



From Uber and Lyft to Autonomous Vehicles: How Emerging Technologies and Business Models Will Influence TDM

Florida Commuter Choice Summit

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Center for Urban Transportation Research
University of South Florida
Thursday, March 26, 2015, 11:00 am - noon

Center for Urban Transportation Research | University of South Florida

Outline

1. What is the current condition of Transportation?
2. What factors do we see on the horizon?
3. What specific impacts will technology have?



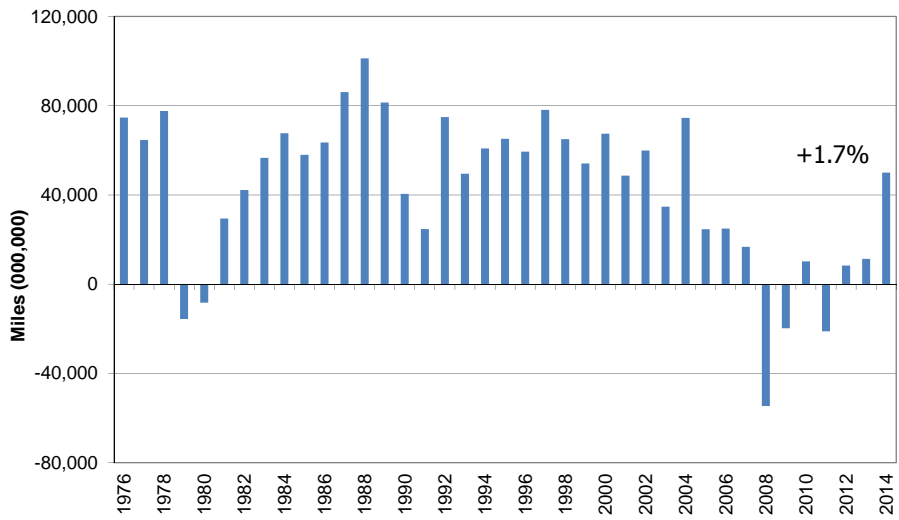
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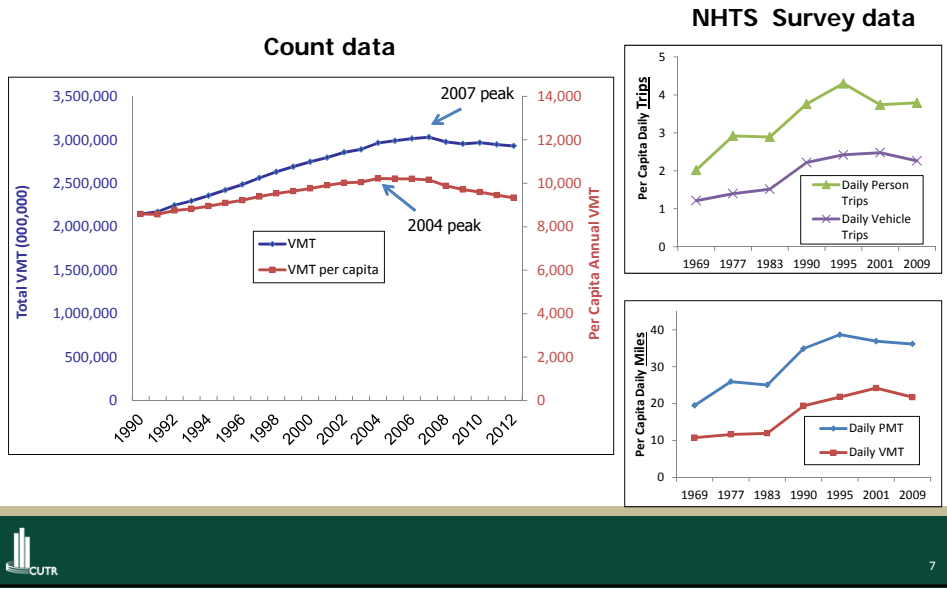
Which grew faster last Year:
 Population?
 VMT?
 Transit Ridership?



