

# SCENARIO 1: INVESTMENT AND RE-DESIGN OF THE FREEWAY SYSTEM

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## CONTEXT

Regional Freeway System

## MARKET PENETRATION BY TIME HORIZON

**2030:** 10% level 2, 60% level 3, and 30% level 4

**2050:** 100% level 4

## SCENARIO DESCRIPTION

In 2025, a metropolitan planning organization (MPO) is in negotiations with a state department of transportation (DOT) to evaluate continued implementation of a planned-for managed lane network. The MPO and transportation authorities have converted 60% of the high occupancy vehicle (2+ HOV) network to high occupancy toll (HOT) lanes; however, the overall system is not fully connected. Certain key segments lack direct flyover connections, which would require costly retrofits. HOV lanes and especially HOT lanes have already begun to be used regularly by private automobiles and transit vehicles automated levels 2 and 3.



<http://www.houstonfreeways.com>

## ASSIGNMENT

1. What is the implication of automated vehicle market penetration rates by time horizons for this scenario? How might they influence future investment and design decisions for the regional freeway system?
2. How might fleet elements influence the need for managed lanes, but also new lanes, ramp metering, signage, medians, and shoulders?
3. How should freeways be redesigned to maximize system capacity, speeds, and safety and minimize infrastructure, operation and maintenance, and environmental costs?
4. Consider, identify, and describe any negative indirect effects of the system you develop (e.g., induced travel).
5. What types of investments and programs would be required realize this system?

# SCENARIO 2: COMPLETE STREETS

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## CONTEXT

Street, District, and Neighborhood

## MARKET PENETRATION BY TIME HORIZON

**2030:** 10% level 2, 60% level 3, and 30% level 4

**2050:** 100% level 4

## SCENARIO DESCRIPTION

By 2030, market demand and regional land use and transportation planning have been effective in limiting development on the outskirts of metropolitan areas and directing new development to lively and diverse urban neighborhoods. Complete street policies have also improved the quality of these neighborhoods and their pedestrian and bike facilities. As level 4 penetration increases, the demand for paid off-street and on-street parking is disappearing. Neighborhood roadway volumes are high due to greater effective freeway capacity and an increase local freight delivery; however, vehicles are cleaner and smaller. The increased demand for local delivery of goods (including groceries) means that the over-all number of retail establishments have declined; however, big box stores have begun moving closer to dense urban areas because less parking is needed. Short distance trips that previously were made by walking and biking are increasingly being made by self-driving vehicles.



<http://www.bicyclemobile.org>

## ASSIGNMENT

1. What is the implication of automated vehicle market penetration rates by time horizons for this scenario? How might they influence future investment and design decisions in the region? Consider development without parking minimums.
2. How might the elements of these fleets influence the need for bike lanes, signage, medians, signal coordination, and on-street parking over time?
3. How should local streets be redesigned to maximize system capacity, speeds, and safety and minimize infrastructure, operation and maintenance, and environmental costs?
4. What new types of curbs or sidewalk designs might be needed to allow for automated pick up and drop off without disrupting pedestrians and bicyclists?
5. What kinds of establishments might replace neighborhood retail space? How can we foster lively and fun neighborhoods?
6. Consider, identify, and describe any negative indirect effects of the developed system.

# SCENARIO 3: TRANSIT AND ROAD USER FEES

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## CONTEXT

District, Neighborhood, and Region

## MARKET PENETRATION BY TIME HORIZON

**2030:** 10% level 2, 60% level 3, and 30% level 4

**2050:** 100% level 4

## SCENARIO DESCRIPTION

By 2030, market demand and regional land use and transportation planning has been effective in limiting development on the outskirts of metropolitan areas and directing new development to existing urban and suburban areas. Significant penetration of alternative fuel vehicles has led to the replacement of the fuel tax with distance-based road-user charges. Revenues from the charges have been used to enhance transit service significantly to meet rising demand for transit travel. Bus-only lanes have proliferated not only on the free-ways but also on neighborhood and district arterials. Parking to access transit, for both rail and bus service, remains a problem in suburban areas. Since the introduction of the first commercially-available self-driving vehicles in 2020, there has been a small but steady growth in the demand and service for shared-used vehicle services, which appear to provide travelers with faster travel times than are possible by city-and county-level bus service. Travelers have become increasingly comfortable with automated vehicles and sharing rides with other travelers, as ubiquitous smartphone-based de-centralized trust-management systems (e.g. Ebay-style stars) reward socially-desirable behavior.



