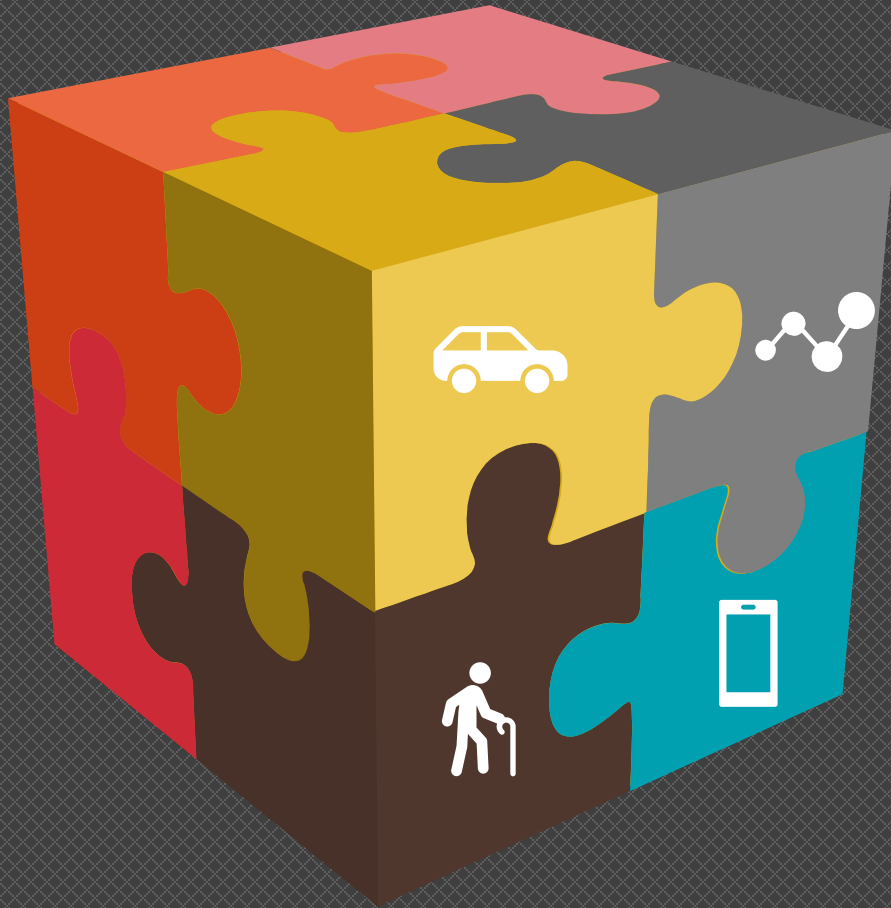
Design for Safe Cycling



Design for Safe Walking

12.