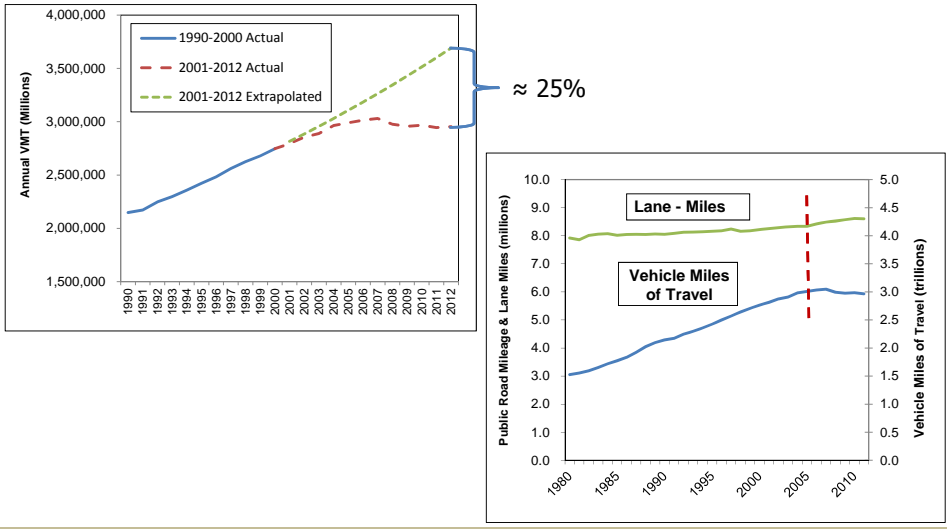
Incremental Annual Change in VMT



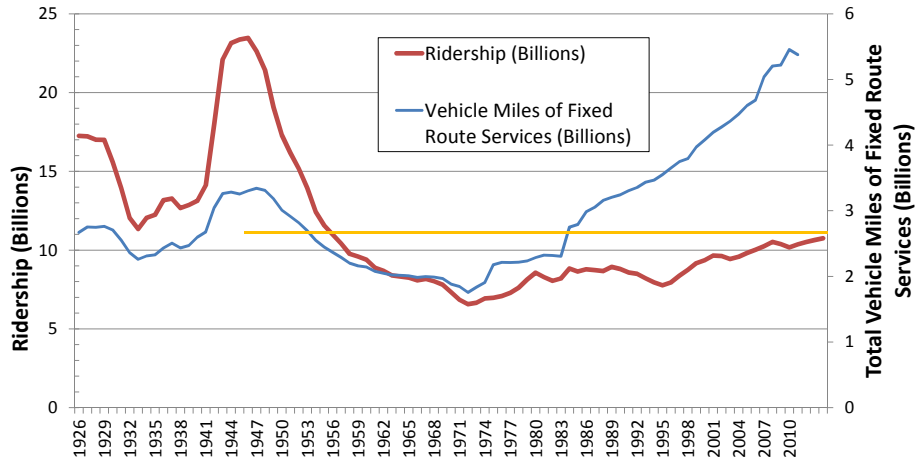
National Trips, VMT and VMT per Capita Trends



Changes in VMT and Capacity – U.S.

