APPENDIX D.
RESEARCH DOCUMENTATION

Colorado State University Literature Review

Transportation Provider Data Requests

Literature Review for SB-19-239

Erika Miller, PhD
Somayeh Aliebrahimi, Graduate Student
Systems Engineering & Mechanical Engineering
Colorado State University

COLORADO
Department of Transportation

Colorado State University

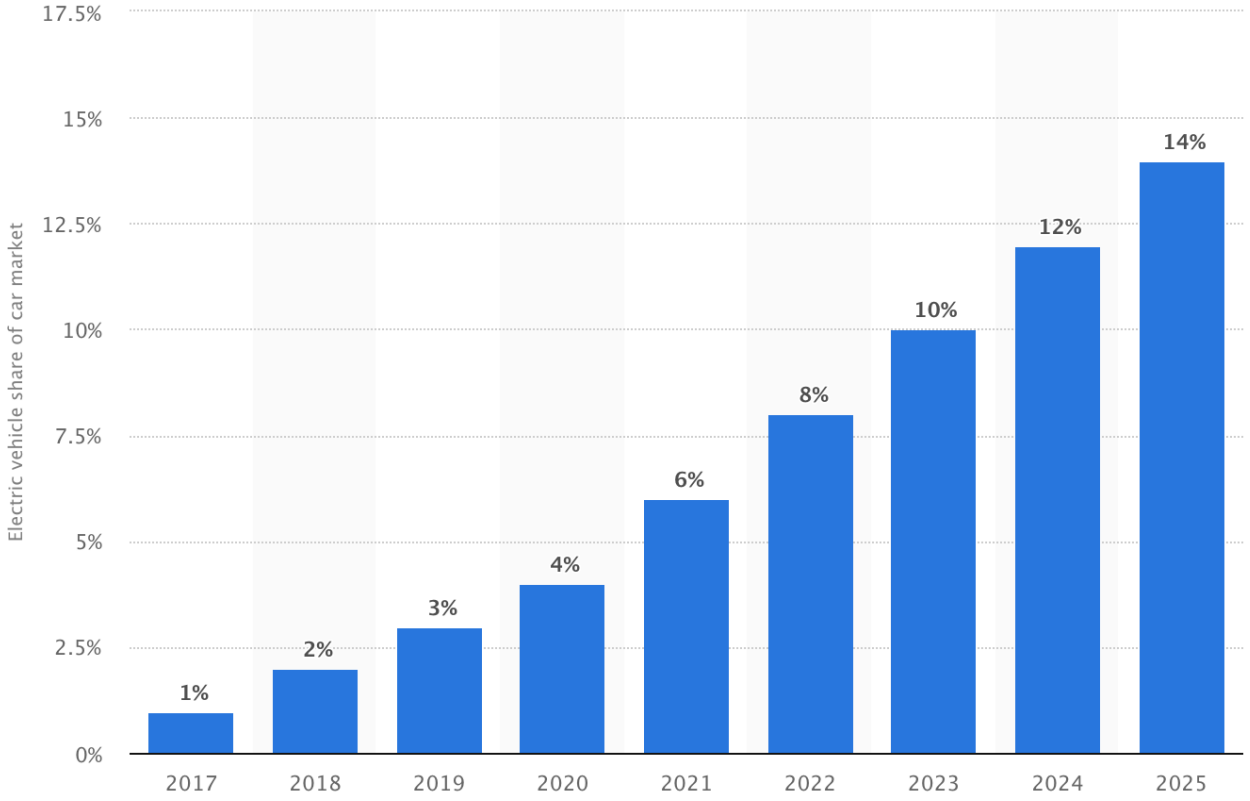
Overview

Potential impacts of new and emerging technologies and business models on transportation system

- How other states, transportation agencies or transit agencies have addressed **congestion model pricing**, with a focus on transportation network companies
- Generate **sufficient revenue** for the state and local governments to mitigate specified impacts
- **Adoption of zero-emissions** vehicles for utilization as motor vehicles used for commercial purposes
- Incentivize **multiple passenger ride sharing** (commercial, first/last mile for public transit)
- Vehicle **automation adoption rates**

Electric Vehicle Adoption Rates

- Colorado EV market share
  - 2018: **2.61%** (up from 1.57% in 2017), ranked 5th most by states [1]



Projected US EV Market Share [2]

1 https://evadoption.com/ev-market-share/ev-market-share-state/
2 https://www.statista.com/statistics/744946/us-electric-vehicle-market-growth/

TNC Growth Rates

3 https://www.sciencedaily.com/releases/2018/09/180927122934.htm
4 http://www.schallerconsult.com/rideservices/automobility.htm
5 http://www.reginaclewlow.com/pubs/2017_UCD-ITS-RR-17-07.pdf
6 http://digital.auraria.edu/content/AA/00/00/60/55/00001/Henao_ucdenver_0765D_10823.pdf
7 https://link.springer.com/article/10.1007%2Fs11116-018-9923-2

- For every 100 miles carrying passengers, TNC drivers travel an **additional 69 miles without a passenger** (conservatively) [3]
  - TNCs **add 2.6 new vehicle miles** for each mile of personal driving removed [4]
- Drivers **willing to pay more for TNC** to avoid stress and cost of parking
- *US Trends:*
  - TNCs transported 2.61 billion passengers in 2017 (up from 1.90 in 2016) [4]
  - Average net **reduction in transit** 6% and 3% in light rail [5]
  - 49-61% of ride-hailing trips would have been walking, biking, public transportation, or not taken at all [5]
  - TNC/taxi trips projected to surpass bus ridership by end of year [4]
- *Colorado Trends:*
  - [Denver]: Estimated 185% increase VMT due to TNC usage [6]
  - [Denver]: **34% would have walked, biked or used public transit** [7]
  - [Denver]: **12% would not have made trip at all** [7]

Automated Technology Adoption

- 2045: **24.8% level 4 AV penetration** for private light-duty vehicle fleet [8]
- *Vehicle Manufacturers*: Self-driving on highway by 2021, **2025 for urban driving** [9]
- *Uber Goal*: 75,000 autonomous vehicles on road this year; driverless taxi services in 13 cities by 2022, **forgo human safety drivers by 2020** [10]
- *Other noteworthy emerging technology:*
  - Dominos teaming with Nuro to have driverless pizza delivery (in Texas this year) [11]
  - Postmates (in LA within year) [12]

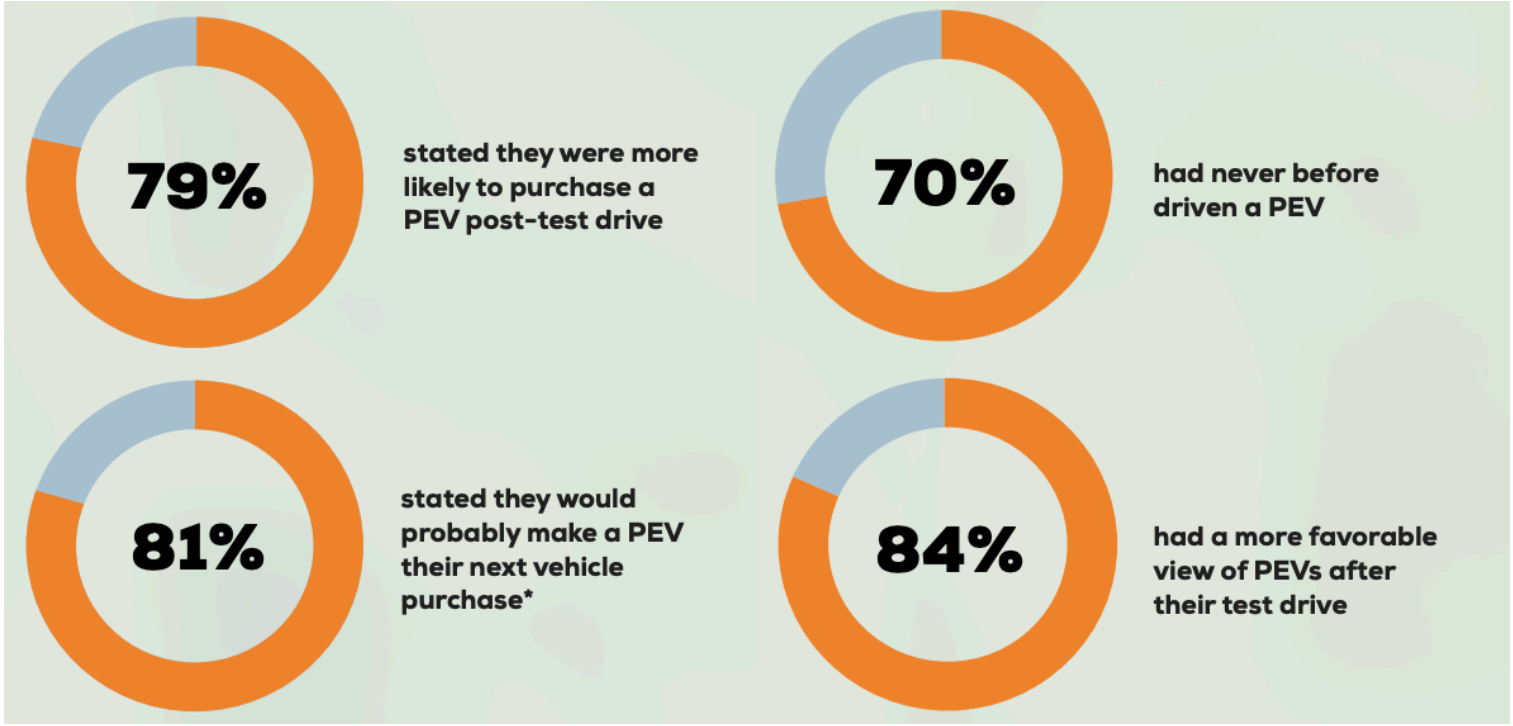
8 https://trid.trb.org/view/1392676
9 https://emerj.com/ai-adoption-timelines/self-driving-car-timeline-themselves-top-11-automakers/
10 https://techcrunch.com/2019/03/12/ubers-self-driving-car-unit-was-burning-20-million-a-month/
11 https://www.forbes.com/sites/greggardner/2019/06/17/dominos-nuro-team-up-for-driverless-pizza-delivery-in-houston/#55d06e76e6b5
12 https://www.forbes.com/sites/lanabandoim/2018/12/21/postmates-reveals-its-autonomous-delivery-rover-called-serve/#617bb33374a9

EV Incentivization

13 https://content.govdelivery.com/accounts/ORDOT/bulletins/24c7950
14 https://www.nescaum.org/documents/2018-zev-action-plan.pdf

- Tiered vehicle registration fees based on MPG [13]
- **Public Outreach**
  - 75% consumers know little or nothing at all about electric vehicles [14]
  - **Availability of charging is of top concern** [14]