## ASSIGNMENT

1. What is the implication of automated vehicle market penetration rates by time horizons for this scenario? How will the role of transit service evolve from 2030 to 2050?
2. What transit services do you think will be replaced, introduced, and enhanced over time in order to maximize access and minimize congestion, infrastructure, operation, and maintenance costs, as well as GHG and criteria pollutants?
3. Consider, identify, and describe any negative indirect effects of the system you develop.
4. What policies, programs, and infrastructure are necessary to realize the optimal combination of transit, share-use, and solo-vehicle travel?
5. What negative effects are possible by this potential shift (e.g., job loss for drivers)?

# SCENARIO 4: COMMUTER RAIL TRANSIT

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## CONTEXT

District, Neighborhood, and Region

## MARKET PENETRATION BY TIME HORIZON

**2030:** 10% level 2, 60% level 3, and 30% level 4

**2050:** 100% level 4

## SCENARIO DESCRIPTION

In 2025, a regional transportation planning authority (RTPA) has acquired a 17-mile decommissioned freight rail line. The RTPA currently runs two limited commuter rail lines and 28 miles of light rail through the urban core. Region-wide the transit mode split is low at 4% but the light rail system is popular and increasingly well connected. Along those corridors transit mode share reaches 40%. The decommissioned freight rail line right of way (ROW) runs from the historic central business district through a gentrifying inner city neighborhood, a still functioning industrial area with high freeway connectivity, a low income area, and two suburban cities. The ROW has been a part of the regional transit vision for years, but with its acquisition RTPA officials will begin formal alternatives analysis. Some members of the RTPA board want to use the ROW for an autonomous vehicle highway. Livability and transit advocates wish to see the ROW become part of the light rail network, while other advocates argue for implementation of semi-automated Bus Rapid Transit (BRT). Yet another group advocates for a Personal Rapid Transit (PRT) option. There are no non-legacy PRT systems in the U.S.; however, due to rapid improvement in connected-vehicle tech-

nology, there are multiple Heathrow-style PRT systems in use in Europe, Japan, Korea, and even Canada.



<http://www.loupiote.com/photos/558637735.shtml>

## ASSIGNMENT

1. Consider the following alternatives for this right of way: automated vehicle highway, connected light rail line, semi-automated BRT, and PRT.
2. Develop an alternative analysis (with 2 or more alternatives) in the context of the automated-vehicle market penetration rates by time horizon.
3. Each alternative should be evaluated against the following criteria: accessibility, equity, capital, operation and maintenance costs, and GHG and criteria emissions. Be sure to consider indirect effects of the alternatives in your evaluation.
4. Consider the ramifications of the PRT network being privately or publicly run.



# SCENARIO 5: PARKING

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## CONTEXT

Street, District, Neighborhood, and Region

## MARKET PENETRATION BY TIME HORIZON

**2030:** 10% level 2, 60% level 3, and 30% level 4

**2050:** 100% level 4



<http://www.baltimore.to/Parking>

## SCENARIO DESCRIPTION

By 2030, it is clear that automated vehicles will have a significant impact on parking in a major metropolitan region with multiple employment centers. Shared self-driving cars services are increasingly picking up and dropping off individuals or groups of travelers with very short access and egress times at affordable prices. Depending on the time of day and the availability and the cost of parking, shared self-driving vehicles either continue driving on streets until their next pick-up or park somewhere. Experts advise that, if trends continue, significant space in core urban areas (parking lots, on-street parking, and parking garages) will be freed from parking use by 2050. Meanwhile, big box retailers project that reduced demand for parking will enable increased profits by allowing for consolidation and relocation of stores from outer suburban areas to urbanized areas.