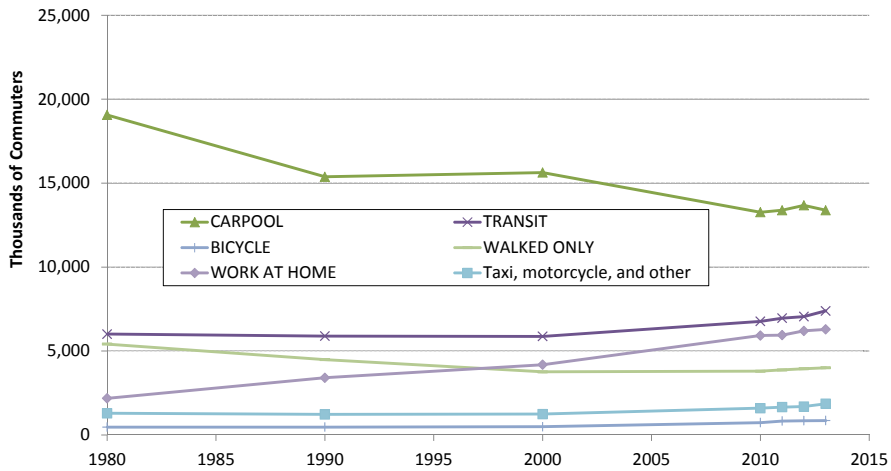


Historical Transit Ridership and Fixed Route Service Miles



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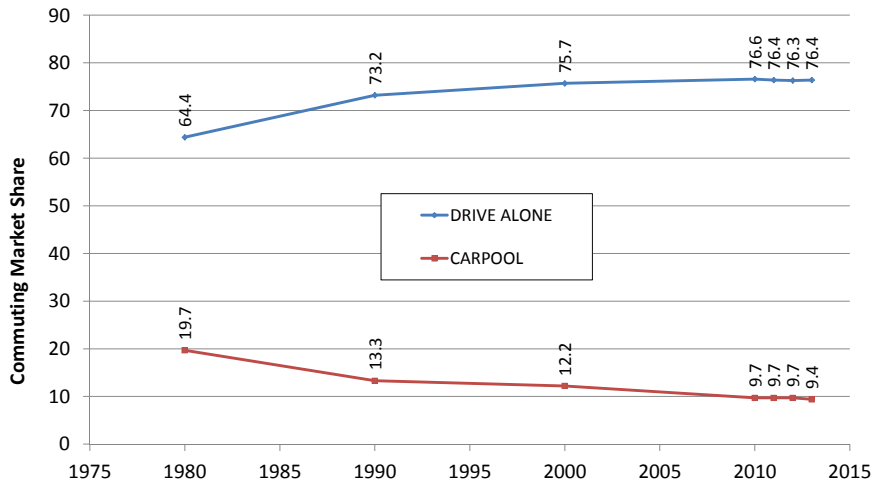
"Usual Commute" Market Size



Source: Census, American Community Survey

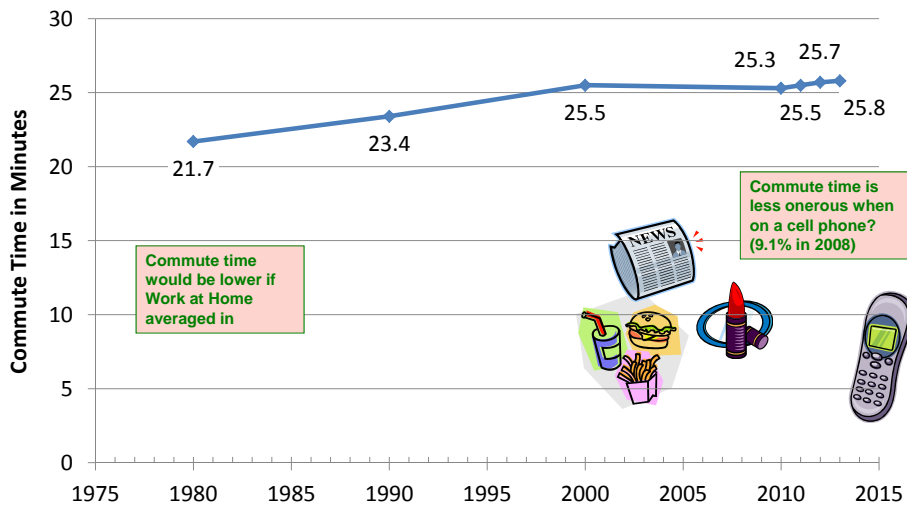
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Drive Alone and Carpool Mode Share



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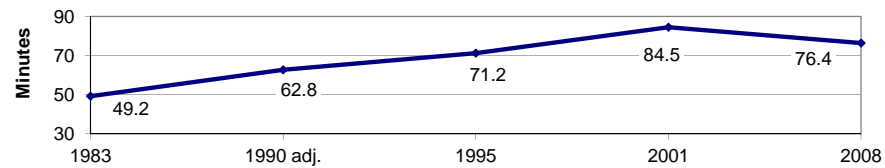
Commute Time Trends: The Stable Decade