2017 Massachusetts State-Sponsored Ride and Drive Campaign



[Voluntary] US RUC Programs

- *Impact*: 5 million EVs would lead to **$500 million decrease** in infrastructure funding annually [15]
- VMT up, but gas tax revenue down
  - CDOT has a **$1 billion-a-year budgetary shortfall** over the next 10 years [16]
- Most RUC fees around **1.5 cents per mile** (Federal 18.4 cents per gallon gas plus more per state, CO 22 cents per gallon) [17, 18, 19, 20]
- California Pilot 2016 (N = 5000) [18]
  - **85% overall satisfaction, 4% attrition**
  - 73% felt RUC was more equitable than gas tax
- Colorado Pilot 2016 (N = 150) [19]
  - 81% felt RUC was fair way of funding
  - **90% thought mileage collection was fair and easy**

15 https://escholarship.org/content/qt62f72449/qt62f72449.pdf?t=pkz4i0
16 https://www.codot.gov/library/AnnualReports/cdot-official-annual-reports/2017-annual-report
17 https://www.oregon.gov/ODOT/Programs/RUF/IP-Road%20Usage%20Evaluation%20Book%20WEB_4-26.pdf
18 https://dot.ca.gov/-/media/dot-media/programs/road-charge/documents/final.pdf
19 https://www.codot.gov/programs/ruc/programs/ruc/documents/rucpp-final-report
20 https://taxfoundation.org/state-gas-tax-rates-july-2018/

Success of International Programs

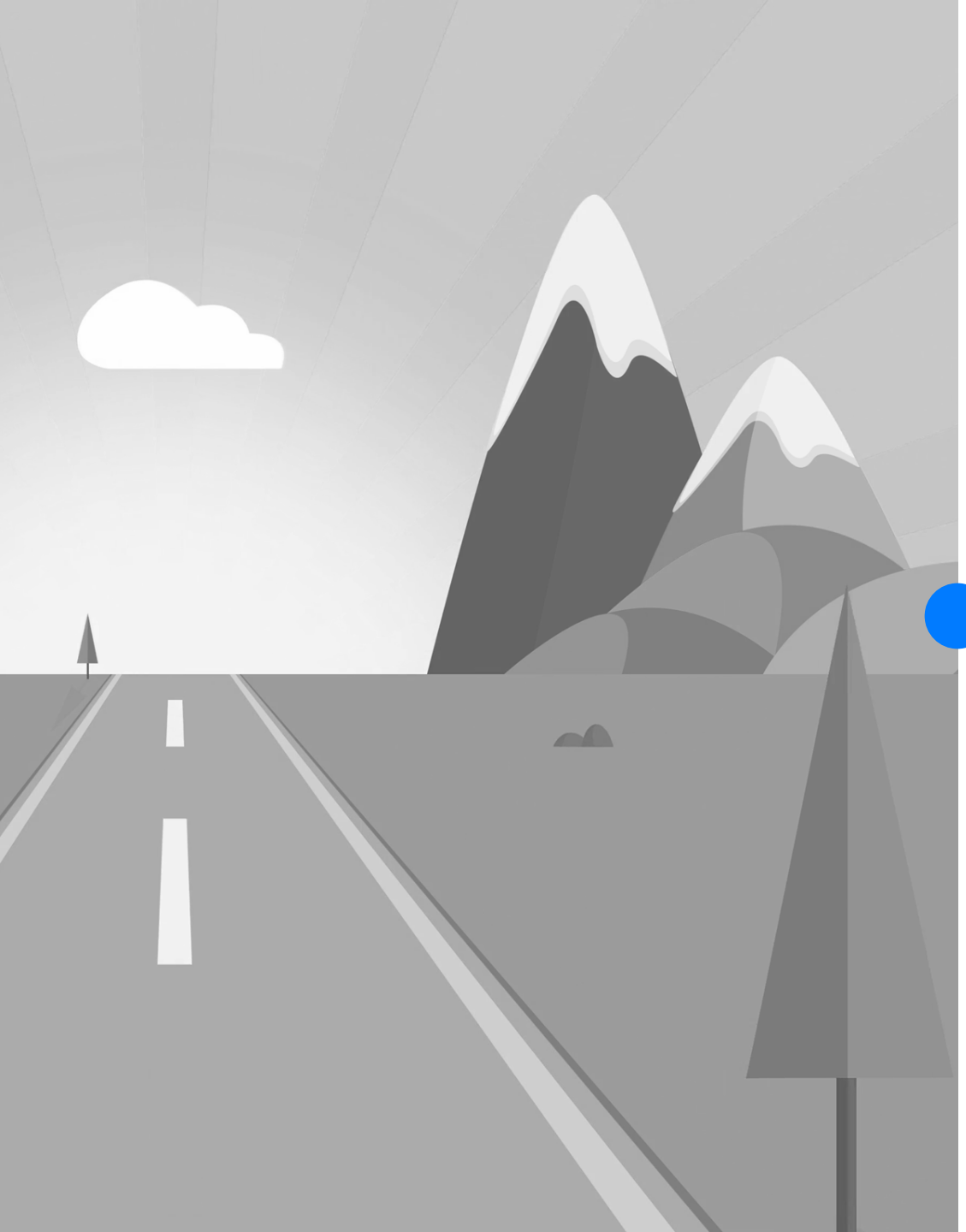
- *London Congestion Pricing* [21]
  - 30% reduction of traffic congestion
  - Gross revenue USD $3.9 billion (USD $130 million annual operating costs)
  - **16% decline in CO2, 13.5% decline in NOX, and 15.5% decline in particulate matter**
- *Stockholm Congestion Pricing* [22]
  - **14% reduction in CO2, 7% in NOX, 9% in particulate matter, and 2.5% reduction in GHG outside of cordon**
  - VMT decreased by 14% within cordon and by 1% outside cordon
- Similar findings in Milan and Singapore [22, 23]

21 https://scholar.utc.edu/cgi/viewcontent.cgi?article=1060&context=honors-theses
22 http://nyc.streetsblog.org/wp-content/uploads/2018/01/TSTC_A_Way_Forward_CPreport_1.4.18_medium.pdf
23 https://www.researchgate.net/publication/325987968_The_Ecopass_pollution_charge_and_Area_C_congestion_charge_-_comparing_experiences_with_cordon_pricing_over_time

TNC Taxes

- Currently, several major cities and states have some type of TNC fee or tax, including some of the following examples: [24, 25]
  - Chicago (72 cents **per trip**)
  - New Orleans and Portland (50 cents **per trip**)
  - King County (33 cents **per trip**)
  - Massachusetts (20 cents **per trip**)
  - NYC (2.75 **per trip**, 75 cents **if pooled**)
  - New York (4**% of total fare** on trips originating outside of NYC)
  - Philadelphia (1.4**% of total fare**)
  - Nevada (3**% of total fare**)
  - California (0.33% of total **TNC revenue**)

24 https://www.enotrans.org/etl-material/eno-brief-taxing-new-mobility-services-whats-right-whats-next/
25 https://www.documentcloud.org/documents/5777494-36154-Appeal-Redacted.html



Thank you!

Erika Miller, PhD
erika.miller@colostate.edu

COLORADO Department of Transportation

Colorado State University

Literature Review for SB-19-239: Update 2

Erika Miller, PhD
Somayeh Aliebrahimi, Graduate Student
Systems Engineering & Mechanical Engineering
Colorado State University

COLORADO
Department of Transportation

Colorado State University

Overview

Potential impacts of new and emerging technologies and business models on transportation system

- Increasing passengers per trip
- Fee structures
- Adoption of zero-emissions vehicles
- Transportation Network Companies

➢Today: Common trends across these topics

TNCs Across US [1]

- Fehr & Peers consultant on behalf of Uber and Lyft
  - Combined vehicle miles traveled compared to total VMT in six cities in September 2018
  - "The results show that while they are vastly out-stripped by personal and commercial vehicles, Uber and Lyft are still responsible for significant shares of VMT in those cities."