## ASSIGNMENT

1. Develop alternative visions for the redevelopment of future vacant parking areas in the urban and/or suburban context?
2. How will people and cars interact to create new synergies of parking and living? What do they look like? Where are they? What is the overall impact on land use?
3. Consider the impacts of non-parking self-driving vehicles on vehicle travel and emissions and traffic congestion.
4. Should new parking areas for self-driving vehicles be developed? If so, where? What might the impacts be on nearby communities?
5. What policies, programs, and infrastructure are necessary to realize these visions?
6. Evaluate alternative visions against the following criteria: accessibility, equity, health, capital costs, operation and maintenance costs, and GHG and criteria emissions?
7. Consider, identify, and describe any negative indirect impacts of the visions you develop.

# SCENARIO 6: MITIGATING POOR PERFORMANCE

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## CONTEXT

Street, District, Neighborhood, and Region

## MARKET PENETRATION BY TIME HORIZON

**2050:** 100% level 4

## SCENARIO DESCRIPTION

By 2035, automated vehicles are rapidly replacing non-automated vehicles. However, auto ownership and mode share trends have not changed significantly from 2015. Significantly more vehicles can safely use the same highway facilities that were available in 2015, once they have been redesigned to accommodate the space-saving attributes of automated vehicles. Severe congestion is rapidly becoming ubiquitous on local urban roads because the volume of vehicles exiting freeways far exceeds their capacity. In areas where real estate costs are high, like San Francisco and New York, some individuals have even starting living in automated vehicles. Hotel use is also down because individuals can now sleep in their cars while they travel. Significantly faster vehicles travel times and the ability to make use of time productively in a vehicle has resulted in more travel to access work and other destinations. Employment and housing developments are poised to expand current urban regional boundaries significantly, threatening rich farmland and other environmentally significant lands. If these trends continue, by 2050, urban transportation systems will be plagued by chronic gridlock.



<http://www.barteverettphotography.com/images/CarpoolLane405A-0152.jpg>

## ASSIGNMENT

1. What can be done between 2035 and 2050 to curb the growth in vehicle travel and congestion in this scenario?
2. What policies, programs, and infrastructure are necessary to realize these visions?
3. Evaluate alternative visions against the following criteria: accessibility, equity, health, capital costs, operation and maintenance costs, and GHG and criteria emissions?
4. Consider, identify, and describe any negative indirect impacts of the visions you develop.

# SCENARIO 7: SUSTAINABLE MOBILITY FOR ALL

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## CONTEXT

Street, District, Neighborhood, and Region

## MARKET PENETRATION BY TIME HORIZON

**2050:** 100% level 4

## SCENARIO DESCRIPTION

By 2020, it is clear that automated vehicles are very likely to have a profound effect on the use of our transportation system, the location of employment and housing, and land development. These effects could be positive or negative depending on how the technology unfolds. For example, negative effects could include increased vehicle emissions due to the increase in the effectiveness of the capacity of the system and increased travel to minimize parking and passenger wait time. In addition, since people may be able to engage in other activities (e.g., work, exercise or even sleep) while driving, it may allow individuals to travel more and farther to access special destinations. Shorter and less costly travel will tend to encourage the location of employment and housing further from core urban areas and new land development.



<http://www.bbc.com/news/business-26433493>

## ASSIGNMENT

1. Consider the potential negative and positive consequences of automated vehicle technology.
2. Establish a set of community development goals that defines sustainable mobility for all (e.g., accessibility, equity, health, land preservation, capital costs, operation and maintenance costs, as well as GHG and criteria emissions).
3. Develop a future transportation and land use system (2050) that combines elements of automated vehicle technology and other land use and transportation investments, policies, and plans to best meet the goals established in 2 above.