
Photo courtesy
Waymo, a self-driving technology company at Alphabet Inc.
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# Planning for Autonomous Vehicles

Phoenix City Council
Transportation and Infrastructure Committee
January 9, 2018

City of Phoenix

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## SAFETY

**94 PERCENT** of U.S. crashes involve human error. [1]

**1.2 MILLION** deaths worldwide due to vehicle crashes in 2013. [2]

**37,461 ROAD DEATHS** in the U.S. in 2016 and 2.4 million injuries in 2015. [3]

**2 OUT OF 3** people will be involved in a drunk driving crash in their lifetime. [4]

## SOCIETY

**$594 BILLION** in harm from loss of life and injury each year. [5]

**$277 BILLION** in annual economic costs. [6]

**$160 BILLION** in gas burned and time lost each year. [7]

## MOBILITY AND QUALITY OF LIFE

**3 MILLION** Americans age 40 and older are blind or have low vision. [8]

**79 PERCENT** of seniors age 65 and older living in car-dependent communities. [9]

**42 HOURS** wasted in traffic each year per person. [7]

# Important Facts About the Current State of Travel

Source: "On the Road to Fully Self Driving – Waymo Safety Report", Waymo, Inc., October 2017

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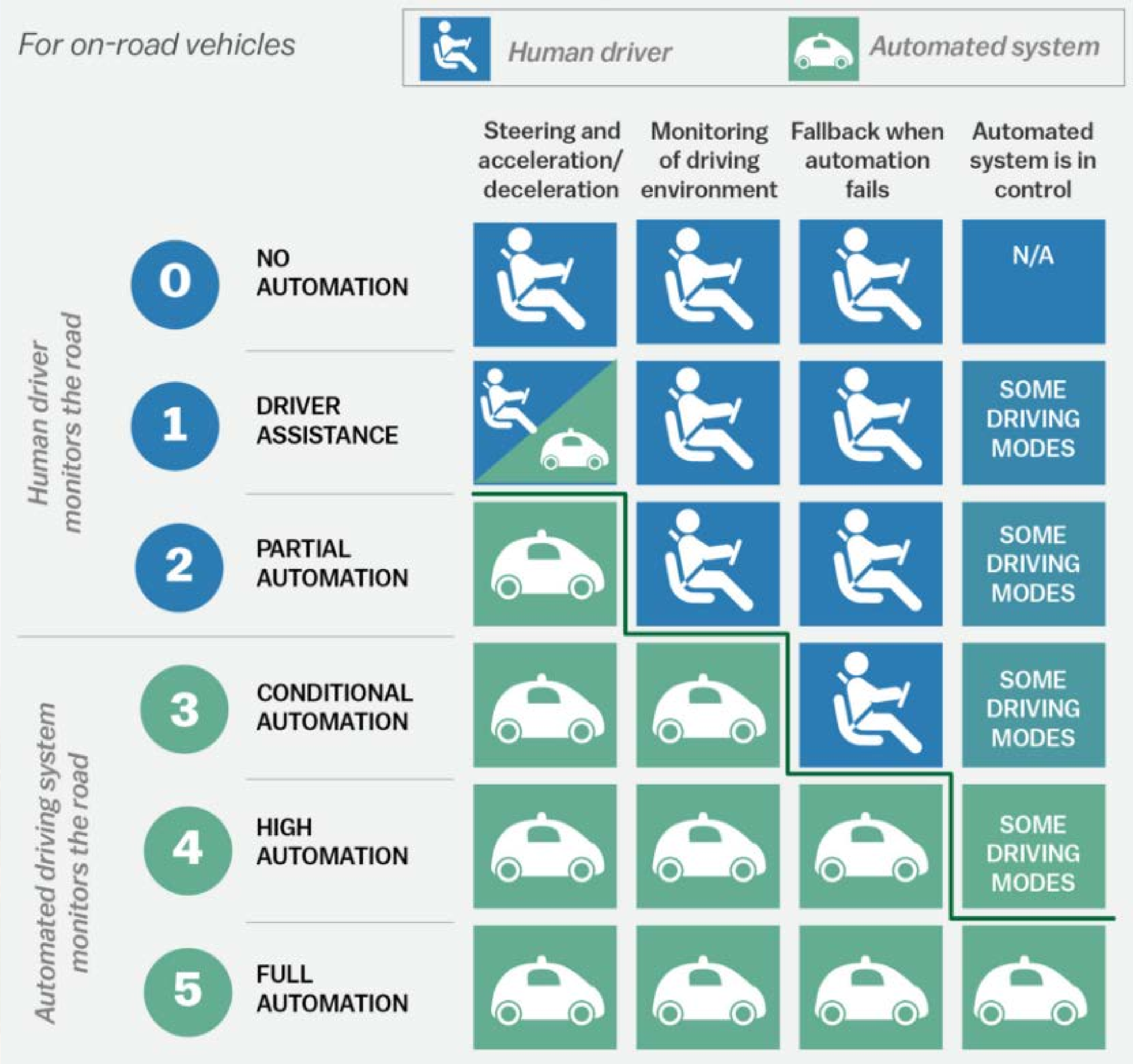