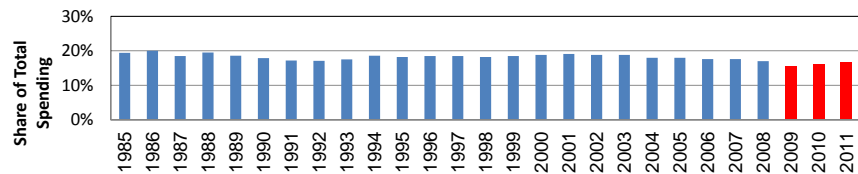
2010 National Household Travel Survey (NHTS) © National Highway Traffic Safety Administration (NHTSA)

Transportation is Profoundly Important

- Consumes approximately 76 minutes per day per person



- Consumes approximately 17% of household spending



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Table 2-1 Commuting in Perspective

Household Travel						
	Travel by All Modes 2009			Private Vehicle Travel 2009		
	Percent of Person Trips	Percent of Person Miles of Travel	Percent of Person Travel Time	Percent of Person Travel Time	Percent of VMT	Percent of Total Roadway VMT
Commuting	15.6	19	18.8	17.9	27.8	76
Work Related/Business Travel	3	6.3	4.6	5.2	9	
Other Resident Travel	81.4	74.7	76.6	76.9	63.2	
Subtotal	100%	100%	100%	100%	100%	
Public and Commercial Travel						
Public Vehicle Travel						2
Utility/Service Travel						12
Freight and Goods Movement Travel						10
Total						100%



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2. What factors do we see on the horizon?

"Prediction is very difficult, especially if it's about the future."

Nils Bohr, Nobel laureate in Physics



Prognosticating the Future of Transportation



And the Future will be



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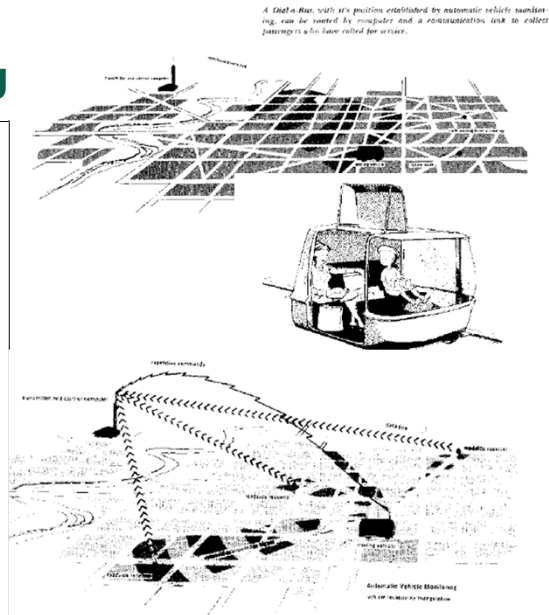
Prognosticating

tomorrow's transportation

NEW SYSTEMS FOR THE URBAN FUTURE



U.S. DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
Office of Metropolitan Development, Urban Transportation Administration
Washington, D.C. 1968



We Can't Always Predict

"Dial-a-bus call stations could be installed at convenient intervals throughout a suburban area."

Dial-a-Bus call stations could be located at convenient intervals throughout a suburban area.



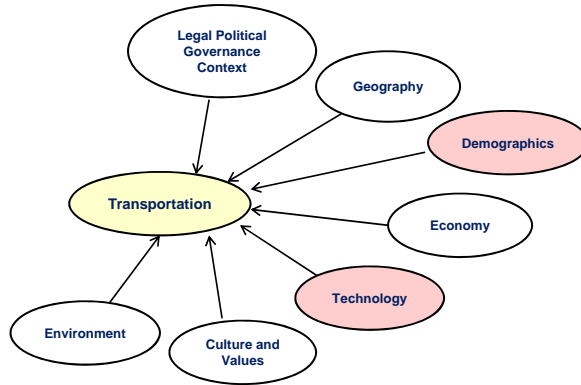
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1968 forecast

- Weather
- Next election
- Hot toys for Christmas
- Box office success
- Hot stocks
- Pace of technology deployment



