The New Mobilities: Smart Planning for Emerging Transportation Technologies

2:00-3:00pm ET

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The New Mobilities
Smart Planning for Emerging Transportation Technologies

Todd Litman
Victoria Transport Policy Institute
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New Mobilities

New Mobilities: Smart Planning for Emerging Transportation Technologies

New Mobilities have tantalizing potential. They allow people to scoot, ride, and fly like never before. They can provide large and diverse benefits. However, they can also impose significant costs on users and communities.

Decision-makers need detailed information on their impacts.

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Previous Transportation Innovations
New Mobilities

- Active & Micro Modes
- Bike- and Carsharing
- Ridehailing
- Electric Autonomous Cars
- Transit Improvements
- Aviation Innovations
- Tunnel Roads
- Pneumatic Tube Transport
- Mobility as a Service
- Telework
- Mobility Prioritization
- Logistics Management
Questions for Communities

- How should we evaluate new transportation modes and services?
- What are their costs and benefits?
- Who is impacted?
- What is fair?
- Who should bear their costs and risks?
- How should we integrate them into our transportation system?
- Which should be mandated, encouraged, regulated, restricted, or forbidden?
Evaluation Framework

Factors to consider for each New Mobility:
- Current status
- User experience
- Travel impacts
- Travel speeds and time costs
- User costs and affordability
- Public infrastructure costs
- Congestion costs imposed on others
- Crash risk
- Social equity objectives
- Resource consumption
- Pollution emissions
- Public fitness and health
- Contagion risk
- Effects on strategic planning goals
- Roles
Many potential benefits of autonomous vehicles depend on them having dedicated lanes where they can platoon (several vehicles driving close together at relatively high speeds).

- At what point should highway agencies dedicate lanes to autonomous vehicles?
- What should users pay for this privilege? How should this be enforced?
- Who is liable if a platoon has a multi-vehicle crash?
- What is most efficient and fair?
Most transportation emission reduction plans subsidize electric vehicles. Since they have lower operating costs, EVs tend to be driven more annual miles, which increases traffic problems.

- How much should communities subsidize electric vehicles compared with other emission reduction strategies?
- How can these subsidies be equitable?
- How should they prevent rebound effects?

Electric vehicles typically reduce emissions 50-70% compared with a comparable fossil-fuel vehicle. Although this is good, it is inaccurate to call them “zero emission” vehicles.
Before 1900 people relied primarily on walking, averaging about 1,000 annual miles, with occasional bicycle and rail trips. Motor vehicle travel grew steadily during the Twentieth Century. It now averages about 10,000 annual miles per adult.
As automobile travel grew during the last 120 years, per capita vehicle, road and parking facility costs increased significantly.

Previous Mobility Innovation Costs
Walking, bicycling, e-bikes and public transit have much lower costs to users and communities than automobile travel.
Effective speeds, measures time spent travelling plus time spent working for money to pay travel expenses.

Many lower-wage motorists spend more time earning money to pay their travel expenses than they spend travelling. Bicycling and transit are generally faster than driving overall.
Active and Micromodes
Vehicle Sharing
Currently, ridehailing tends to be somewhat less expensive and more convenient than conventional taxi services, but these advantages are likely to decline somewhat as taxi companies develop smartphone apps and ridehailing companies strive for profitability.
Public Transit Improvements

• More convenient – better navigation and payment systems, and real-time arrival information.
• Faster loading and operation.
• More frequent service
• More comfortable stations and vehicles, and amenities such as on-board internet.
• More affordable.
• Better integration with other modes.
• Better marketing, increased social status.
Autonomous Electric Vehicles

Autonomous Cars

Autonomous Trucks

Autonomous Buses
Market and Fleet Penetration

- **Sales - Optimistic**
- **Sales - Pessimistic**
- **Travel - Optimistic**
- **Travel - Pessimistic**
- **Fleet - Optimistic**
- **Fleet - Pessimistic**

Market Penetration vs. Year:
- 2020
- 2030
- 2040
- 2050
- 2060
- 2070

Y-axis: Market Penetration (0% to 100%)
X-axis: Year (2020 to 2070)
Direct User Benefits

• Less stress.
• Cost savings compared with paid human drivers.
• More productivity during travel.
• Independent mobility for non-drivers.
Autonomous vehicle travel will probably cost somewhat less than current human-operated taxis or ride-hailing services (Uber and Lyft), but more than current automobile travel.
Owned Versus Shared Vehicles

Many projected benefits depend on vehicle sharing, but motorists have reasons to own their cars:

- **Convenience.** Motorists often keep items in their vehicles, such as car seats, tools, and other supplies.

- **Response speed.** In suburban and rural areas, taxi response can be slow and unreliable.

- **Costs.** Vehicle sharing is generally only cost effective for motorists who drive less than about 6,000 annual miles. Most higher annual mileage drivers will own their cars.

- **Cleaning and vandalism.** Autonomous taxis will lack privacy and comfort features.

- **Status.** Many drivers are proud of their skills and vehicles, and so may prefer to own and drive personal cars.

*Once the novelty wears off, autonomous taxies will probably seem tedious and inferior, like elevator or economy air travel.*
Advocates predict that, because human error contributes to 90% of all traffic crashes, autonomous vehicles will reduce crashes by 90%.

This overlooks additional risks these technologies introduce.

**Hardware and software failures.** Complex electronic systems can fail. Self-driving vehicles will certainly have errors that cause crashes; the question is how frequently.

**Malicious hacking.** Self-driving technologies can be manipulated for amusement or crime.

**Increased risk-taking.** When travellers feel safer they tend to take additional risks, for example, reduced seatbelt use and less caution by other road users.