# Transit Impacts Analysis



## Ride-hailing

First- and last-mile



## Fixed Routes

Focus on higher density and high ridership routes



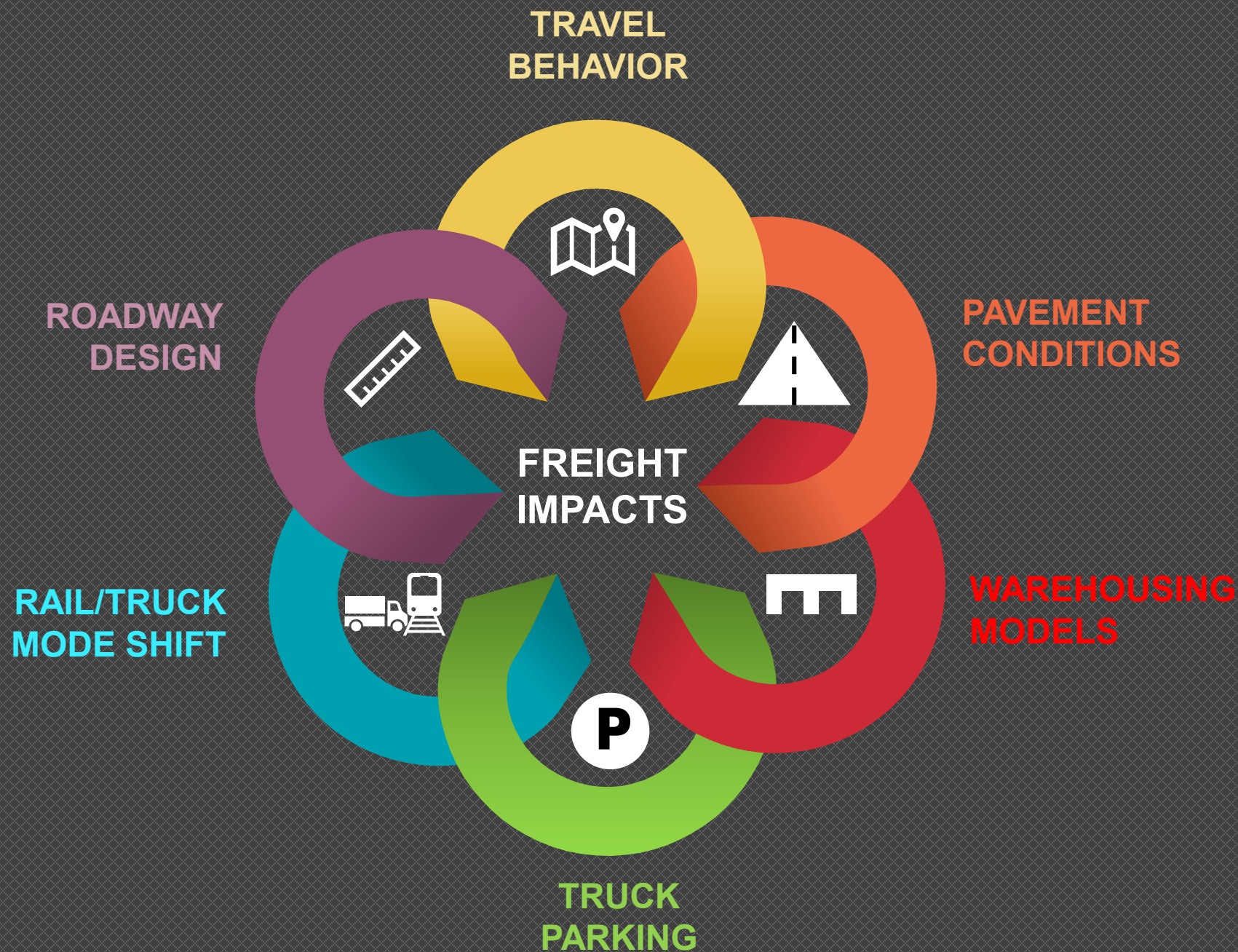
## Paratransit

Consider partnering with ride-hailing companies



## Mobility-as-a-Service

Open data and partnerships



13.