Everything Affects Transportation and Transportation Affects Everything



Demographics

Literature Review

Analysis of data

Conclusions and Implications



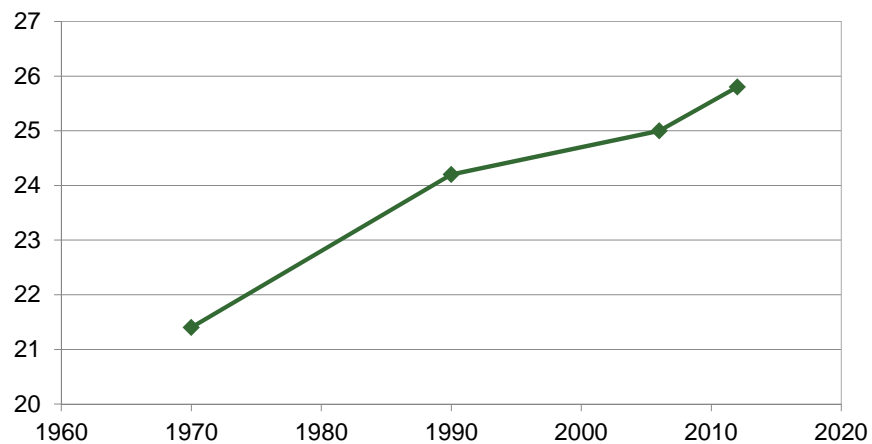
Generational Differences

- Urban/rural residency
- Race/ethnicity
- Labor force/education participation
- Income/economic status
- Living arrangements
- Lifecycle status
- Licensure status
- Vehicle availability
- Values
- Technology as a substitution for travel



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Age of Mother at First Birth

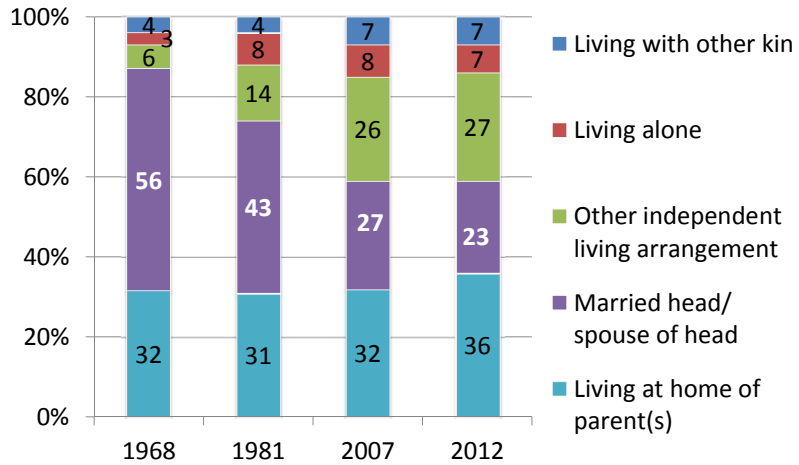


Source: Center for Disease Control and Prevention



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Living Arrangements (Ages 15-34)

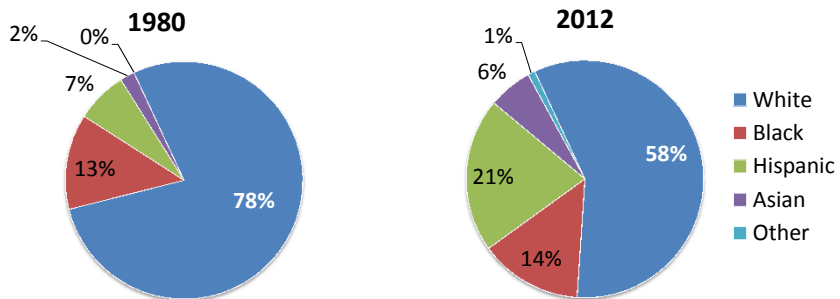


Source: PEW Research Center



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Race/ Ethnicity (Ages 15-34)



Source: U.S. Census Bureau



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Conclusions

- ✓ Millennial travel levels have **declined** relative to prior points in time.
- ✓ Travel declines are substantially explained by **different socio-demographic** and **economic** characteristics.
- ✓ While some travel moderating characteristics may **persist** at higher levels than historic norms as millennials age, they are **not anticipated to remain** at today's levels.
- ✓ **Emerging technologies** will likely continue to impact travel behavior and minimize or **eliminate travels' negative impacts**.
- ✓ Travel demand growth scenarios should prudently include **more modest growth** ranges than historically observed.