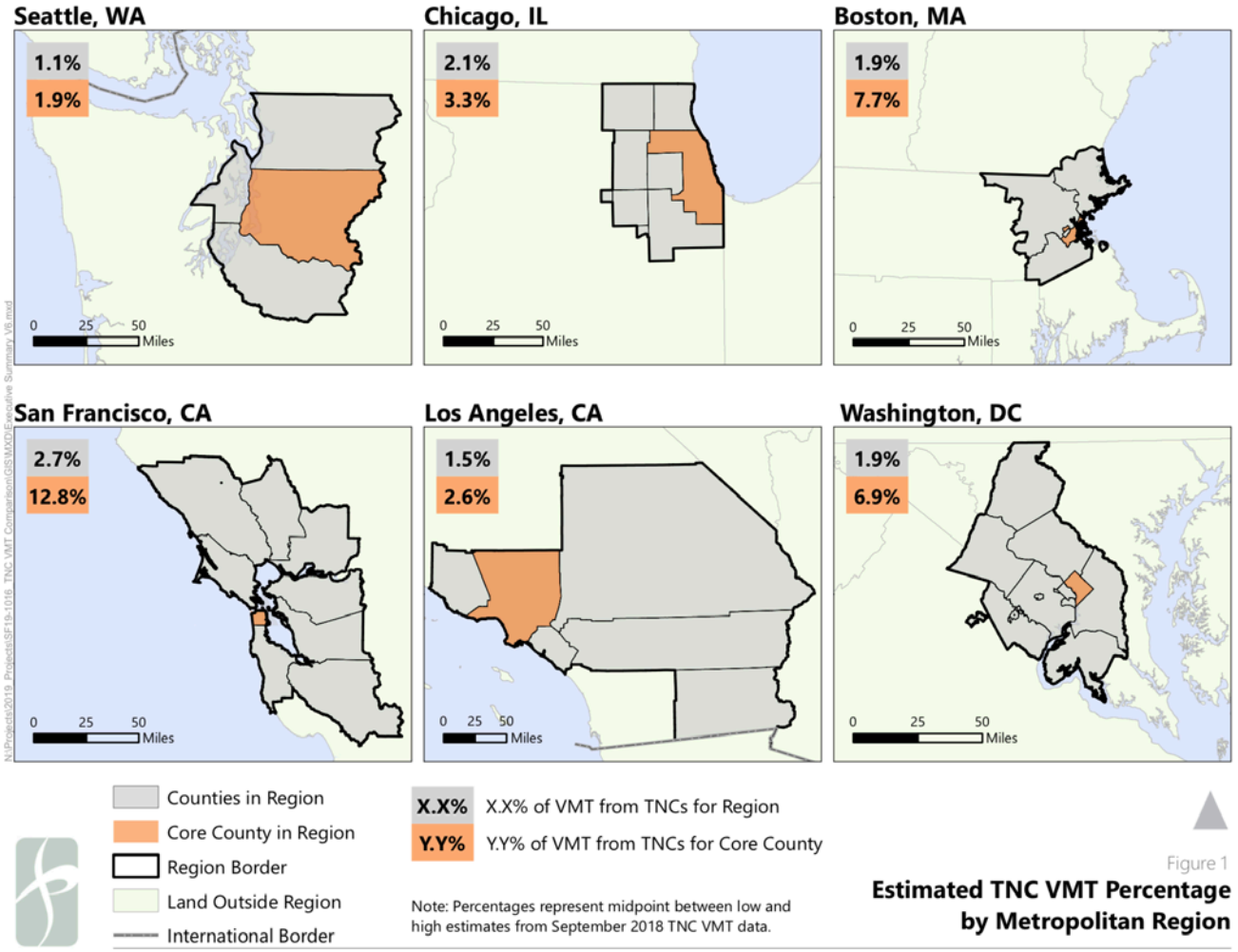


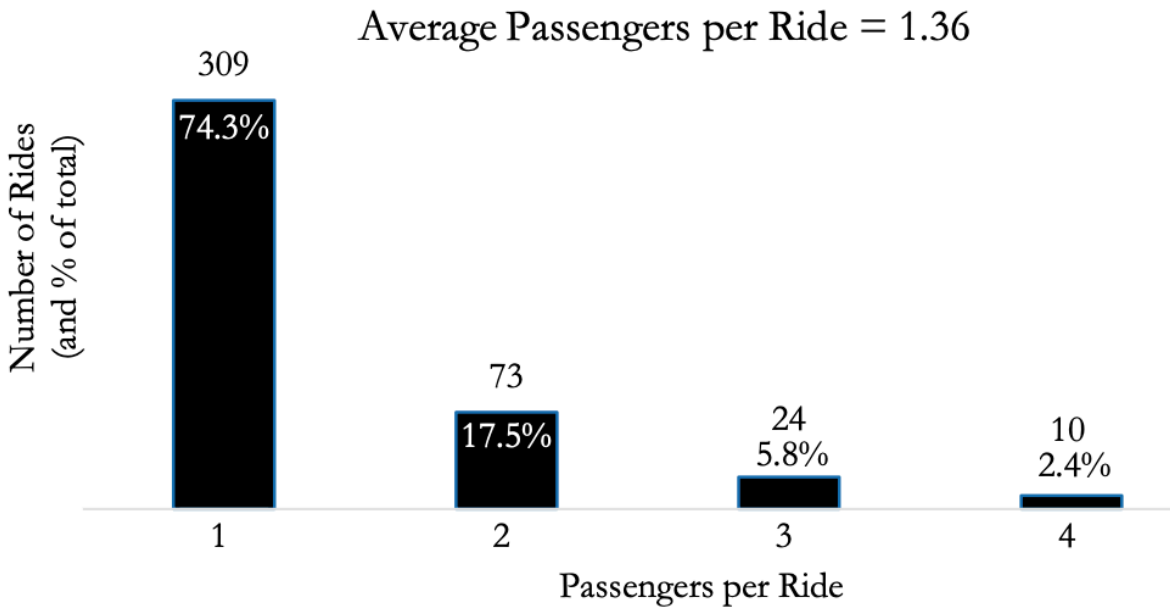
Figure 1
Estimated TNC VMT Percentage by Metropolitan Region

TNCs Across US

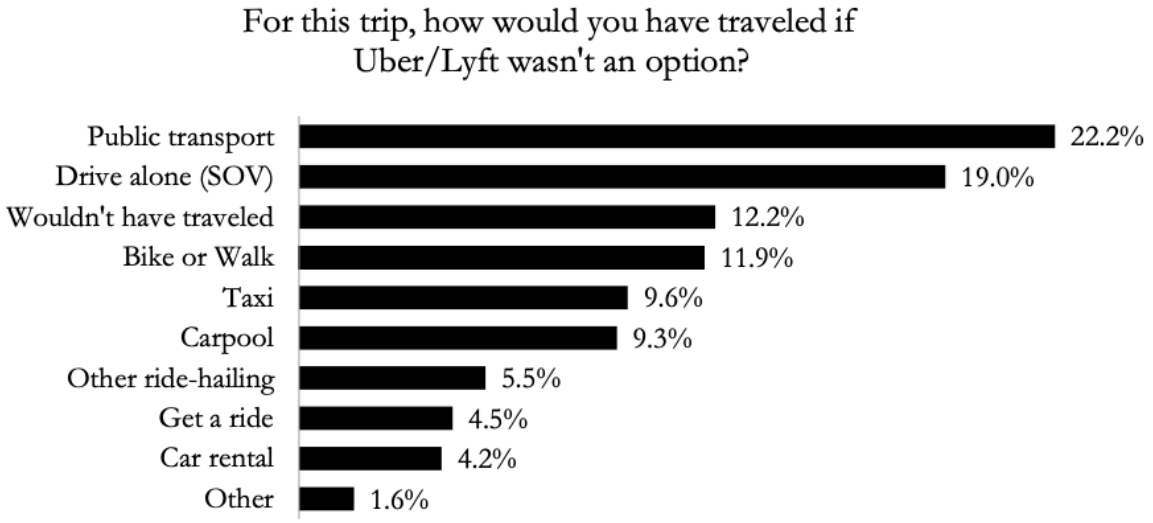
- Lyft Across US: [2]
  - 35% of users do not own or lease a personal vehicle
  - 50% of those say they are likely to purchase one if services become unavailable
- Lyft in Colorado: [2]
  - 23% of riders take Lyft to get around when public transit does not operate
  - Late night rides account for 11% of rides
  - 54% of rides begin or end in low-income/underserved areas
- Lyft in Colorado: [3]
  - 40% of riders are more likely to attend community events as a result of using Lyft
  - 27% of healthcare riders state that without Lyft they would be less likely to make it to their appointments regularly
  - 11% of Lyft drivers are veterans
  - 27% of Lyft drivers are over age 50

TNCs in Denver [4]

- Study with 416 participants
- Almost 75% of fares had only 1 passenger



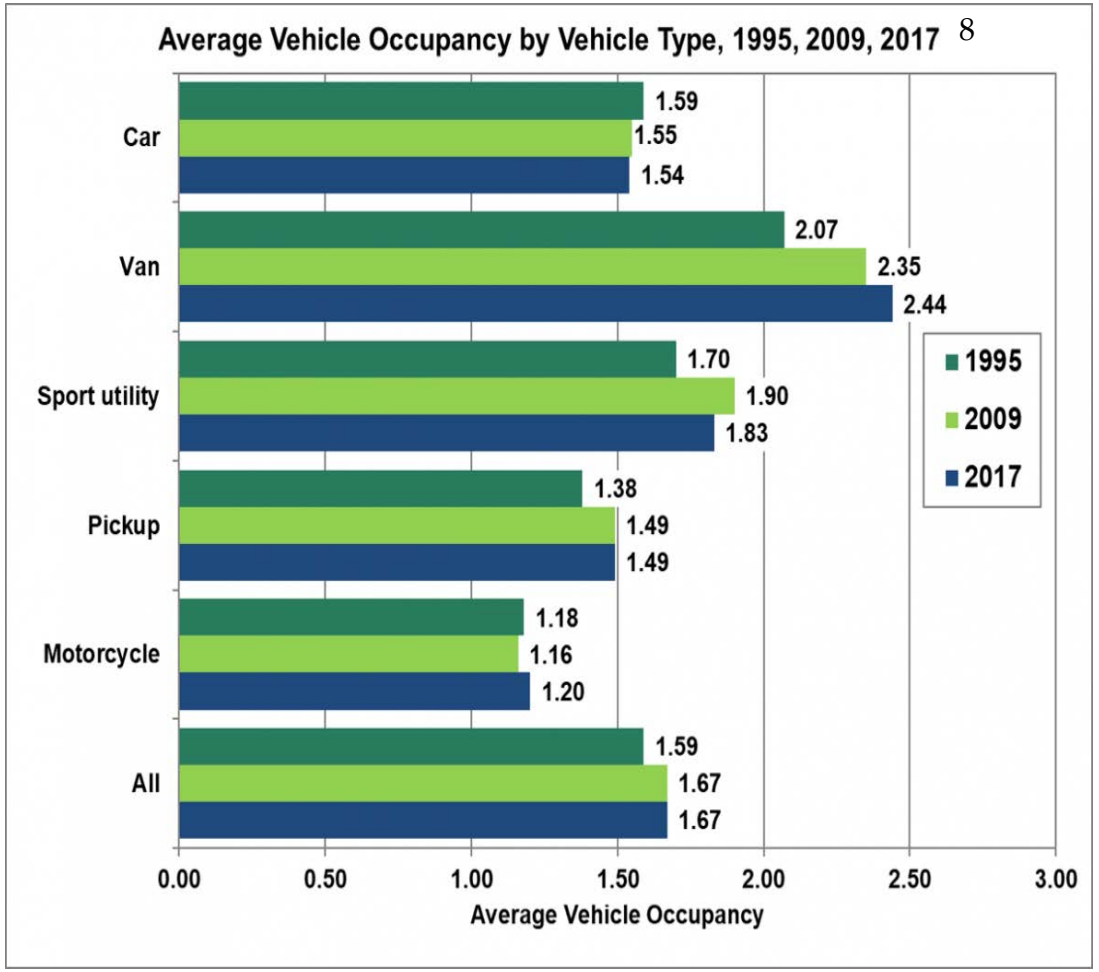
Vehicle Occupancy



Mode Replacement

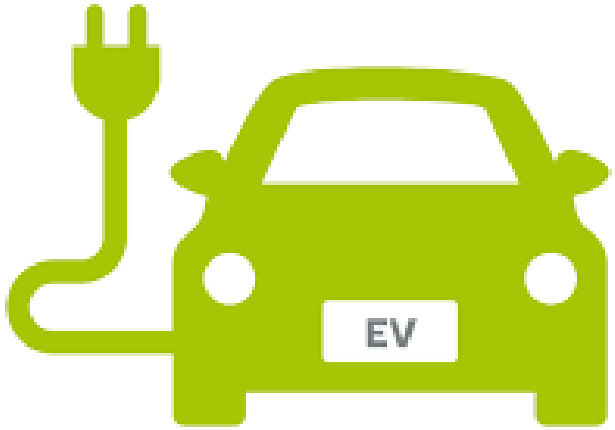
Travel Behavior

- Average person in US took 2.8 trips per day in 2018 [5]
- In 2016, 76.6% of workers in US commuted by driving alone, and only 9.0% of workers carpooled (a drop from 19.7% in 1980) [6]
- A case for equality [7]
  - Lower-income individuals typically spend a much larger portion of their income on fuel taxes than wealthier individuals do
  - Fuel efficiency has improved markedly over the past four decades, but total motor fuel consumption has remained stable since 2005
  - Electric and other alternative fuel vehicles have become common in the US