GM "Super Cruise"

Tesla Model S

Waymo (Google)

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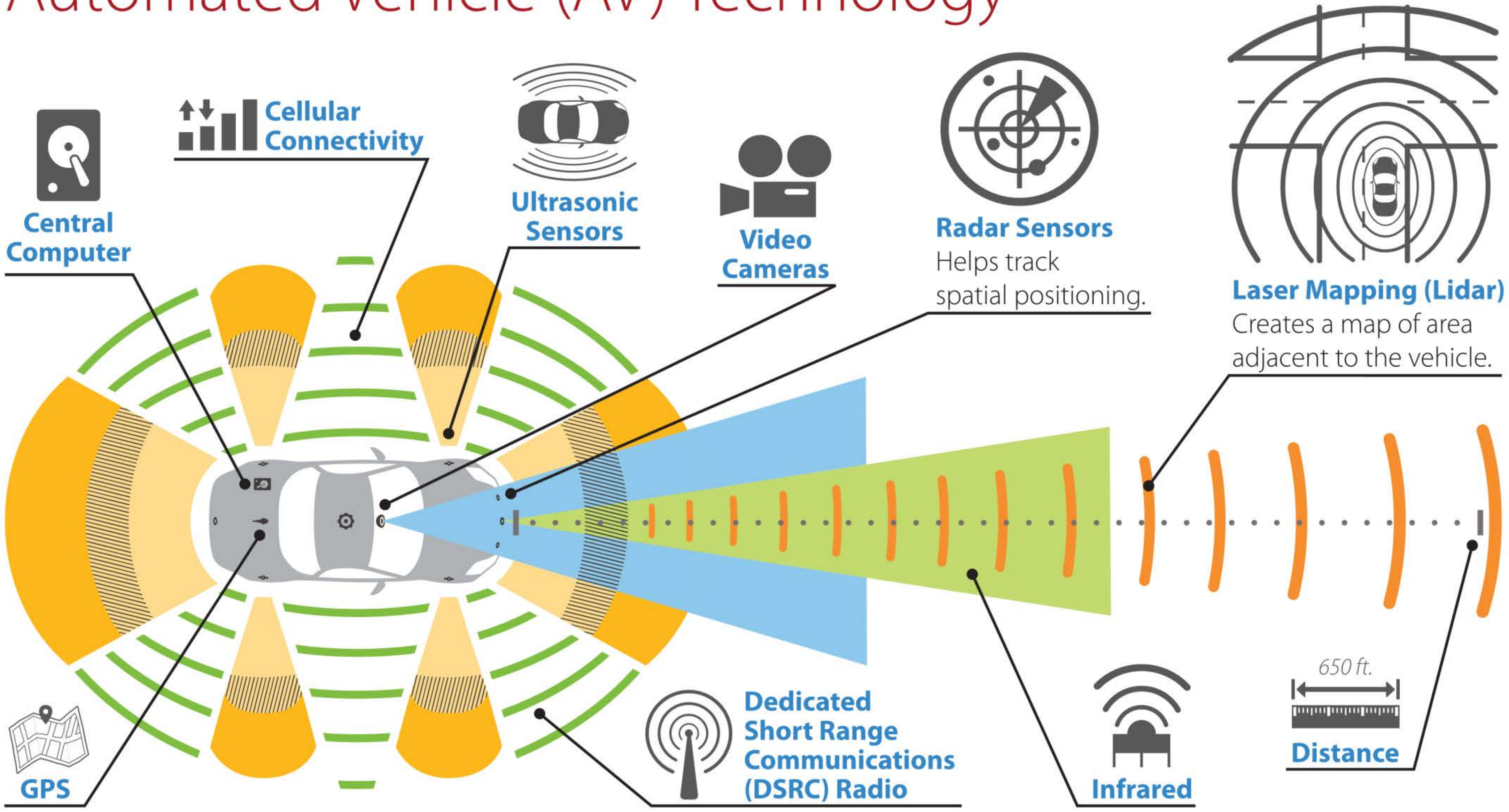
# Levels of Automation