# Freight Impacts Analysis



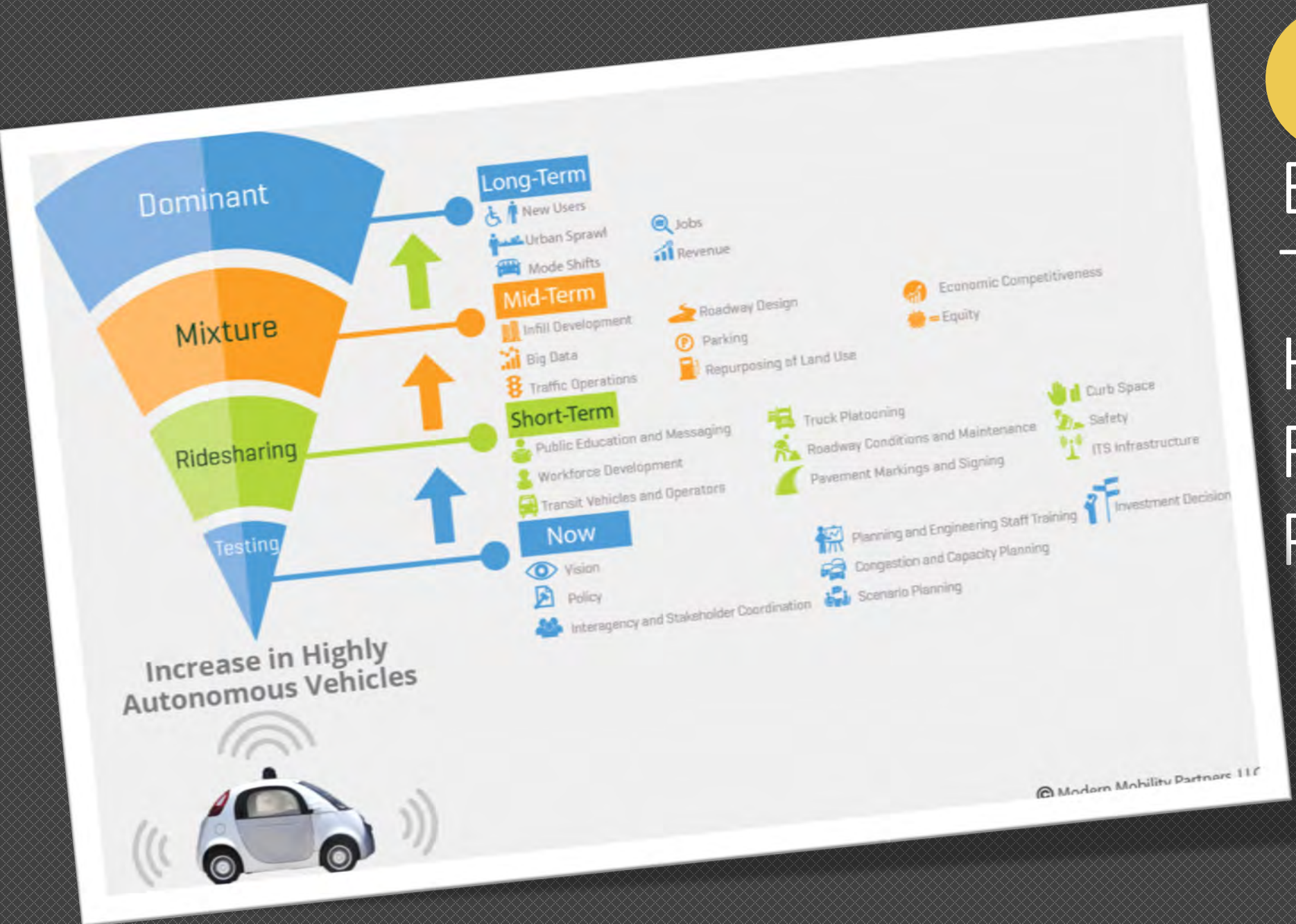


14.

# Airport impacts Analysis

15.

# Emerging Technologies/ HAV Readiness Plan



# Download Our White Paper!

## <https://modernmobilitypartners.com/survey/>

### 15 STRATEGIES TO PREPARE FOR EMERGING TECHNOLOGIES & HIGHLY AUTONOMOUS VEHICLES

Companion to Emerging Technologies & Autonomous Vehicles Readiness Planning Survey conducted in March-April 2018.



#### SURVEY INFORMATION

The Emerging Technologies & Autonomous Vehicles Readiness Planning national survey, conducted during March–April 2018, was fully funded by Modern Mobility Partners, LLC. The survey and results, once complete, can be found at: <https://modernmobilitypartners.com/survey/>.



#### MODERN MOBILITY PARTNERS, LLC

Modern Mobility Partners, LLC is an Atlanta-based transportation planning firm co-founded by Jennifer Zhan, AICP, PTP and Keli P. Kemp, AICP, PTP in early 2015. Modern Mobility Partners provides consulting services in autonomous vehicle readiness planning, transportation planning, travel demand modeling, traffic and revenue analyses, project prioritization and performance measures, and funding and grant applications. We are proud to be female- and minority-owned firm and a certified disadvantaged business enterprise (DBE).

Below are 15 strategies for transportation and land use planners and policy makers to begin preparing for emerging technologies and highly autonomous vehicles (HAVs).