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And Technology



- Powerful global positioning satellites
- Ubiquitous wireless communication capability
- Powerful computing capability capable of pathfinding and optimization – traveling salesman problem
- Sophisticated sensors
- Artificial intelligence/machine learning

Integrated with new materials, designs, propulsion systems, etc.



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A Framework for Assessing Impacts



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Technology Enables:

- Pathfinding
- Instant communications
- Customer-Supplier matching/Ridematching
- Electronic payment
- Vendor/customer feedback

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Transportation Network Companies (TNC): Uber, Lyft



Ridesharing: Carma, eRideShare, CarpoolWorld, BlaBlaCar (in Europe), and Zimride (for companies and colleges)

Cab-sharing: UberPool and Lyft Line, whose users pay lower fares for the off chance they'll have to slide over.

Car Sharing



How Might this Impact Transportation?

1. Convenience/cost will support alternative mode travel
 1. First mile last mile for transit
 2. Contingency for transit
2. The availability of these options will enable reduced auto ownership and more profoundly impact travel
3. These options/technologies will enable increased vehicle occupancy and reduced VMT



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Household Vehicle Ownership Distribution

HH Vehicles	National Household Vehicle Ownership Distribution, 2009					
	Number of Adults in HH					All
	1	2	3	4	5+	
0	3.49%	1.12%	0.15%	0.04%	0.01%	4.80%
1	17.29%	8.94%	0.62%	0.12%	0.02%	26.99%
2	3.72%	34.89%	2.10%	0.34%	0.05%	41.10%
3	0.77%	12.56%	3.75%	0.59%	0.07%	17.75%
4	0.20%	3.63%	1.50%	0.73%	0.10%	6.17%
5+	0.12%	1.72%	0.75%	0.44%	0.17%	3.20%
All	25.59%	62.84%	8.86%	2.27%	0.43%	100.00%

5% no veh

13% less veh than adults

57% veh = adults

25% veh > adults

2009 NHTS



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Vehicle Ownership and the Mode Choice Decision

Fully Amortized Auto Operating Cost	\$0.575 / mi.
Maintenance and Operation	\$0.23
Out of Pocket	\$0.14
IRS	

Auto owners “feel” \$0.14 per mile costs

Non-auto owner “feel” \$0.575 (full cost) per mile costs



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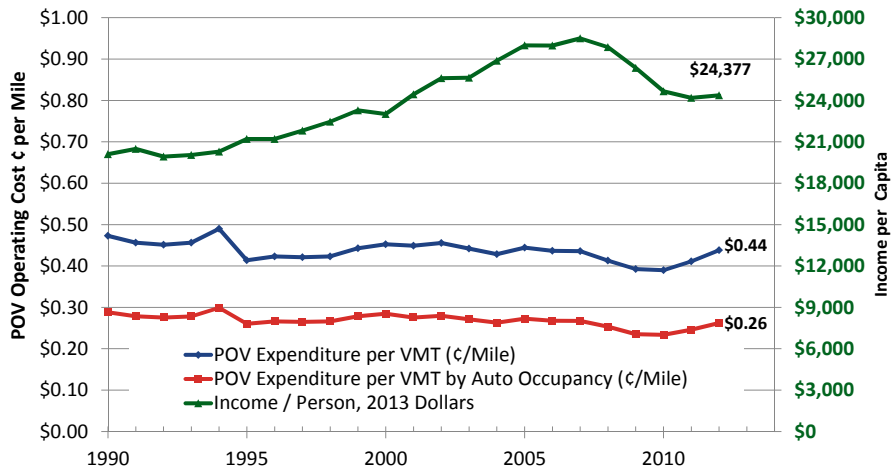
Fun Facts

- Average car driven about 10,000 to 12,000 miles per year
- About one hour per day at an average of 30 mph
- About 13+ million new vehicles purchased by households annually
- 17 years and 163,000 miles until scrapping.
- Households responsible for about 2.25 trillion VMT annually
- U.S vehicle fleet valued at over 2 trillion.



