



The Future is Already Here: Connected and Autonomous Vehicles

Three Revolutions

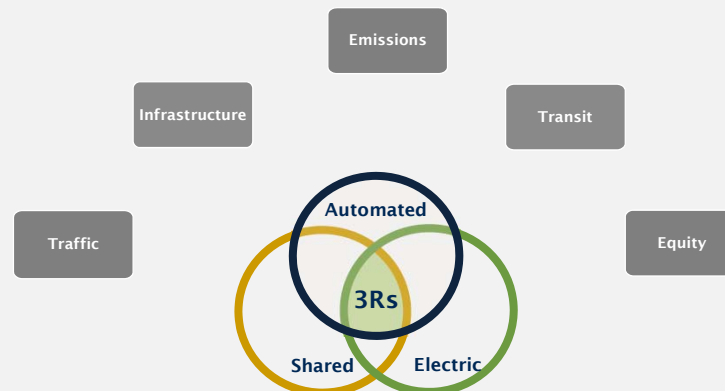
Steering Automated, Shared, and Electric Vehicles to a Better Future

Mollie D'Agostino, Policy Director
3 Revolutions Future Mobility Program
Institute of Transportation Studies at UC Davis
UC Davis Policy Institute for Energy, the Environment, and the Economy

[Website: www.3rev.ucdavis.edu](http://www.3rev.ucdavis.edu)

[Email: mdagostino@ucdavis.edu](mailto:mdagostino@ucdavis.edu)

October 31, 2018

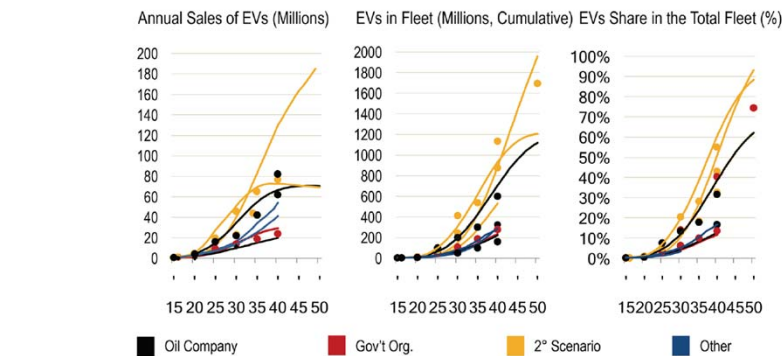




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Today: Electrification at a Tipping Point?

Figure 5. Forecasts of global electric vehicle penetration



Source: CGEP Survey & Analysis

Kah, 2018



Today: Many More Electric Cars on the Market

- I3
- CHEVROLET Bolt EV
- Fiat500e
- Fordfocus Electric
- Honda clarity Electric
- Hyundai ioniq Electric
- Hyundai kona Electric
- Jaguari-pace
- Kiasoul EV
- Nissanleaf (1st Gen)
- Nissanleaf (2nd Gen)
- Smarted
- Teslamodel 3 (Long Range)
- Teslamodel S 100D
- Teslamodel S 75D
- Teslamodel S P100D
- Teslamodel X 100D
- Teslamodel X 75D
- Teslamodel X P100D
- Volkswagen e-golf

EV Rater, 2018

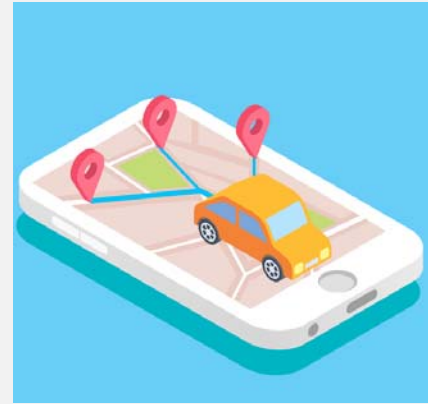




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Today: Ridehailing, Ridesourcing,
Legal Designation: Transportation Network Companies (Tncs)

- Uber
- Lyft
- ExecutiveRide
- Ride Plus
- See Jane Go
- Silver Ride
- Sitbaq Inc
- SocialDrv
- Wingz
- Altruistic
- Ainos
- MVN
- Uber



Today: Ridehailing (E.G. Lyft Uber) Mixed Societal Impacts
Sharing Or “Ride-pooling” Will Mitigate These Impacts

Ridehailing linked to reduced GHG/VMT associated with:

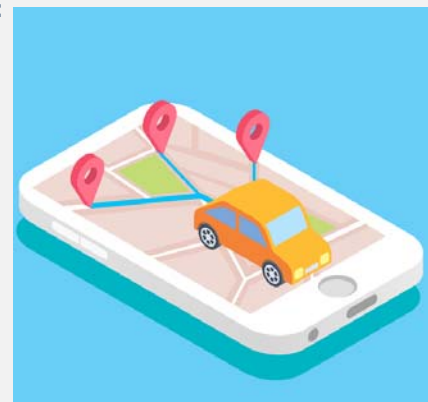
- lower auto ownership
- Use as first/last mile to transit
- Impact of hypothetical increases in densification in CBDs

Ridehailing linked to increased GHG/VMT due to:

- hypothetical fringe development
- trip generation and mode shift from transit/walk/bike
- network travel (deadheading)

Other Societal Impacts:

- Reduced drunk driving
- Improved mobility options



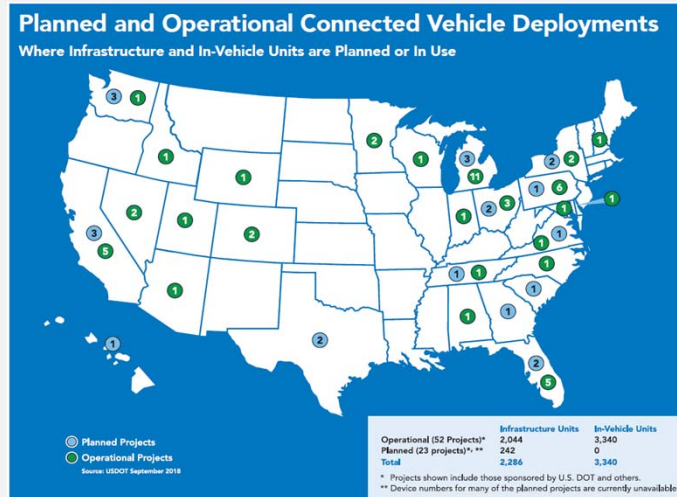
Rodier, 2018





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Today: Automated Vehicle Deployments



U.S. Department of transportation, 2018



Today: 3 Revolutions Are Here Shared, Automated, Electric Low-speed “Pod” Vehicles

Currently operating:

- Las Vegas, NV
- San Ramon, CA
- Arlington, TX (On park paths)
- Ann Arbor, MI
- Tampa, FL

Demonstrations Occurred

- Austin, TX
- San Francisco, CA
- Minneapolis and Rochester, Minnesota
- Detroit, MI
- Several Others





How Will Automation Impact Future Travel?

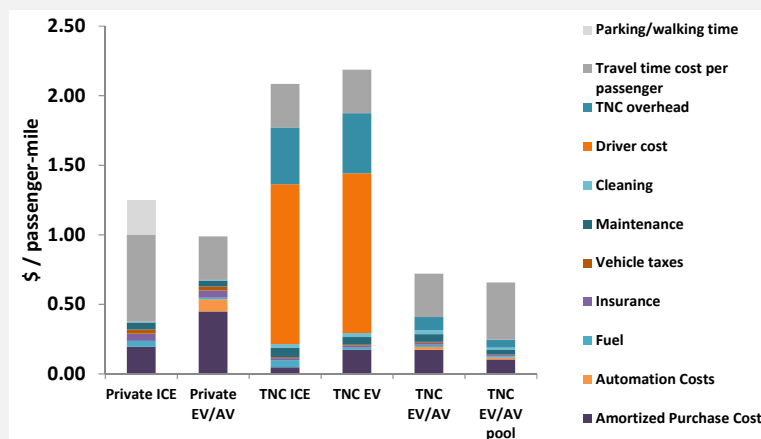
- ✓ Automation could double or triple travel (despite small increases in capacity) due to assumed reduced costs of travel
- ✓ Automation could enable new traveler, e.g. old and young, and people with mobility disabilities (10-14%)
- ✓ Parking demand could be reduced by 90%, which could result in relocation travel (mixed effects)