# Automated Vehicle (AV) Technology

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## The Nuts and Bolts of a Connected and Autonomous Vehicle

# How will autonomous vehicles arrive?

Fully Autonomous

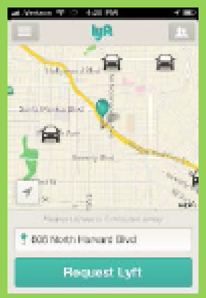
Semi-Autonomous

Driver

**Personal Automation**

**Shared Automated/ Platooning**

**Business as Usual**




**Shared Mobility**

Personally Owned

Mobility Fleets

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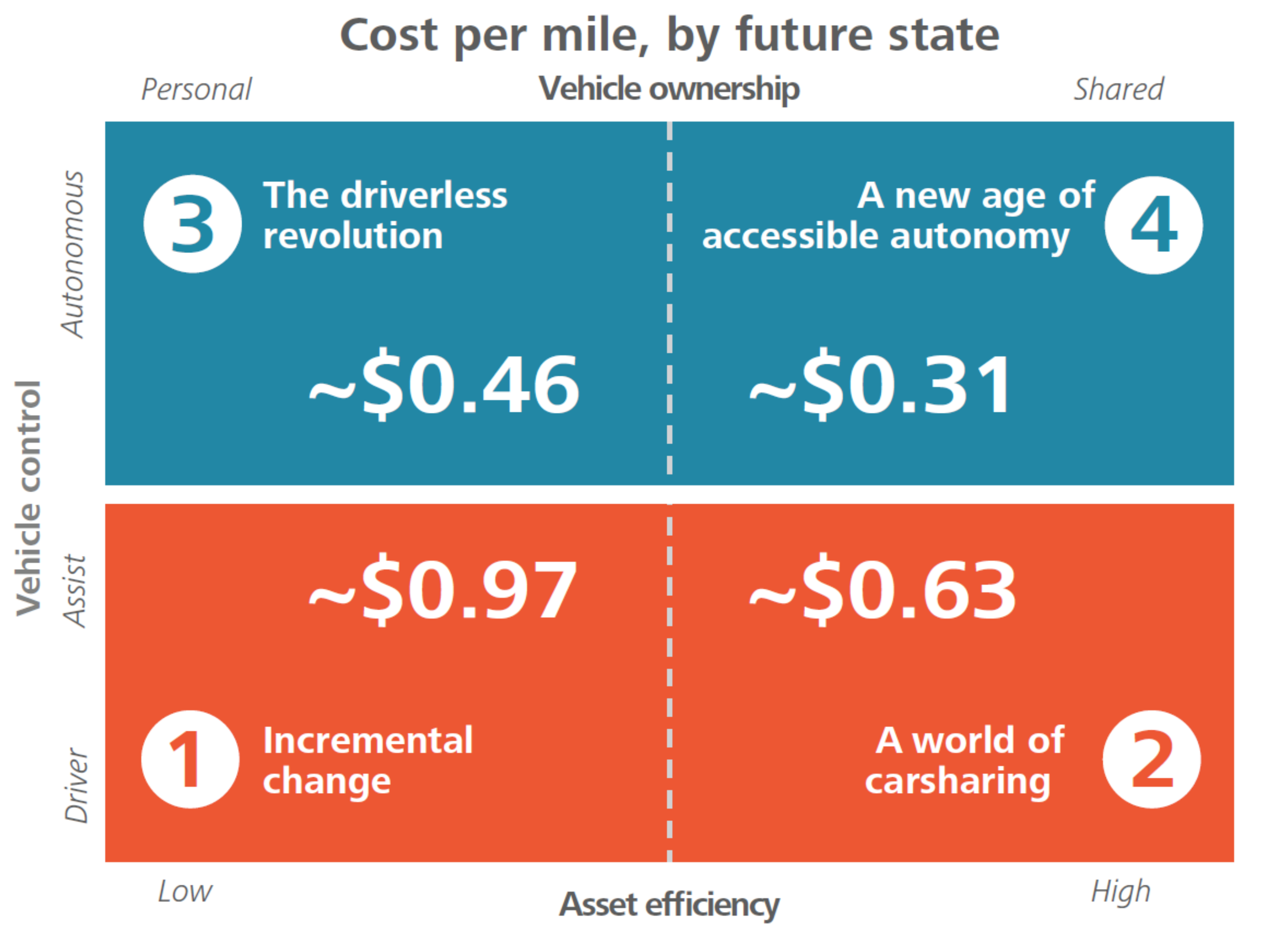