EV Penetration

- In the US, transport sector responsible for 29% of GHG emissions, with 59% from light duty vehicles [9]
- 55% of all new car sales and 33% of global feet projected to be electric by 2040 [10]
  - If plug-in electric vehicles make up at least 40% of new vehicle sales globally by 2040, will cause GHG to stabilize at 450 ppm [11]



Transportation Funding Sources

- Several states considering creating new transportation funds, such as: [12]
  - -Road usage charge
  - -Tolling
  - -Fees and taxes for vehicles that do not use gasoline

Incentivize

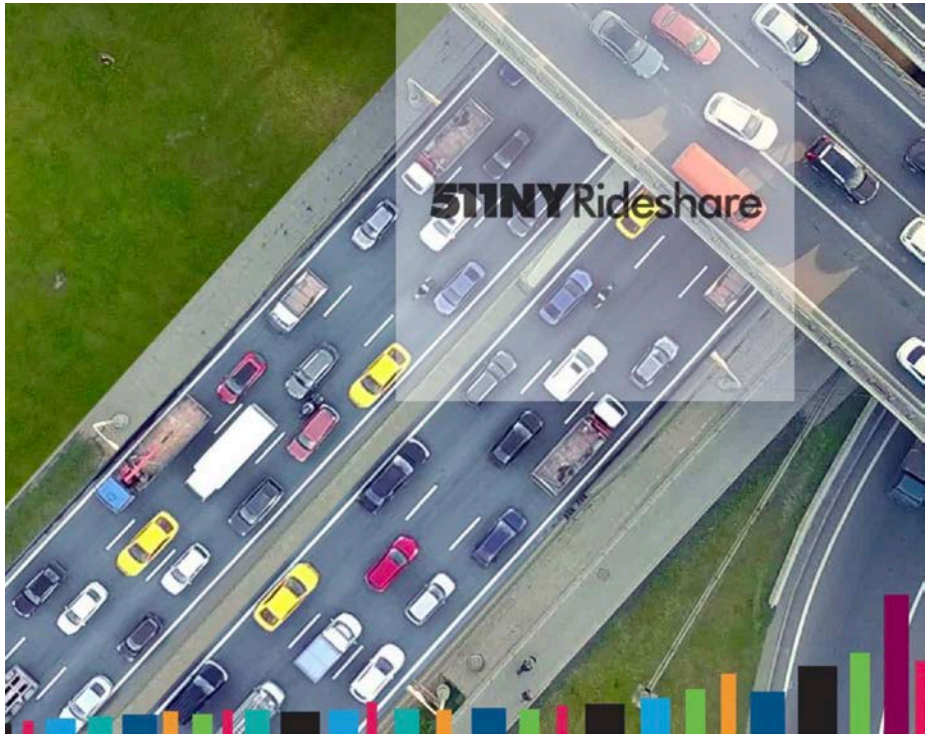
- Public-private partnerships in transit (e.g., Transportation network Companies, first last mile) [13]
- ZEVs: [14]
  - State rebates, sales tax credits, and other tax exemptions
  - HOV lane access regardless of number of passengers
  - Toll reduction
  - Preferential parking and reduced parking fees
- Average EV will cost $6k more than a gasoline vehicle in 2023 [15]
- Cost of gasoline fuel is 2.5 times higher than electric fuel [15]

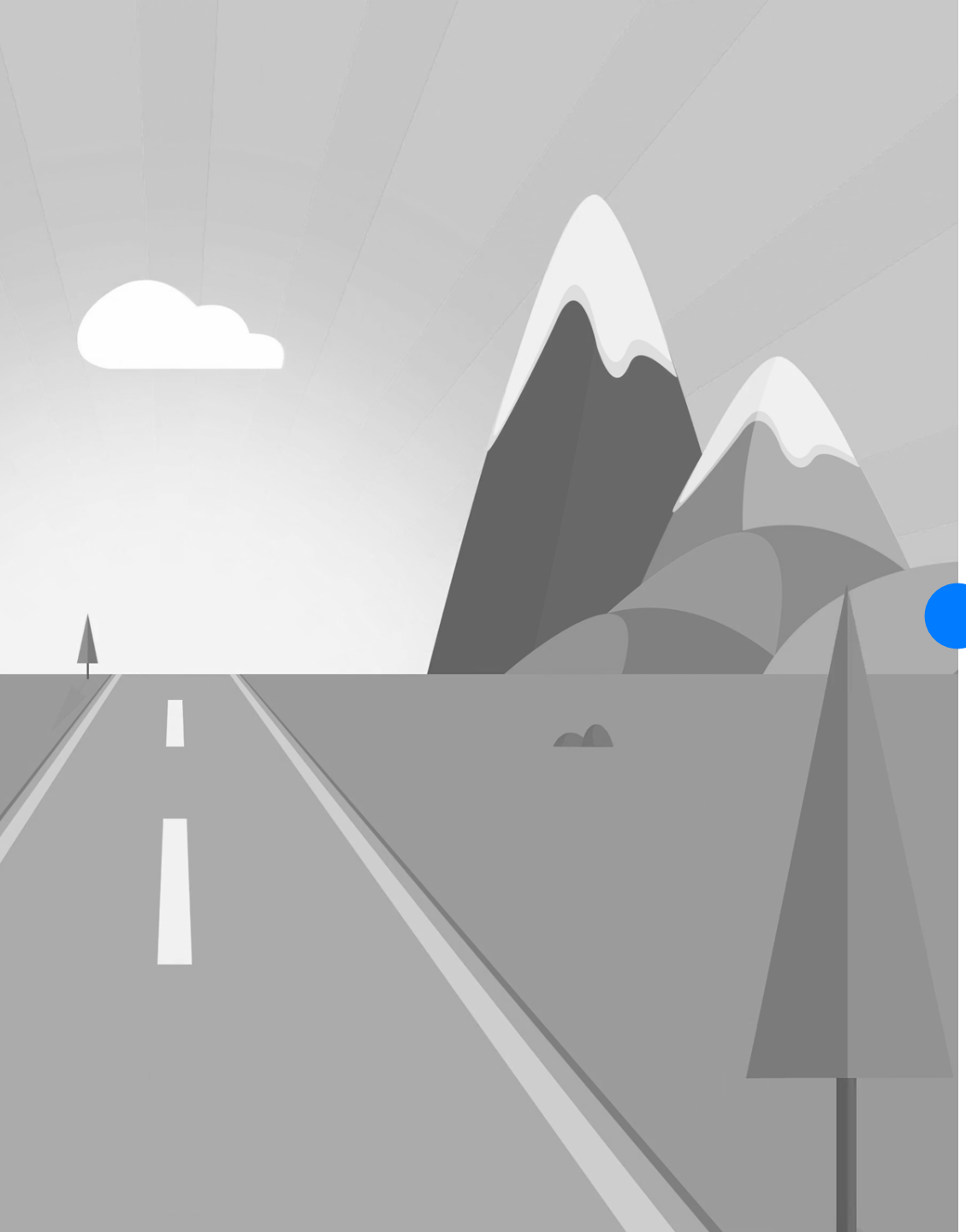
Fee Structures

- Congestion Pricing [16]
  - Variably priced lanes or tolls on entire roadways
  - [Variable and fixed] cordon charges
  - Area wide charges
- Road usage charges (DE, WA, OR, CA, CO) [17]
  - Adjusted based on vehicle weight, road type, time-of-day to better reflect the actual costs of transportation system [18]
- TNC fees/taxes [19]
  - Per ride: Chicago, New Orleans, NYC, Portland, King County, Seattle, Tacoma, Washington DC, Brunswick, Massachusetts
  - Percent of total fare: Philadelphia, Alabama, Connecticut, Nevada, New York, Rhode island, South Carolina, South Dakota, Wyoming
  - Percent of total revenue: California

Case Study: New York City [20]

- NY State DOT to reduce single-occupancy vehicles
- Generate mass awareness of alternative commuting options
  - Launched innovative media and outreach campaigns to visualize environmental benefits, cost-effectiveness, and availability of rideshare/mobility services
- Results of 511NYRideshare since 2010
  - Consolidated 3.7 million single-occupancy vehicles off the road
  - Reduced traffic by 20%
  - 12,100 tons of CO2 reduced
  - 201,560 commuters connected





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Erika Miller, PhD
erika.miller@colostate.edu

COLORADO Department of Transportation

Colorado State University

References

1. https://www.fehrandpeers.com/what-are-tncs-share-of-vmt/
2. Research/Lit Review from Lyft (Jake Swanton)
3. EIR 2019 State: Economic Impact 2019: Colorado and Lyft
4. https://link.springer.com/article/10.1007/s11116-018-9923-2
5. https://www.bts.gov/sites/bts.dot.gov/files/docs/browse-statistical-products-and-data/transportation-statistics-annual-reports/TSAR-Full-2018-Web-Final.pdf
6. http://css.umich.edu/sites/default/files/Personal_Transportation_Factsheet_CSS01-07_e2018.pdf
7. https://www.theamericanconsumer.org/wp-content/uploads/2019/01/VMT-Fee-Final.pdf
8. https://www.energy.gov/eere/vehicles/articles/fotw-1040-july-30-2018-average-vehicle-occupancy-remains-unchanged-2009-2017
9. https://www.epa.gov/greenvehicles/fast-facts-transportation-greenhouse-gas-emissions
10. http://www.ncsl.org/bookstore/state-legislatures-magazine/deep-dive-transportation-funding.aspx#/
11. https://iopscience.iop.org/article/10.1088/1748-9326/aad0f8/pdf
12. http://www.ncsl.org/bookstore/state-legislatures-magazine/deep-dive-transportation-funding.aspx#/
13. https://www.leg.state.mn.us/docs/2018/mandated/180120.pdf
14. https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=2&cad=rja&uact=8&ved=2ahUKEwi0-oPB27njAhUMVs0KHaqKCwkQFjABegQIBRAC&url=https%3A%2F%2Fwww.nescaum.org%2Fdocuments%2Fmulti-state-zev-action-plan.pdf%2F&usg=AOvVaw1QJ_RQMexKs_WmqzsGJ9jT
15. https://drive.google.com/file/d/1mqRd_JfcDpFeMXvRzshX1mWxnYw4hOw0/view
16. https://ops.fhwa.dot.gov/publications/congestionpricing/sec2.htm
17. http://www.ncsl.org/research/transportation/road-use-charges.aspx
18. https://www.theamericanconsumer.org/wp-content/uploads/2019/01/VMT-Fee-Final.pdf
19. https://www.enotrans.org/etl-material/eno-brief-taxing-new-mobility-services-whats-right-whats-next/
20. https://www.icf.com/clients/transportation/nysdot

Literature Review in Support of SB19-239

Original: August 16, 2019
Revision: September 13, 2019

Erika Miller, PhD
Systems Engineering and Mechanical Engineering
Colorado State University, Fort Collins, CO 80523
erika.miller@colostate.edu

Overview and Objectives:

CSU was tasked to conduct a literature review for CDOT to provide background and practical information on how other states, entities, and transportation entities have examined the transportation system impacts of adoption of new and emerging technologies and business models. Specifically, the literature review focused on collecting prior information regarding:

- Breadth of knowledge on how other states, transportation agencies or transit agencies have addressed congestion model pricing in general and related to commercial vehicles, such as ride-sharing/ride-hailing or other transportation network companies;
- Generate sufficient revenue for the state and local governments to mitigate specified impacts to the transportation system;
- Adoption of zero-emissions vehicles for utilization as motor vehicles used for commercial purposes;
- Incentivize multiple passenger ride sharing for motor vehicles used for commercial purposes and the use of such vehicles as a first and last mile solution for users of public transit; and
- Vehicle automation adoption rates.