- 1. REGIONAL STAKEHOLDER COORDINATION**  
To effectively plan for rapidly evolving technologies and HAVs that will ultimately cross jurisdictional boundaries, a formal stakeholder coordination structure can be established that identifies both traditional and non-traditional stakeholders from across the region. In addition to your standard federal, state, regional, and local agency partners, non-traditional partners may include universities, ride-sharing companies, truck operators, shippers, and transit agencies. Alternatives to pavement technologies that may not have had a seat at the "transportation table" in the past may need to be invited, including planning and zoning, law enforcement, finance, information technology, and human resources.
- 2. MOBILITY AS A SERVICE (MaaS)**  
Mobility as a Service (MaaS) uses a digital platform (i.e. mobile app) to plan, book, ticket, and pay for an entire trip, end-to-end, across all transportation modes, both public and private. The primary goal is to simplify the transportation process to the point that consumers may deem their personal vehicles obsolete. In addition to providing a comprehensive tool to subscribers, MaaS is flexible and can be either pay-per-use or a monthly subscription. MaaS can also serve as a robust data source. A MaaS study can research the pros, cons, challenges and opportunities of different MaaS scenarios, develop case studies from other regions where MaaS is being tested, evaluate technology options and cost, consider impacts to operations, and develop an actionable plan for establishing MaaS in the larger region if appropriate.
- 3. TRANSPORTATION DEMAND MANAGEMENT PLAN/UPDATE**  
A Transportation Demand Management (TDM) Plan includes a suite of strategies intended to reduce drive-alone trips, such as carpooling, vanpooling, transit, flextime work hours, teleworking, etc. Ride-hailing has an impact on travel behavior, especially in the urban core, and could impact the types of TDM strategies and/or benefits an employer might provide. Furthermore, HAVs could have an unintended consequence of zero-occupant vehicles. A TDM plan or update could introduce and evaluate policies to minimize zero-occupant vehicles in the future. It can also evaluate the impacts of emerging technologies on travel behavior and make recommendations for how employers might provide benefits to their employees that align with this evolving mobility revolution.
- 4. CURBSIDE MANAGEMENT PLAN**  
With the advent of ride-hailing companies, such as Uber and Lyft, there is an increasing need for designated passenger pick-up and drop-off locations. A converse effect is the potential decrease in need for parking. Furthermore, with the dramatic increase in online shopping, there is additional demand for truck loading zones. A curbside management plan can identify locations that could provide passenger and truck loading zones, that may or may not be created by repurposing existing on-street parking.
- 5. PARKING/LAND USE REDEVELOPMENT PLAN**  
As more people use ride-hailing companies and as HAVs increase, it is anticipated that parking needs within the urban core and/or high priced real estate areas will decrease. Over time, gas stations will become obsolete with the dominance of electric vehicles. A land use redevelopment plan that includes an inventory of parking and gas stations at a minimum, could be a great opportunity to identify potential redevelopment opportunities for prime real estate locations, increasing quality of life, revenues, and economic competitiveness.
- 6. LONG RANGE TRANSPORTATION PLAN**  
Whether it's a city, county, regional, or statewide long-range transportation plan, there are multiple ways to account for emerging technologies and/or HAVs, including but not limited to: the vision, goals, objectives, socioeconomic forecasts (population and employment), future travel patterns and roadway capacity, project prioritization framework, types of projects, revenue forecasts, and investment strategies. In addition, tools can be developed to look at alternate future scenarios, as well as evaluate short-term needs and opportunities.