Source: “The Future of Mobility,” Deloitte University Press, 2015

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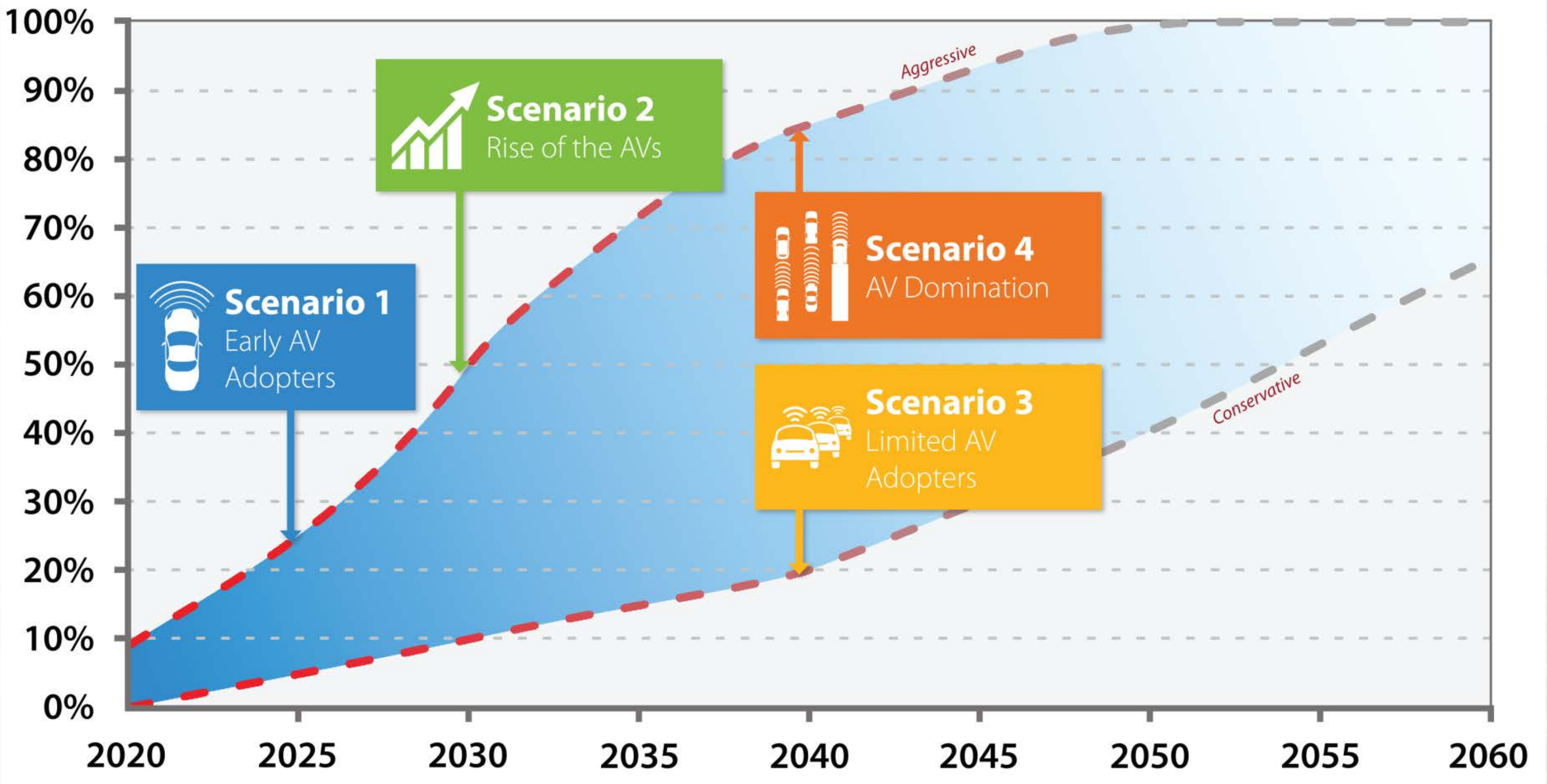


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# 50% Penetration for Partial AV by 2030 or Not

Source: HDR Engineering, Inc.