Revision: Expanded definition of Emerging Technology to capture expanded car sharing methods and goods delivery.

Methods:

The predominant focus of this literature review was finding sources available online, with an emphasis on academic publications, journal articles, and publications by cities, states, transit agencies, and for-profit companies. Several subject matter experts in the field were also interviewed to provide depth on available resources and key concepts to include in the online searches.

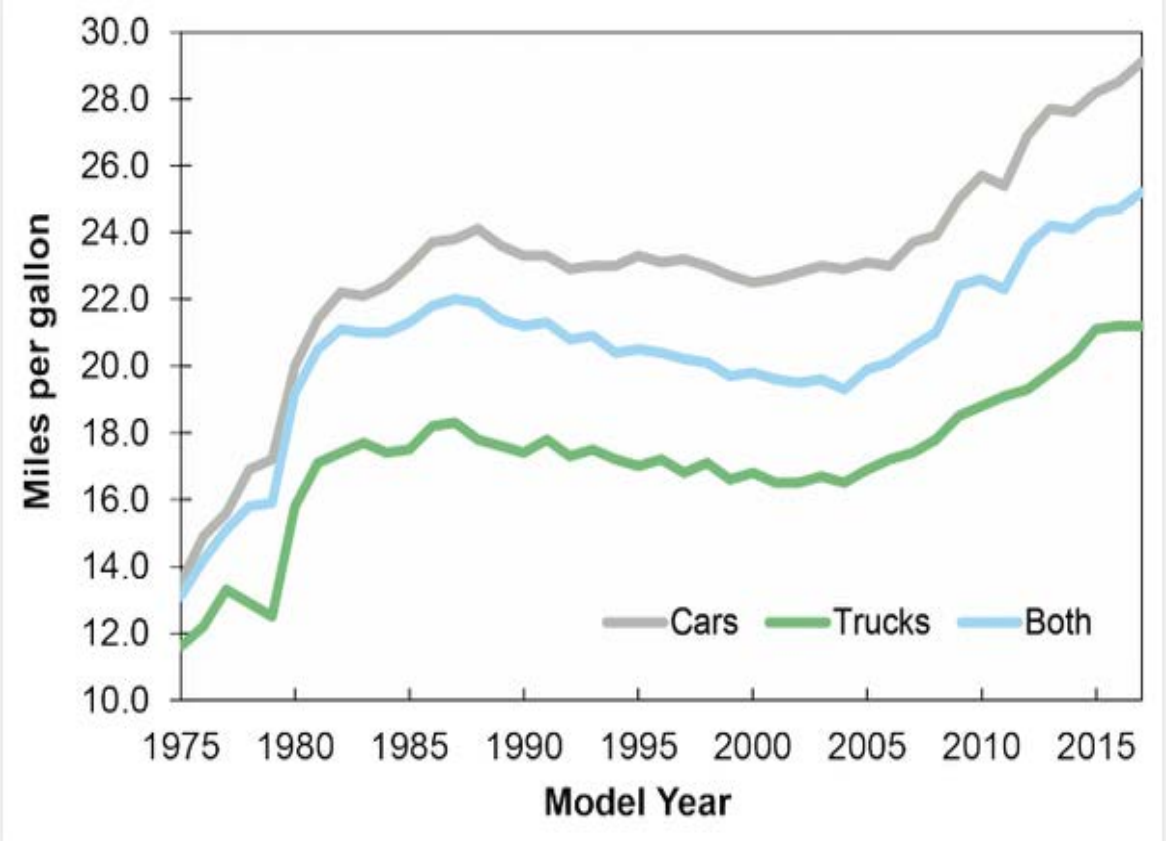
The results of the literature review are provided in an Excel file, which is organized into five key themes: Electric Vehicles, Emerging Mobility, Congestion Pricing, Road Usage Charge, and Multiple Passenger. The supporting figures referenced in the Excel tables are provided in the Appendix of this document. The Excel tables include the source of the reference, a summary of the key findings from the source, and a theme/subtheme for ease of sorting.

Results:

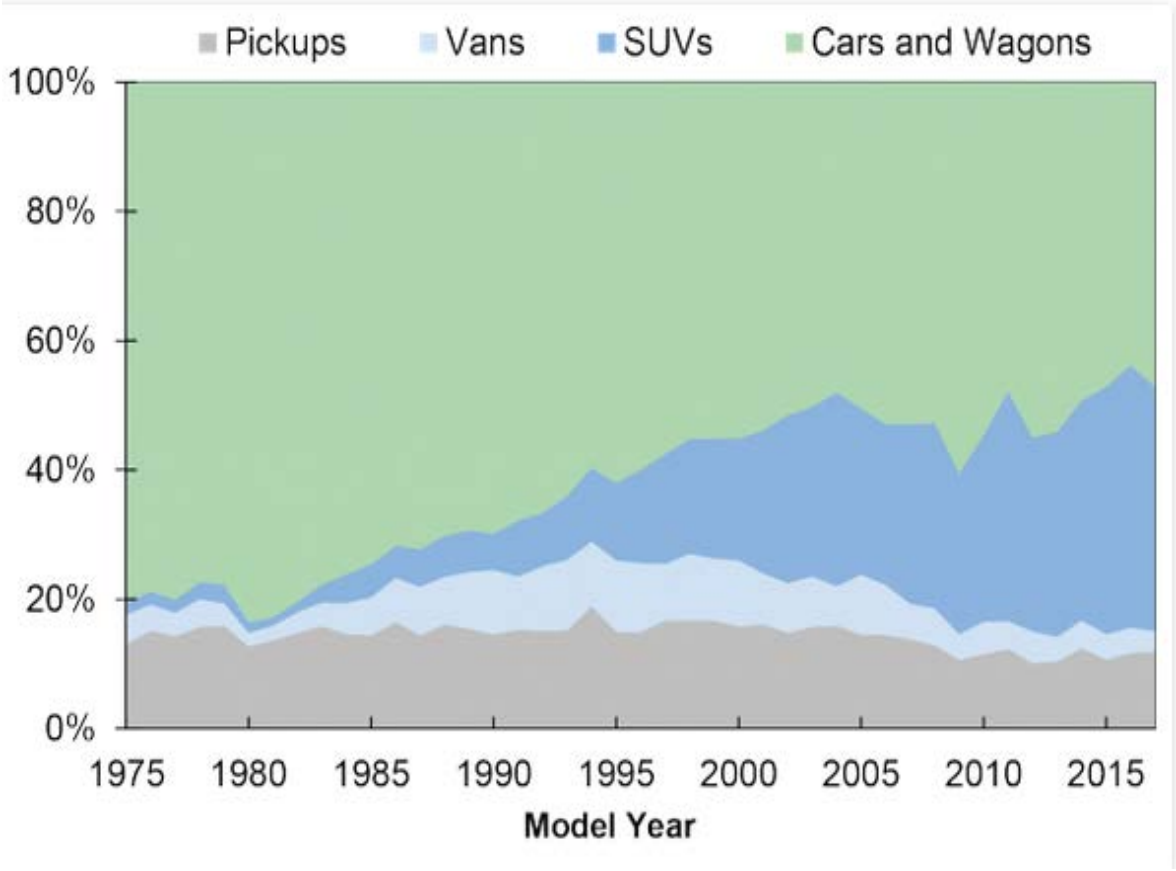
See Excel file.