- 7. ALTERNATIVE PAVEMENT TECHNOLOGIES EVALUATION**  
Several emerging pavement technologies are being developed and tested, including roadside Wi-Fi sensors which can provide a connected vehicle advanced warning, thereby increasing the time available for human drivers to intervene while in an autonomous vehicle. Solar pavement options can charge electric vehicles, prevent icing, and potentially generate revenue with any excess solar energy. Sensors can be installed in roadbeds to dynamically monitor and report the condition of the pavement. These, and other options, may be considered for roadways, sidewalks, multi-use trails, airport runways and taxi ramps, etc. Alternative pavement technologies can be researched, areas or corridors ripe for testing can be identified (ex. transportation innovation zones), and pavement technologies can be plotted to determine their viability in other areas.
- 8. ELECTRIC VEHICLE CHARGING INFRASTRUCTURE**  
With the widespread increase of electric vehicles expected over time, electric vehicle charging infrastructure will be critical, whether it's at stationary locations, mobile, or built within the pavement. Transportation innovation zones, like those mentioned above, can be identified for testing of different electric vehicle charging options. An evaluation of the different types of electric vehicle charging options should first be conducted prior to a test deployment as the options are constantly evolving.
- 9. REGIONAL ITS ARCHITECTURE**  
Many regional ITS architecture plans are outdated, let alone plan for future technology interoperability. With the advent of connected and/or HAVs, it is critical that these plans be updated to reflect emerging technologies, determine what technologies should be accommodated within the ITS architecture across the region, and ensure they can communicate with each other and ultimately, across jurisdictional boundaries.
- 10. HAV MANAGED LANE STUDY**  
Managed lanes are used to manage access to a lane based on vehicle type, occupancy, and/or a fee. Since it will take time for HAVs to fully penetrate the market, there will be a mix of driverless and human-driven vehicles on the road for some time which will introduce certain challenges. One solution to help mitigate this challenge is to assign a dedicated lane for HAVs and as the market share of highly autonomous vehicles increase, so does the share of lanes dedicated to HAVs. Transportation agencies can begin identifying and evaluating potential managed lane corridors that may be ripe for dedicated HAV and/or electric vehicle lanes.
- 11. SAFETY IMPACTS ANALYSIS**  
One of the primary goals of HAVs is to time, increase safety and reduce the high number of crashes resulting from human behavior. However, there are other safety considerations that should be considered related to the long transition period where there will be a mix of human-driven vehicles and HAVs. A safety impacts analysis could be conducted to develop strategies to mitigate these impacts, as well as include the design of safe pedestrian and bicycle facilities that reduces interaction with vehicles.
- 12. TRANSIT IMPACTS ANALYSIS**  
It is anticipated that at a minimum, ride-hailing companies and other emerging technologies, as well as transit in the urban areas, will have an impact on transit in some capacity. Implementation of a suite of mobility options, including transit, is vital for a striking transportation ecosystem. Transit impacts analysis can be conducted to evaluate the impacts of emerging technologies and HAVs on fixed route transit systems of varying transit types (ex. bus, rail, bus rapid transit, etc.), as well as on paratransit. Alternate low-cost and more convenient paratransit models can be evaluated that may include ride-hailing companies as a partner. In addition to transit service, highly autonomous transit vehicles and/or microtransit options can be considered and evaluated for potential testing.

- 13. FREIGHT IMPACTS ANALYSIS**  
Currently, truck drivers are only permitted to drive a maximum of 11-hours after a 10-hour break. It is anticipated that highly autonomous trucks will operate along the interstates with human truck drivers to navigate the surface streets once off the interstate. This new model could impact truck parking needs and locations, road pavement deterioration rates, interstate freight congestion, warehousing models, rail truck mode shift (potentially), etc. A freight impacts analysis could assist with developing investment strategies and priorities.
  - 14. AIRPORT IMPACTS ANALYSIS**  
With ride-hailing companies transporting more and more passengers to and from airports, airports are experiencing increasing outside congestion, staging areas, signage, and enforcement needs. At the same time, parking revenues are diminishing, and airports are beginning to consider renegotiating concession agreements with other transportation service providers. With shans expected to increase even further, airports could develop an actionable plan to accommodate the disruption of ride-hailing services and ultimately, HAVs, including determining if ride-hailing fees offset the parking revenue impacts, parking infrastructure capacity impacts and potential redevelopment, curbside management and enforcement, concession agreements, etc.
  - 15. EMERGING TECHNOLOGIES & HAV READINESS PLAN**  
The purpose of an emerging technologies and HAV readiness plan is to provide a more overarching look at how all the pieces of the puzzle noted above, among others outside of transportation, may be impacted and to develop a vision with an actionable plan for the region. This readiness plan could include the development of a vision for the region (before it's created for us) related to how people will live, work, and play in the future. It might also include the evaluation of opportunities and impacts related to policy, revenue, economic competitiveness, workforce development, land use, urban design, transportation planning, traffic operations, technology interoperability, roadway design, freight, transit planning and operations, and land-side aviation planning, as well as stakeholder coordination and public education and messaging, just to name a few.
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- The diagram shows three overlapping circles representing 'Urban', 'Suburban', and 'Rural' areas. Arrows point from these areas to a central point labeled 'Increase in Highly Automated Vehicles'. To the right, a flowchart shows 'Long Term' and 'Short Term' impacts leading to 'HAVs' and 'Transit'.

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