# Why does this matter?

# How does this affect us?

Ford Motor Company Photo
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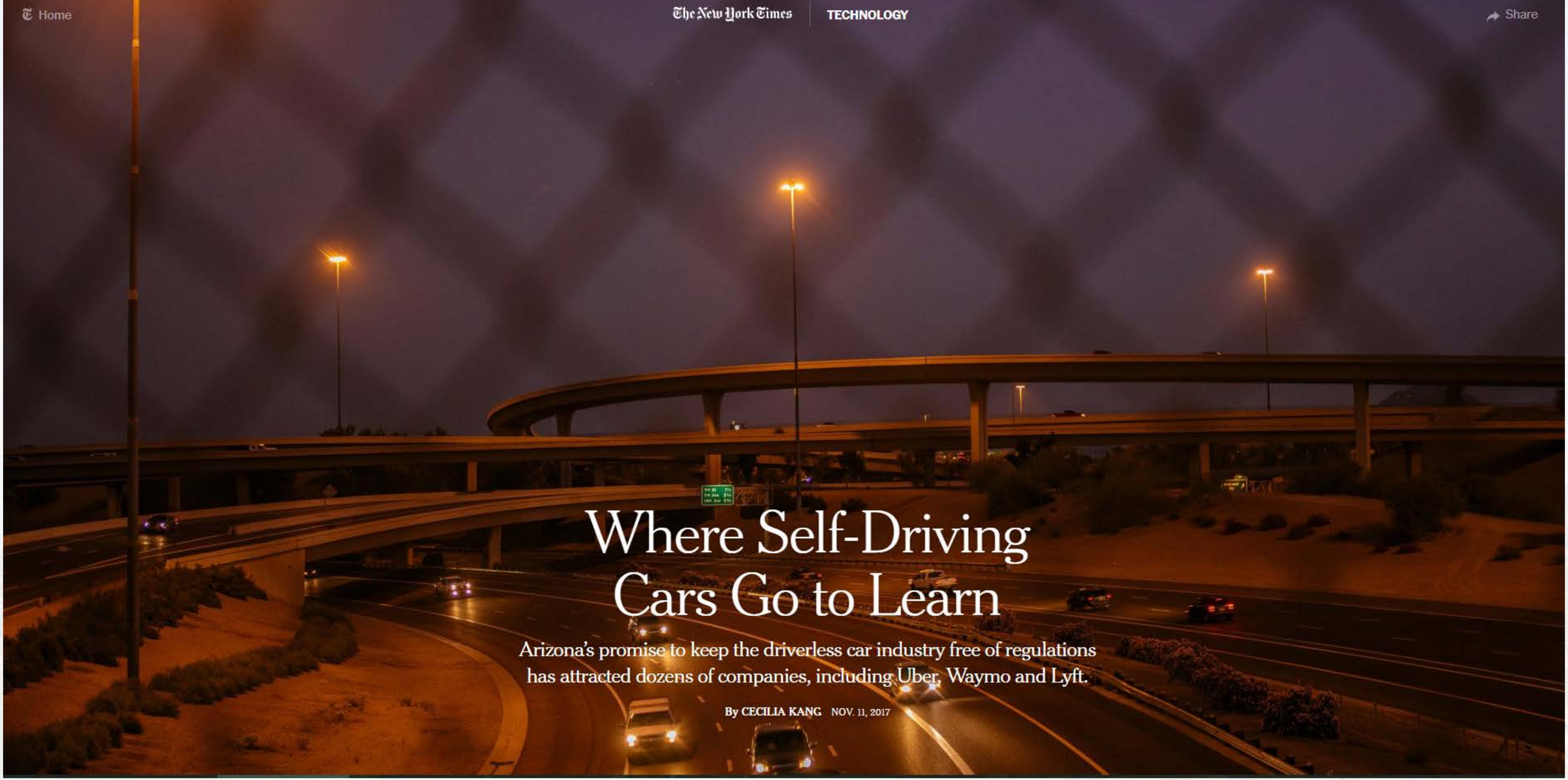


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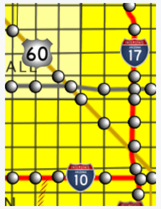
Source: *New York Times*, November 11, 2017. Downloaded November 15, 2017.
https://www.nytimes.com/2017/11/11/technology/arizona-tech-industry-favorite-self-driving-hub.html