Appendix: Supporting Figures

Plot 1: MPG by Model Year



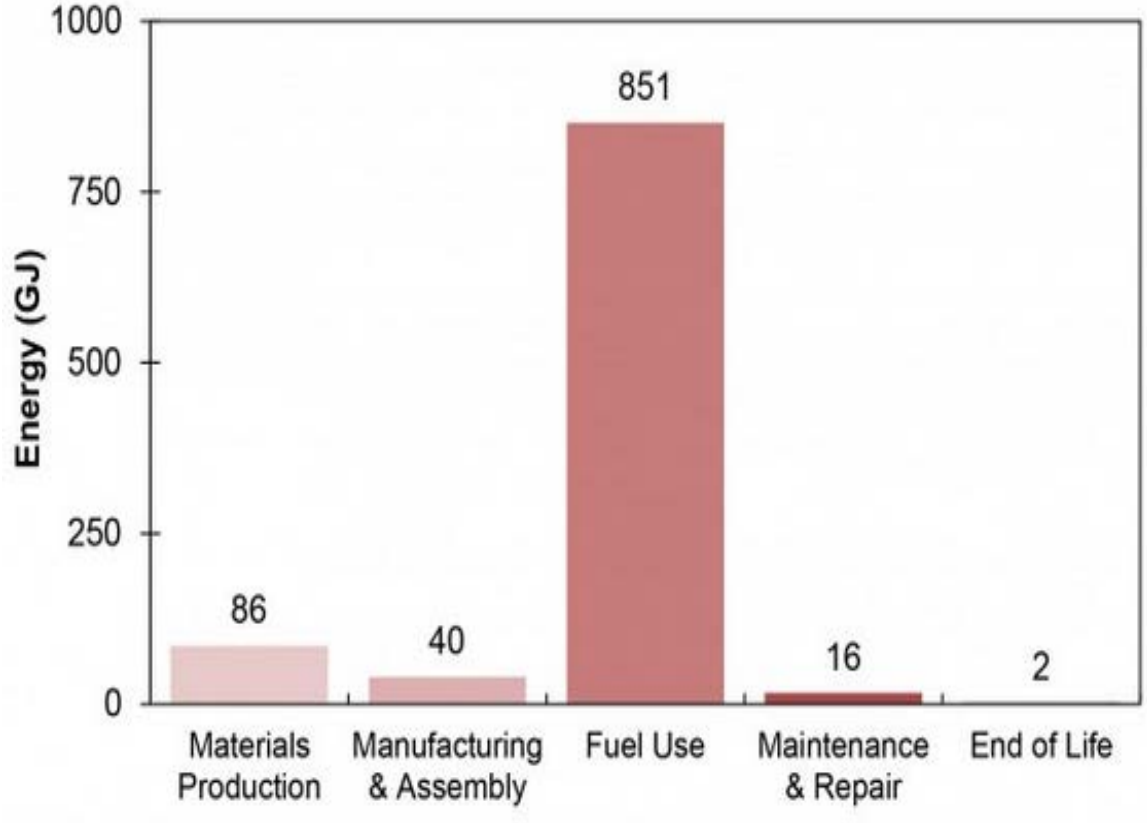
Plot 2: Market Share by Vehicle Type



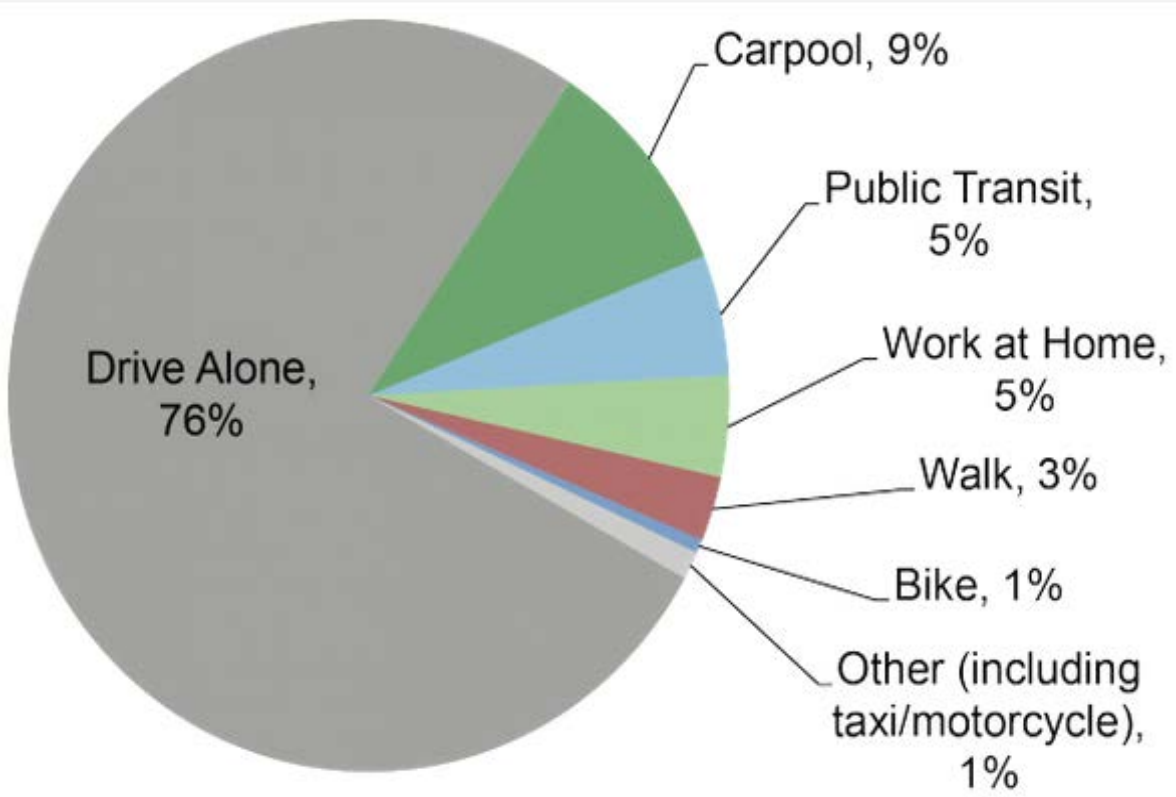
Plot 3: Total life cycle burdens, 1995 midsize sedan

Environmental Flow	Lifetime (120,000 miles) Total (kg)	Per Mile (g)
CO_2	61,300	511*
CO	1,940	16
SO_x	137	1.1
NO_x	256	2.1
NMHC	259	2.1
Methane	70	0.58
Solid Waste	4,380	36.5
Energy	995 GJ **	8.3 MJ

Plot 4: Life cycle energy consumption, 1995 midsize sedan



Plot 5: US Modes of Transportation to Work



Plot 6: Average Savings for Carpooling

Money	Average savings	**$227 per month or $2722 per year**
	Initial cost	$0
	How long to get back your money	Immediate
Carbon footprint	Average CO_2 savings	-once a week carpooling: cutting the carbon footprint by 402 lbs. of CO2 - carpooling all year long: cutting 2820 lbs. of CO2
Health	Lower stress	Feel happier and healthier by significantly reducing the stress level of your commute

Plot 7: Cutting the commuting costs, how much can carpooling help?

Number of passengers	Average savings per year
1 Passenger	$2722
2 Passengers	$3629
3 Passengers	$4083

Plot 8: Tax advantages of transit benefit (yearly calculation)

EMPLOYEE COSTS	AMOUNT
Annual Transit Set-Aside*	$2,760.00
Federal Income Tax Save**	$772.80
Employee FICA 7.65% Saved	$211.14
State Income Tax Saved***	$82.80
TOTAL COST FOR $2,760 IN TRANSIT	$1,693.26
TOTAL SAVINGS TO EMPLOYE	$1066.74
EMPLOYER COSTS	**AMOUNT**
Employee Annual Transit Set-Aside*	($2,760.00
Employee's Pre-Tax Salary Deduction	$2,760.00
Actual Cost to Employer	$0.00
Employer FICA 7.65% Saved	$211.14
Employer Unemployment Tax Save****	$22.08
NET SAVINGS TO EMPLOYER	$233.22

*Assumes employee sets aside the maximum per month

** Assumes employee pays 28% in Federal Income Tax

*** Assume employee pays 3% in State Income Tax

****Assumes employer

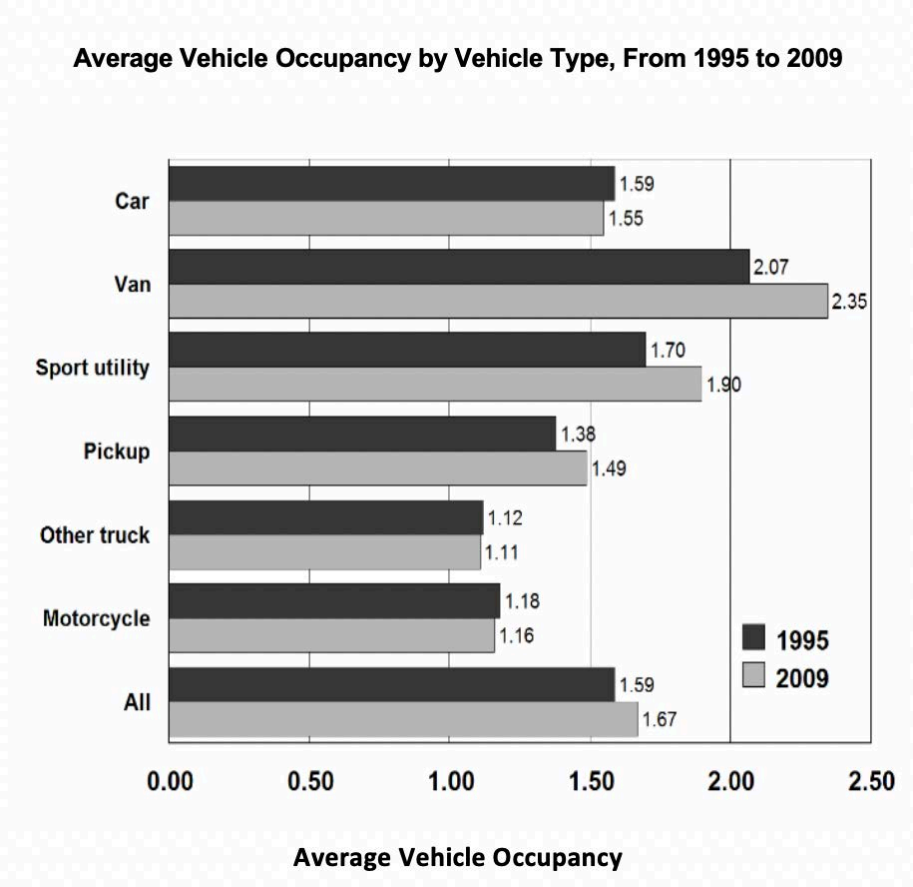
Plot 9: a commuting cost calculator from the state of NJ estimates the following savings for carpools of various sizes:

Potential Savings Per Week versus Driving Alone					
Mode	1Day	2Days	3Days	4Days	5Days
Carpool-2	$6.11	$12.22	$18.33	$24.44	$30.55
Carpool-3	$8.14	$16.28	$24.42	$32.56	$40.70
Carpool-4	$9.16	$18.32	$27.48	$36.64	$45.80

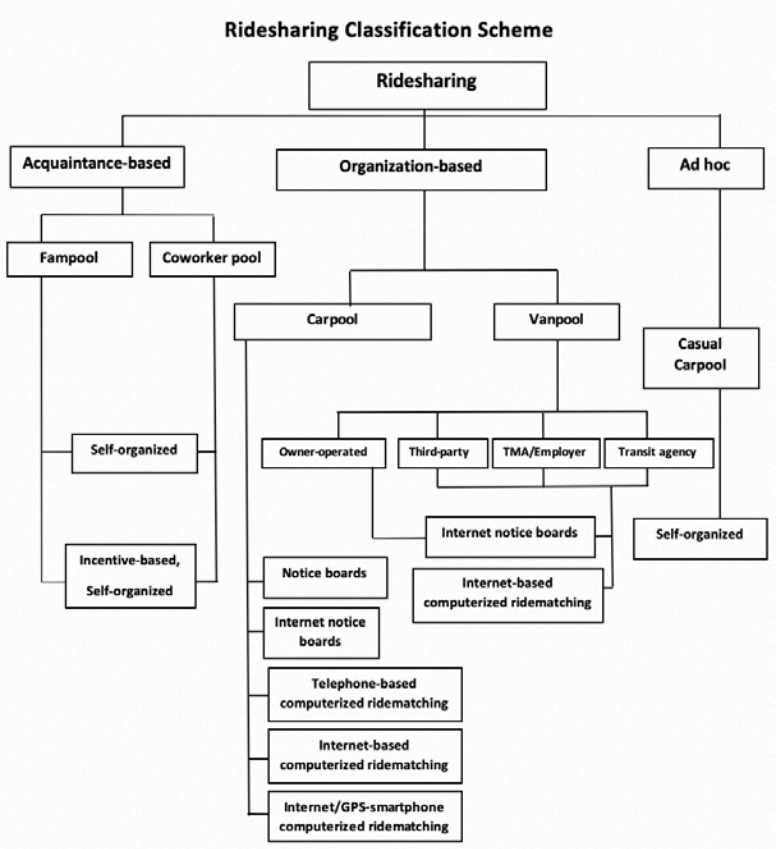
Plot 10: Center city mode share comparison (2010 and 2017)