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What are people spending to travel by POV



Source: CUTR analysis of NHTS, BLS

The Demise of Carpooling?



CUTR

Where Have All the Carpoolers Gone

- The most significant change in commuting behavior in the past few decades is the decline in carpooling.
- In 2013 there were 5.7 million fewer carpoolers than in 1980. There were 2.2 million fewer carpoolers than in 2000.
- The decline in carpooling since 2000 impacted 50 more percent commuters than did the increase in transit use.



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The Decline in Carpooling

- In spite of higher gas prices, declining vehicle availability, and a challenging economy – carpooling continued to decline since 2000.
- Of all modes, the change in use between 2000 and 2013 was the second largest for carpooling and the only absolute decline (+12.2 million drive alone, -2.2 million carpoolers)



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Tidbits on Carpooling

- Work trip auto occupancy is approximately 1.13.
- Approximately half of the passengers riding with commuters are other work commuters and half are persons carrying out other activities (go to school, go to daycare, etc.)
- Thus, for every 100 vehicles commuting to work about six have a fellow commuter, approximately half are fampools.



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Why have All the Carpoolers Gone?

- Dispersion of population and employment
- Greater worker schedule flexibility impeding carpool formation
- Declines in employment types conducive to carpooling (manufacturing, construction, etc.)
- Cell phones, audio systems, in vehicle eating, etc. – resulting in persons wanting privacy.
- A growing share of workers not accustomed to sharing (bedrooms, bathrooms, televisions, etc.) – and not wanting to share travel.
- A premium on travel time due to the competitive economy.
- Better transit options?
- Other?



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Implications

- Transportation network companies (TNC's) have visions of shared ride strategies providing low-cost mobility and spurring the shared economy.
- Autonomous vehicle advocates envision shared ride strategies enabling autonomous vehicles to replace public transportation and provide environmentally and financially sustainable mobility.



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Automated/Connected Vehicles



Autonomous Vehicle Implementation Predictions Implications for Transport Planning

26 August 2013

By
Todd Litman
Victoria Transport Policy Institute

Figure 1 Projected Autonomous Vehicle Sales, Fleet and Travel

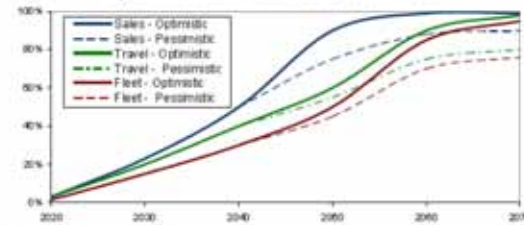
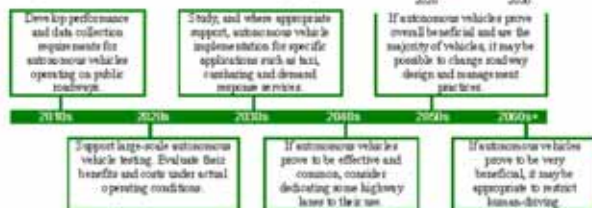


Figure 2 Autonomous Vehicle Planning Impacts Timeline



The timeline summarizes how autonomous vehicles will impact transport planning



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Thoughts

- Some safety benefits evident by mid 2020s
- Some capacity impacts (incident reductions benefits) by late 2020's
- Sufficient market penetration for some dedicated high capacity exclusive lanes in high volume corridors in 2040s