# A Unique Opportunity . . .

New Travel Choices
Ridesharing
Better Car Ownership Alternatives



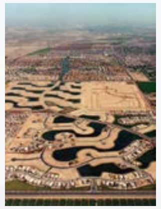

Safer Streets
Improved User Experience
Efficient Network Management

Compliment to Public Transit
Greater Transit Efficiency

Repurposed Parking
Space for Housing
Public Space

# ...but not without concerns.

Increased VMT
Empty Vehicle Circulation
Fight for the Market



Less Dense Urban Form
Higher Road Congestion
Longer Travel Times

Decline in Local Transit Use
Inequity

Cyber Attacks
Privacy Concerns

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Source: Future Mobility Research Program, Metropolitan Transportation Commission, San Francisco Bay Area, October 2017. Downloaded November 1, 2017.

# Literature Review Ranges for Key Variables

| Timing | Safety | Capacity | Demand | Energy/ Emissions |
|---|---|---|---|---|
| • **3 to 13 years** until fully driverless vehicles available for purchase. | • **+40% to +90%** increase in safety. | • **0% to +45%** increase in roadway capacity. | • **+5% to +40%** increase in VMT. | • **-50% to +100%** change in GHG emissions. |

Source: Future Mobility Research Program, Metropolitan Transportation Commission, San Francisco Bay Area, October 2017. Downloaded November 1, 2017.