**Platooning risks.** Many potential benefits, such as reduced congestion and pollution emissions, require platooning. This can introduce new risks.

**Increased total vehicle travel.** Autonomous driving may increase total vehicle travel and therefore crashes.
Autonomous driving may increase traffic congestion:

- Increases total vehicle travel.
- It is often cheaper to drive on public roads than pay for urban parking.
- May reduce public transit services.
Many community benefits, such as reducing congestion and pollution, and improved mobility for non-drivers, require level 4-5 vehicles to become reliable and affordable.

Reduced traffic congestion, energy consumption and pollution emissions require *platooning*, with vehicles travelling a few meters apart on dedicated highway lanes.
Projected AV Benefits

- Reduced stress and more independent mobility for affluent motorists
- Lower-cost bus and truck operation
- Lower-cost taxi services
- Increased safety
- Reduced traffic congestion and pollution emissions
- Independent mobility for middle-income non-drivers

Market Penetration

2020 2030 2040 2050 2060 2070
**Telework**

**Benefits**
- Less commuting time and financial costs
- Reduced traffic congestion
- More time at home
- Flexible schedules

**Problems**
- Home equipment costs
- Isolation
- More sprawl and errand trips (often increases total vehicle travel)
- Unsuitable for many workers (particularly with low incomes)
Tunnel Roads and Pneumatic Tubes

Tunnel Roads

Pneumatic Tube Transport
Aviation Innovations

Super Sonic Jets

Air Taxi

Delivery Drones
## Mobility Prioritization

### High-Occupancy Toll Lanes

### Curb & Parking Management

<table>
<thead>
<tr>
<th>Mobility Priority</th>
<th>Curb/Parking Priority</th>
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<tbody>
<tr>
<td>1. Walking</td>
<td>1. Passenger loading</td>
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<td>2. Bicycling</td>
<td>2. Freight loading</td>
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<td>3. Public transit</td>
<td>3. Quick errands (less than 30 minutes)</td>
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<td>4. Commercial and service vehicles.</td>
<td>4. Longer-term errands</td>
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<td>5. Shared automobiles (ridesharing)</td>
<td>5. Commuter</td>
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<td>7. Mobile billboards and cruising to avoid parking fees</td>
<td>7. Long-term storage</td>
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Freight Logistics

Urban Freight Logistics measures in CIVITAS cities (2002-2012)
## Analysis Summary Table

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This figure compares the New Mobilities’ overall ratings. Because they are resource efficient and affordable, the following have the highest ratings:

- Active and micromodes
- Public transport improvements
- Mobility prioritization
- Mobility as a Service
- Logistics management
- Vehicle sharing
## Travel Impacts

<table>
<thead>
<tr>
<th>Increases Vehicle Travel</th>
<th>Reduces Vehicle Travel</th>
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<tbody>
<tr>
<td>• Provides more vehicle travel options to non-drivers.</td>
<td>• Convenient shared vehicle services reduce vehicle ownership and use.</td>
</tr>
<tr>
<td>• Increased convenience and productivity increases travel.</td>
<td>• Increases vehicle ownership and operating costs.</td>
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<tr>
<td>• Empty vehicle travel when dropping off or picking up passengers</td>
<td>• Self-driving buses improve transit services.</td>
</tr>
<tr>
<td>• Encourage sprawled development.</td>
<td>• Reduced traffic risk and parking facilities make urban living more attractive.</td>
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<tr>
<td>• Reduces traffic congestion and vehicle operating costs.</td>
<td>• Reduces some vehicle travel, such as cruising for parking.</td>
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New Mobilities can increase vehicle travel in some ways and reduce it in others. This will affect external costs including congestion, roadway subsidies, accident risk and pollution emissions. These impacts will depend on public policies.
Conclusions – Deployment

- Vehicle innovations tend to be implemented more slowly than other technological change due to high costs, strict safety requirements, and slow fleet turnover. Automobiles typically cost fifty times as much and last ten times as long as personal computers and mobile phones. Consumers seldom purchase new vehicles simply to obtain a new technology.

- Most vehicle innovations are initially costly and imperfect. It usually takes decades before they are common in the fleet.

- Predictions that autonomous electric taxis will soon be cheap and ubiquitous, and displace most private vehicle travel, are mostly by people with financial interests in the industry.
Conclusions – Benefits and Costs

- There is considerable uncertainty concerning New Mobilities’ benefits, costs and travel impacts.
- Advocates often exaggerate net benefits by ignoring new costs and risks, rebound effects, and harms to other people.
- Some New Mobilities support, and others contradict, social equity goals.
Benefits Are Contingent

- Many potential benefits depend on how New Mobilities are implemented, regulated and priced.
- The most glamorous modes are not necessarily the most useful, beneficial or fun.
- Total benefits tend to be greatest for affordable, resource-efficient modes. Expensive, resource intensive modes tend to provide smaller benefits, greater costs and risks, and more inequity.
Policy Recommendations

- Test and regulate new technologies for safety and efficiency.
- Critically evaluate all impacts, including indirect and long-term effects.
- Support active and micromodes for local trips and high quality public transit on major travel corridors.
- Reduce parking requirements to take advantage of shared vehicles.
- Plan and price to favor efficient modes and prevent induced vehicle travel and sprawl.
“Not So Fast: Better Speed Valuation for Transport Planning”

“Our World Accelerated: How 120 Years of Transportation Progress Affects our Lives and Communities”

“Autonomous Vehicle Implementation Predictions”

“The New Transportation Planning Paradigm”

“Transportation Cost and Benefit Analysis”

“Are VMT Reduction Targets Justified?”

“The Future Isn’t What It Used To Be”

and more...

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