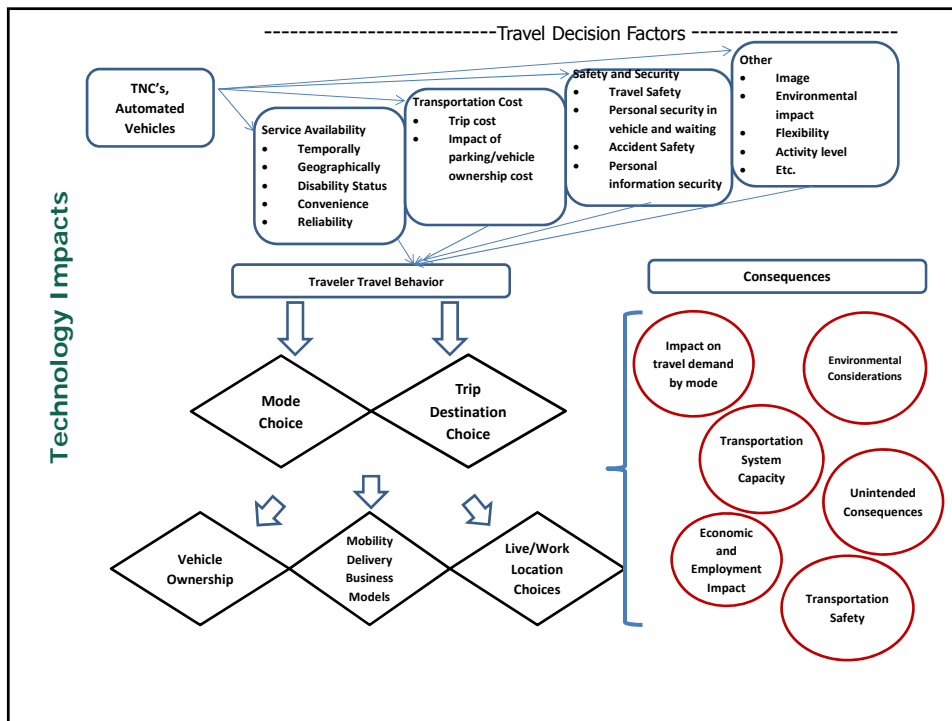
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Some Comments of Planning for Automated Vehicles

- 2040 to 2060 design years common in Regional and State Long Range Plans
- 20+ year time frames for individual projects
- 50+ year time frames for systems (interstate, WMATA, DART, etc.)
- Time frames for investment implementation and amortization exceed our window of confident predictions.



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Free up Driver Time?



Land Use Impacts



**Drive till you qualify
becomes
Nap till you qualify?**



Dumb Facts

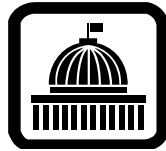
- A single shared use autonomous vehicle can replace 13 personal autos so vehicle sales will plummet.
- **We do not know the effects of age, mileage, technological obsolescence as factors in future vehicle cost/lives.**
- **Call Uber for Hurricane Evacuation?**



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Are the Institutional Roles and Cost Structures Governing Mobility Going to Remain the Same?



Government



Self



Family



Employer

Community



Church

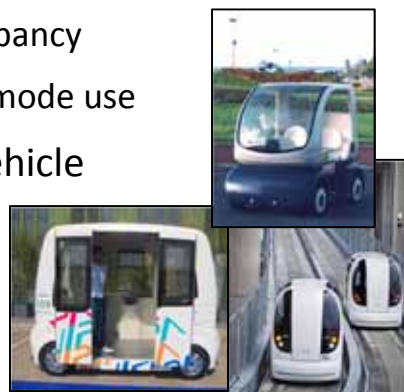


What Does it Mean?



Ultimate Impacts

- Safety, Congestion, Travel cost, Mobility, Environment?
- Do we ultimately reduce VMT?
 - Increase vehicle occupancy
 - Facilitate alternative mode use
- Or do we decrease vehicle size/impactfulness



A Different Planning World

- Time frames for investment implementation and amortization exceed our window of confident predictions
 - 10 years to plan,
 - 10 years to construct,
 - 50 years to amortize investment
- This multiplies risk and uncertainty in a world of rapid change



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Questions

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<http://traveltrends.transportation.org/Pages/default.aspx>

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The screenshot shows the AASHIO website interface. At the top, there is a navigation menu with options like 'Home', 'About', 'Contact Us', and 'Search'. Below the navigation, there is a main content area featuring a large banner for the report 'Economic in America 2013: The National Report on Commuting Patterns and Trends'. The banner includes a photograph of a road and the text 'COMMUTING IN AMERICA'. Below the banner, there is a table with columns for 'Report Title', 'Date', and 'Author'. The table lists several reports, including 'Economic in America 2013', 'Economic in America 2012', and 'Economic in America 2011'. At the bottom of the page, there is a footer with the AASHIO logo and contact information.