Connected and Autonomous Vehicles

- Planning
- Policy
- Process

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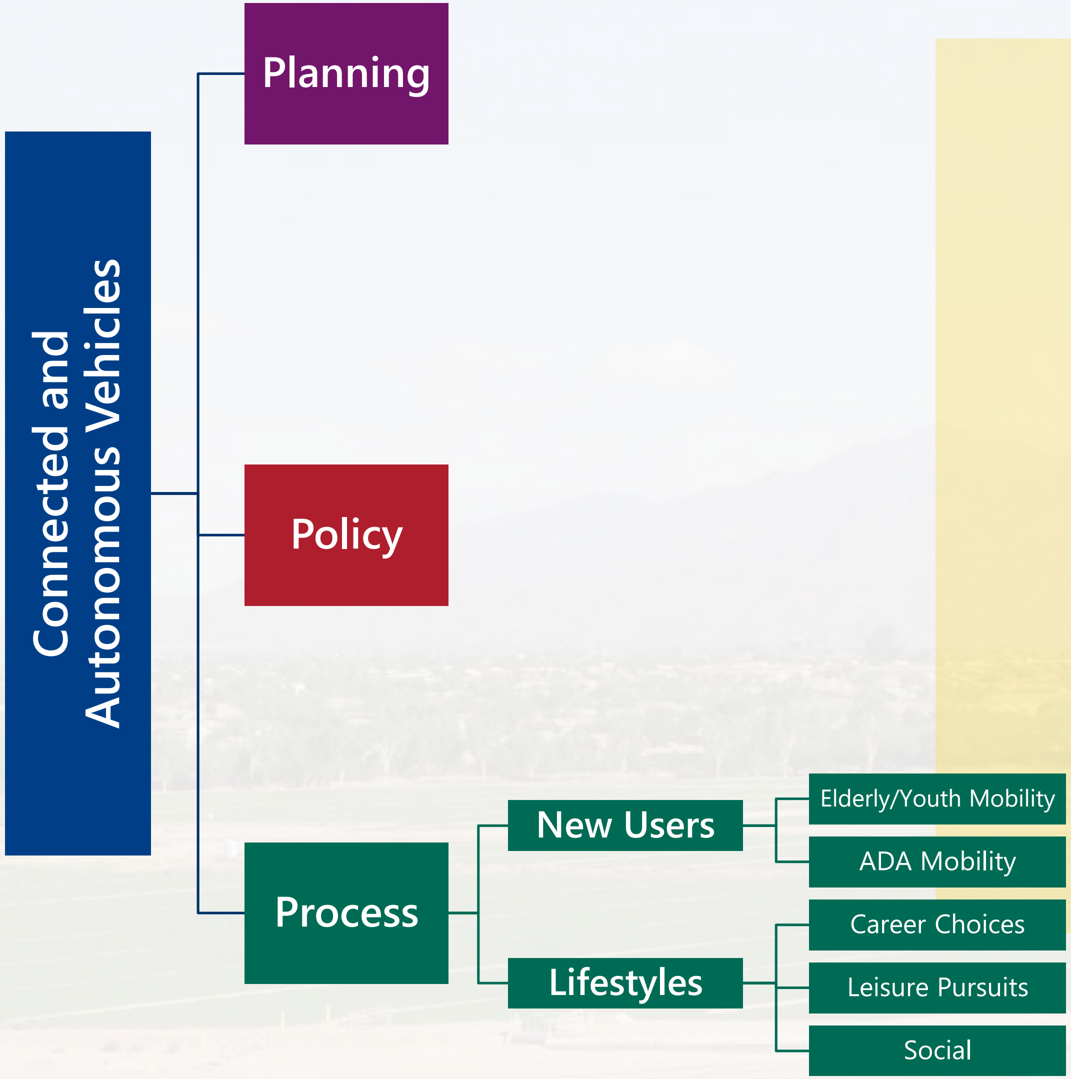
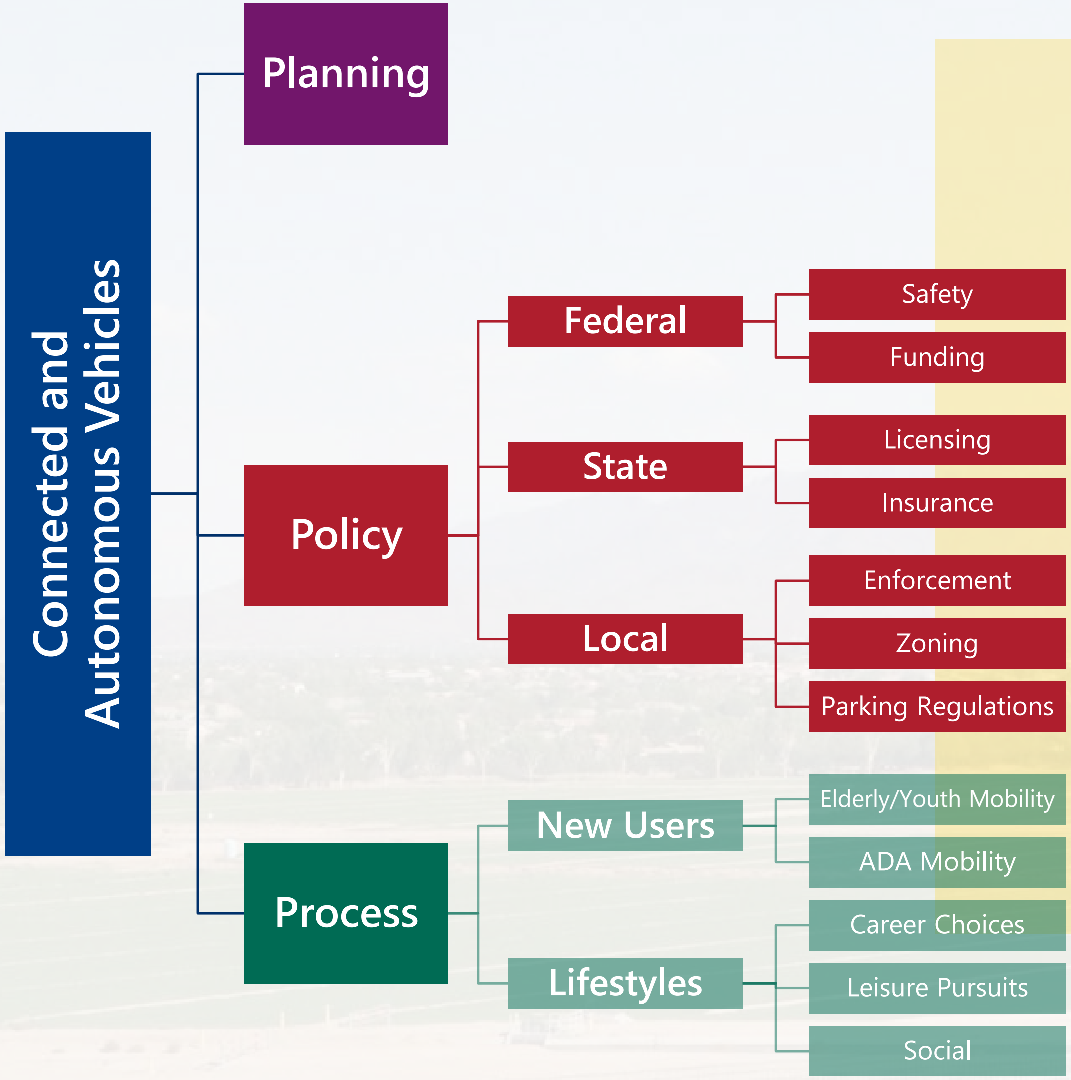