Commute Mode	2010	2017	Changes
SOV	34.5%	25.4%	-9.1%
Transit	42.3%	48.4%	+6.1%
Walk	5.9%	7.7%	+1.8%
Bike	2.8%	3.1%	+0.3%
Rideshare	9.6%	9.7%	+0.1%
Other	4.9%	5.7%	+0.8%

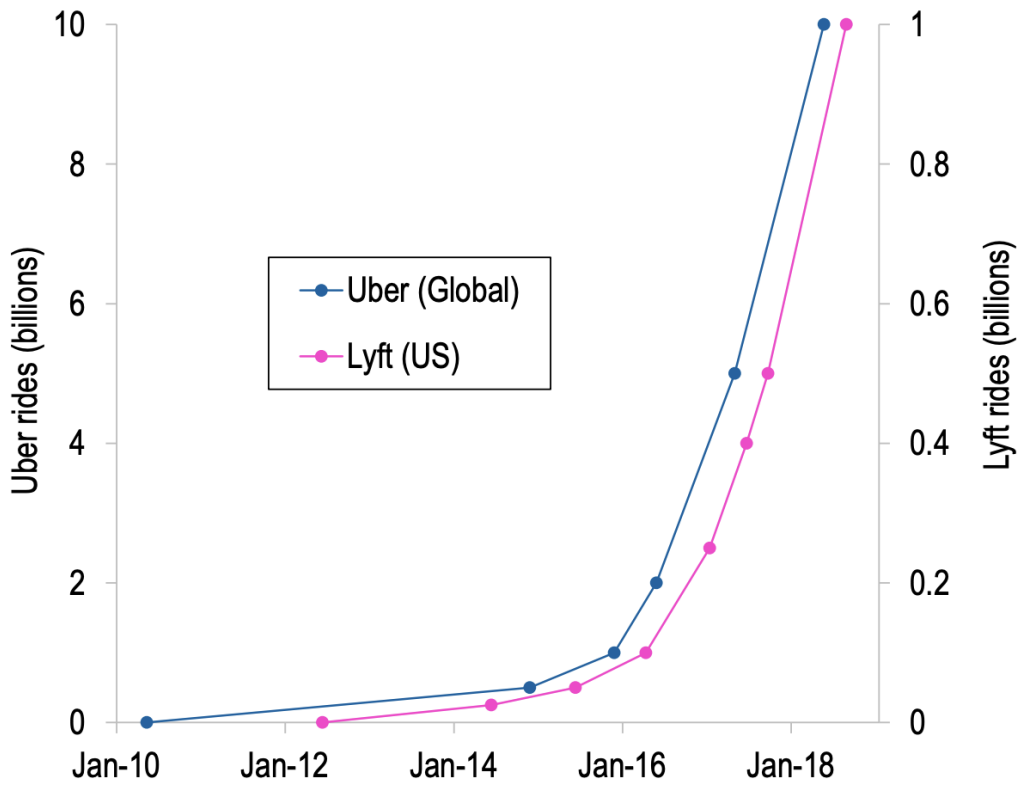
Plot 11: average vehicle occupancy by vehicle type, from 1995 to 2009



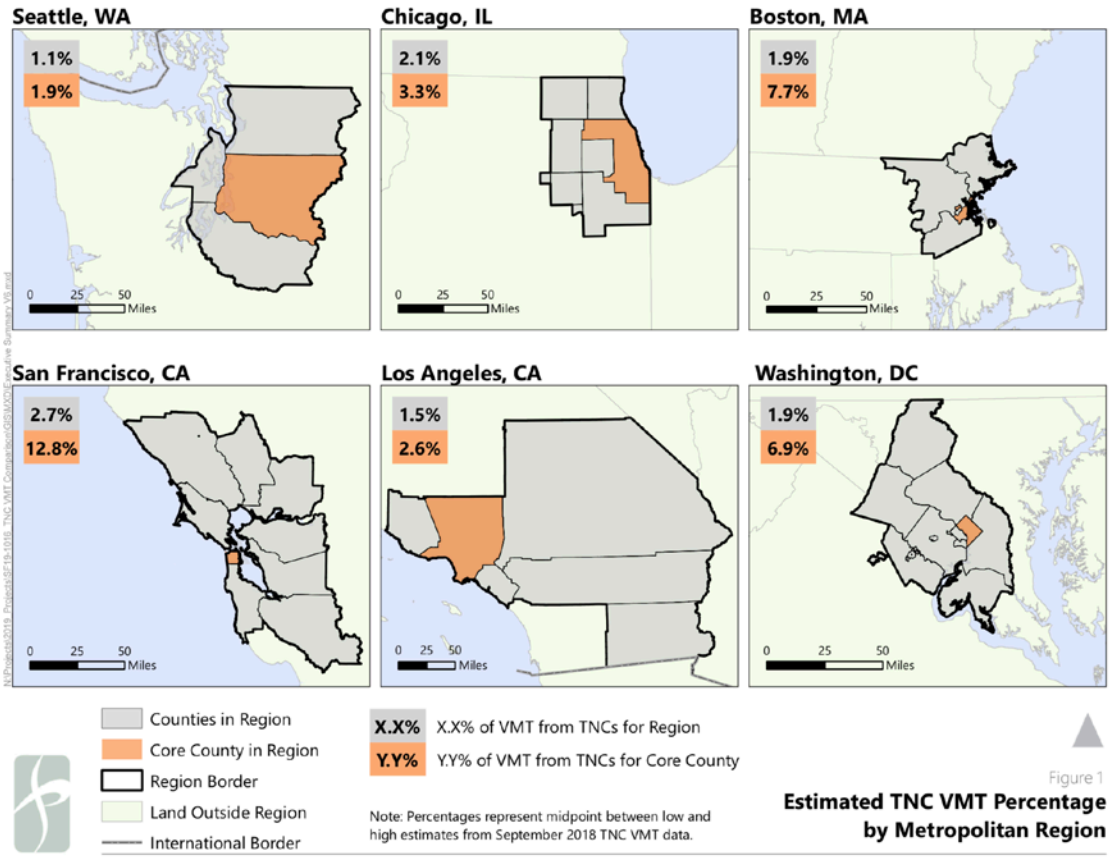
Plot 12: ridesharing classification scheme