**Absent policy intervention the
Net effects of automations will likely be
more traffic**

Rodier, 2018



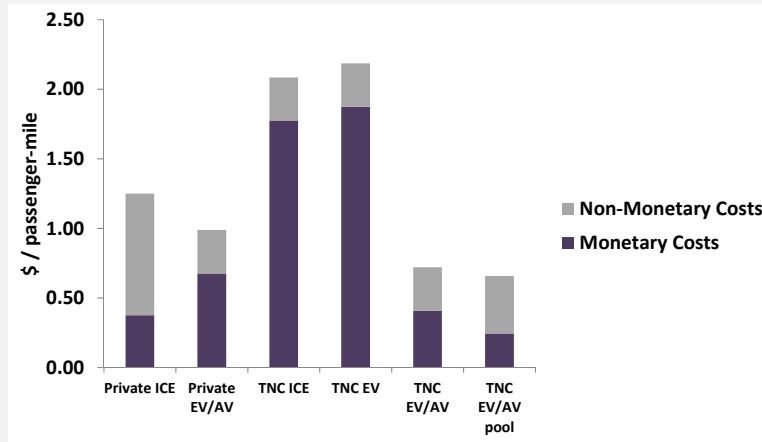
Costs Of Future Travel



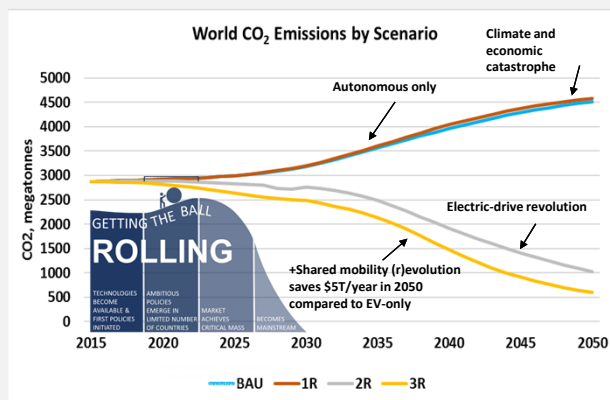


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Automated Modes are Cheap- Both in money and time



Climate Findings



Note: Graph shows CO₂ emissions from urban passenger mobility including 2 & 3 wheelers, passenger vehicles, buses, and trains.

(Chart: Eggart, Sperling, Gauthier, 2018; Data: Fulton, Meroux and Mason, 2017)



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Travel and Traffic impacts: Shared Robot Taxis

- ↑ + 1.5% --- 4.5% **Vehicle Miles Traveled (VMT)**
(30%, 50% shared taxis) (Fagnant et al 2016)
- ↑ + 30% **VMT**
(75% shared fleet) (Fulton et al 2017)
- ↓ - 22% - 15%
(100% shared taxis) (Bishoff et al. 2017)

NOTE THESE STUDIES ARE NOT TECHNICALLY COMPARABLE- Only shown for context



What do we do about all this?

- **Champion pooling** increase choices and build “pooling-supportive” infrastructure (bus-only lanes, pooling-only curbs, ridehailing charging hubs)
- **Get the pricing right** (roads, curbs, occupancy)
- **Keep the environment/public health in mind** (reforms to CAFE, ZEV, LCFS)
- **Keep “mobility have-nots” in mind** (use 3Rs as tools to improve access and mobility)
- **Enable ongoing research** by balancing data collection and availability (more research!) with privacy concerns and private sector IP protection.

Theme is “Pooling & Pricing”





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Policy Solutions for Regional Gov'ts

(MPOs/RTPAs/Counties/AQMDs/Ports)

- **KEY POLICY: Create comprehensive system of regional price signals to encourage pooling e.g.**
 - Congestion pricing- increase choices then give points for good behavior, e.g. "Decongestion Zone" in L.A.(Eaken, NRDC, 2017) publicizing communal + personal benefits, direct revenues very locally to increase choices.
 - HOT lanes on freeways
 - Waived bridge/tolls for pooled vehicles
 - Airport fees for standard taxis/TNCs (rebates for pooling)



Policy Solutions for Regional Gov'ts

(MPOs/RTPAs/Counties/AQMDs/Ports)

- **Redouble commitment for multi-modal planning** and investment in high capacity, high quality transit along major corridors
- **Support innovation** with grants for cities and transit agencies to grow capacity for pilot testing focusing on first-last mile solutions for seamless connections to high quality transit
- **Get smarter about TDM**
- **Develop regional data warehouses** to collect data on emerging technology access and usage, vehicle occupancy, etc.





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Policy Solutions for Transit Agencies

- **Actively pursue grants to grow capacity for pilot testing**
 - Including funds for data collection and pilot research/evaluation(!)
 - Develop criteria for pilot success that quickly transitions pilots into longer term programs
 - Identify funding mechanisms for all phases of partnerships and service provision



Policy Solutions for Cities

- **Redouble efforts to develop mode separated corridors for transit and active modes**, and encourage slow-speeds and complete streets for local roads and retail areas.
- **Support the regional pooling supportive pricing systems with local land use authority**
 - Price access to curbs
 - Create “shared use mobility zones” for pooled ridehail drop-offs only (Rogers, Eno 2018)
 - Pair TNC subsidies with low-density transit routes or during off-peak hours
 - Parking price management
 - Landbank parking lots to install better pricing and prepare for potential redevelopment





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<https://islandpress.org/books/three-revolutions>

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