## Potential Benefits

| Driving Externality | Connected Vehicles | Autonomy | Share Autonomy | Electric Fleet |
|---|---|---|---|---|
| Safety | Strong | Strong | Strong | Weakest |
| Congestion | Strong | Uncertain | Some | Weakest |
| Emissions | Some | Weakest | Weakest | Strong |
| Land Use | Weakest | Uncertain | Some | Weakest |
| Mobility | Weakest | Strong | Strong | Weakest |

Strong  Some  Weakest  Uncertain

Source: *NCHRP Research Report 845, Advancing Automated and Connected Vehicles: Policy and Planning Strategies for State and Local Transportation Officials,* Transportation Research Board, The National Academies of Sciences, Engineering, and Medicine, Washington DC, August 2017.




- **Economic Instruments**
  - Fuel Taxes
  - Value Added Taxes
  - Vehicle Age Taxes
- **Regulatory Instruments**
  - Insurance Requirements
  - Establish/Update Rules of the Road and License Requirements
- **Structure of Private Rights**
- **Service Provisions**
- **Information/Education**
- **Financing/Contracting/Collaboration**

Source: *NCHRP Research Report 845, Advancing Automated and Connected Vehicles: Policy and Planning Strategies for State and Local Transportation Officials,* Transportation Research Board, The National Academies of Sciences, Engineering, and Medicine, Washington DC, August 2017.

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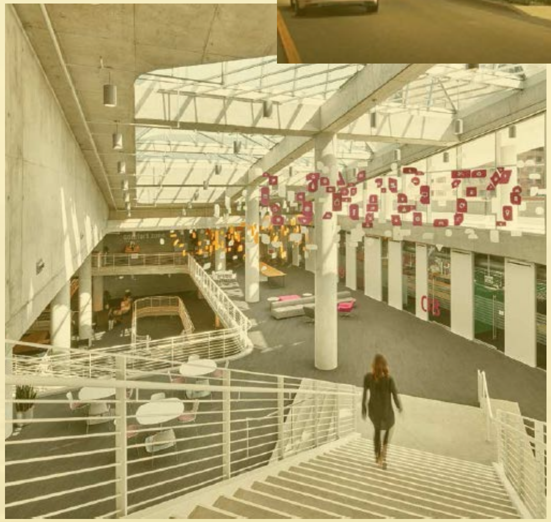
# Connected and Autonomous Vehicles

- **Planning**
  - Land Use
    - Commercial
    - Residential
    - Retail
    - Institutional
- **Policy**
  - Federal
    - Safety
    - Funding
  - State
    - Licensing
    - Insurance
  - Local
    - Enforcement
    - Zoning
    - Parking Regulations
- **Process**
  - New Users
    - Elderly/Youth Mobility
    - ADA Mobility
  - Lifestyles
    - Career Choices
    - Leisure Pursuits
    - Social

## Development & Redevelopment Real Estate

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- Connected and Autonomous Vehicles
  - Planning
    - Land Use
      - Commercial
      - Residential
      - Retail
      - Institutional
    - Transportation
      - Infrastructure Investments / Management and Operations
        - Statewide
        - Regional
        - Local
  - Policy
    - Federal
      - Safety
      - Funding
    - State
      - Licensing
      - Insurance
    - Local
      - Enforcement
      - Zoning
      - Parking Regulations
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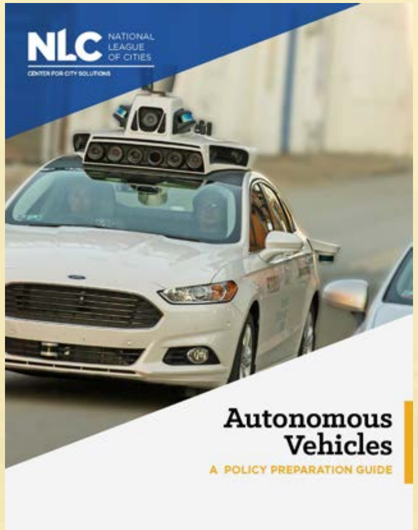


Source: Autonomous Vehicles: A Policy Preparation Guide, National League of Cities, Washington DC, April 19, 2017, downloaded October 17, 2017.

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Photo courtesy
Waymo, a self-driving technology company at Alphabet Inc.


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