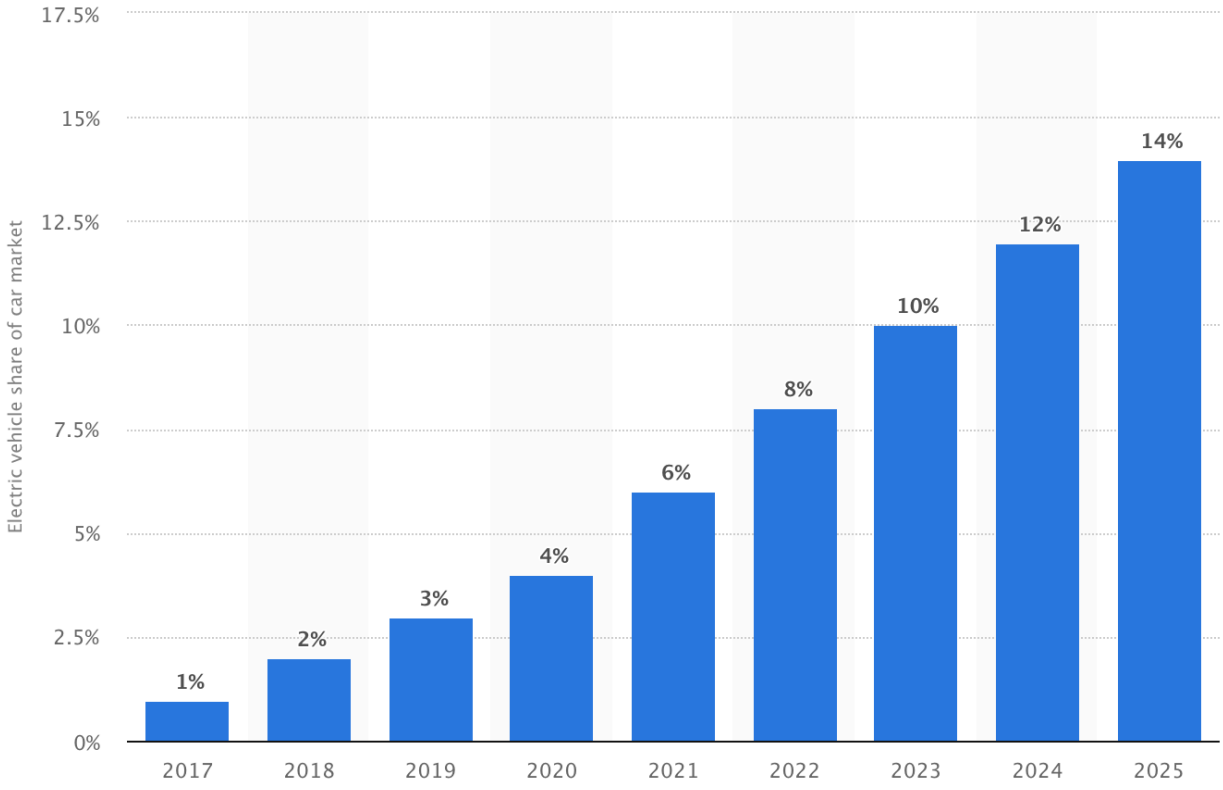
Plot 13: Ride hailing growth



Plot 14: Estimated TNC VMT percentage by Metropolitan Region

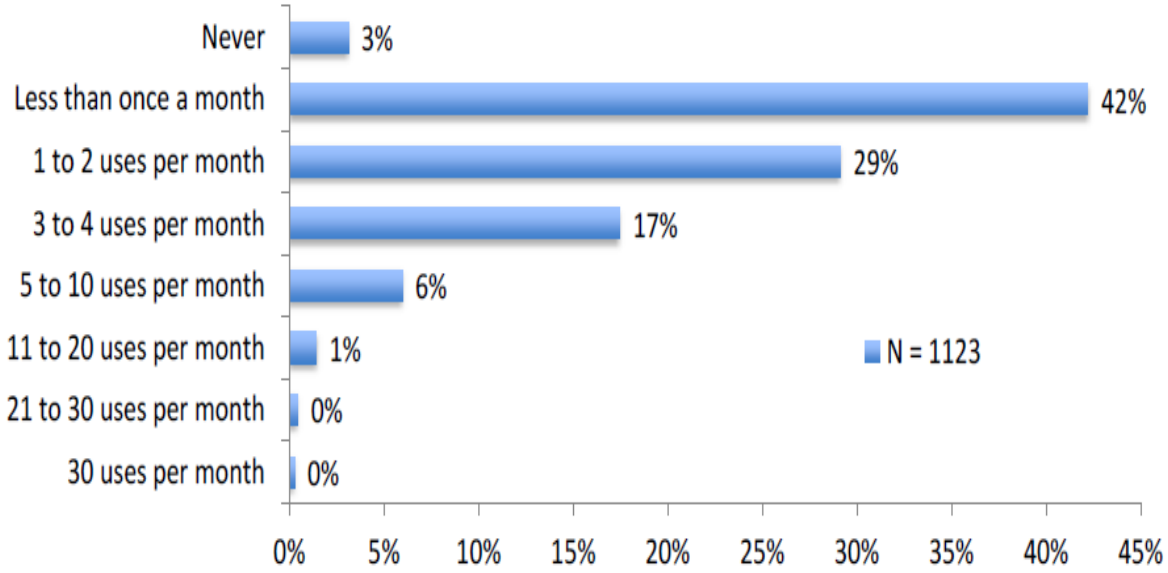


Plot 15: Projected US electric vehicle Market Share

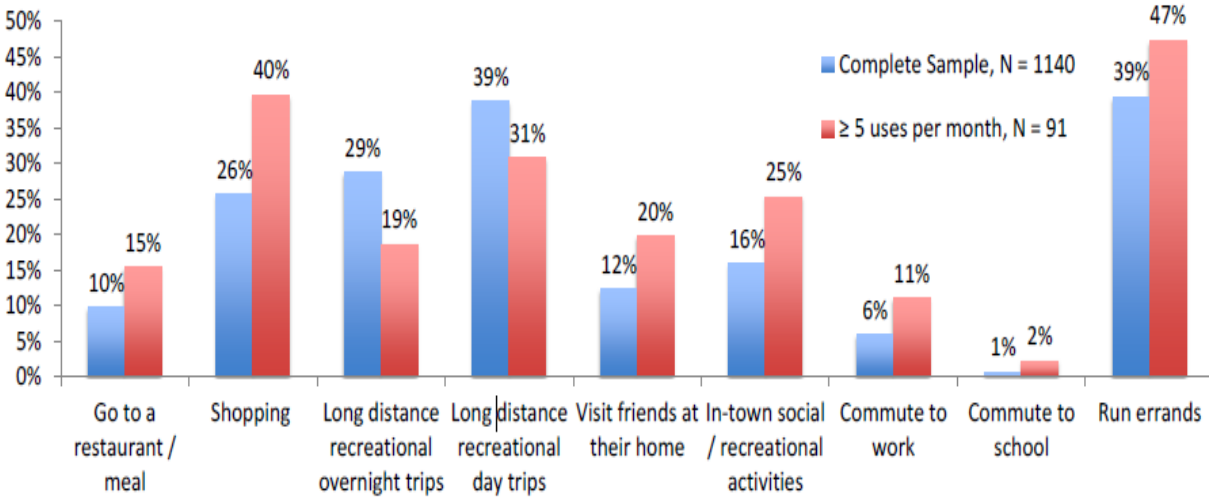


Plots 16:

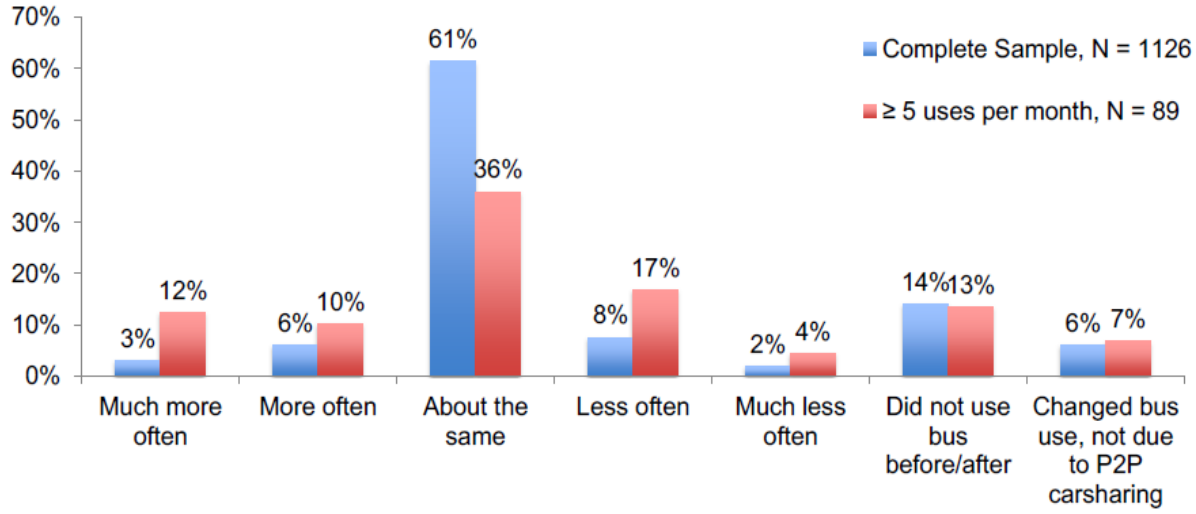
a) Frequency of Usage of P2P Carsharing



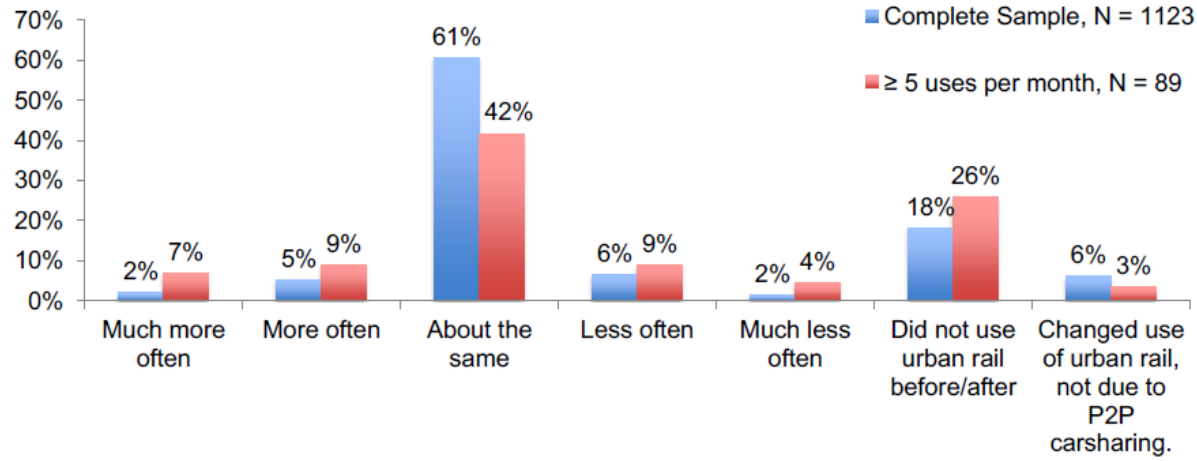
b) For what trip purposes do you use P2P carsharing vehicles?



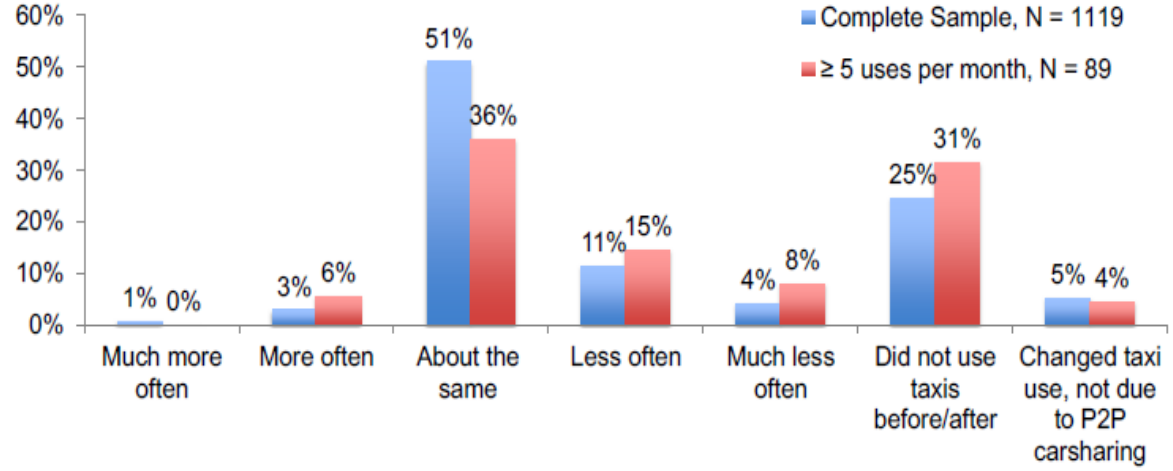
c) As a result of my membership with peer-to-peer carsharing, I use the bus…



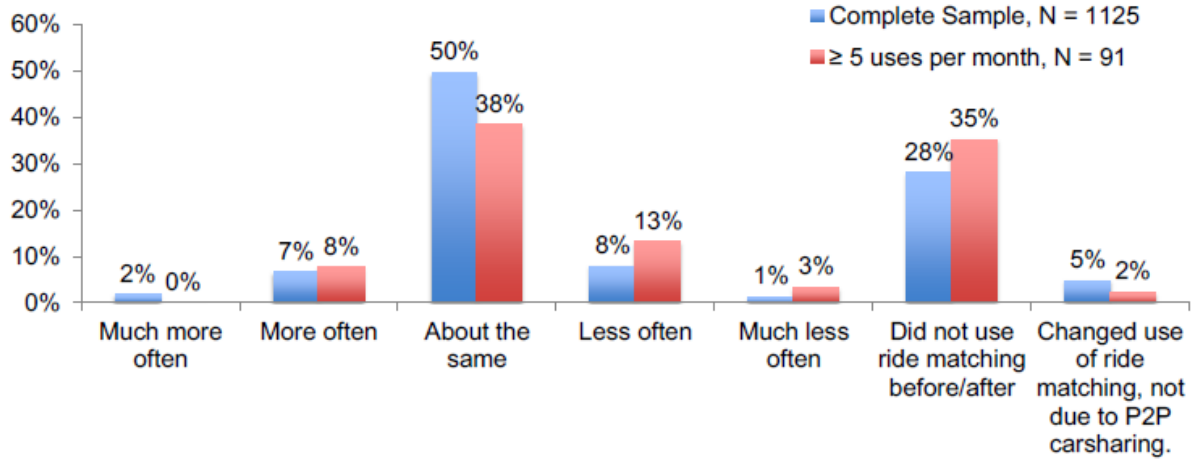
d) As a result of my membership with the P2P carsharing system, I use urban rail…



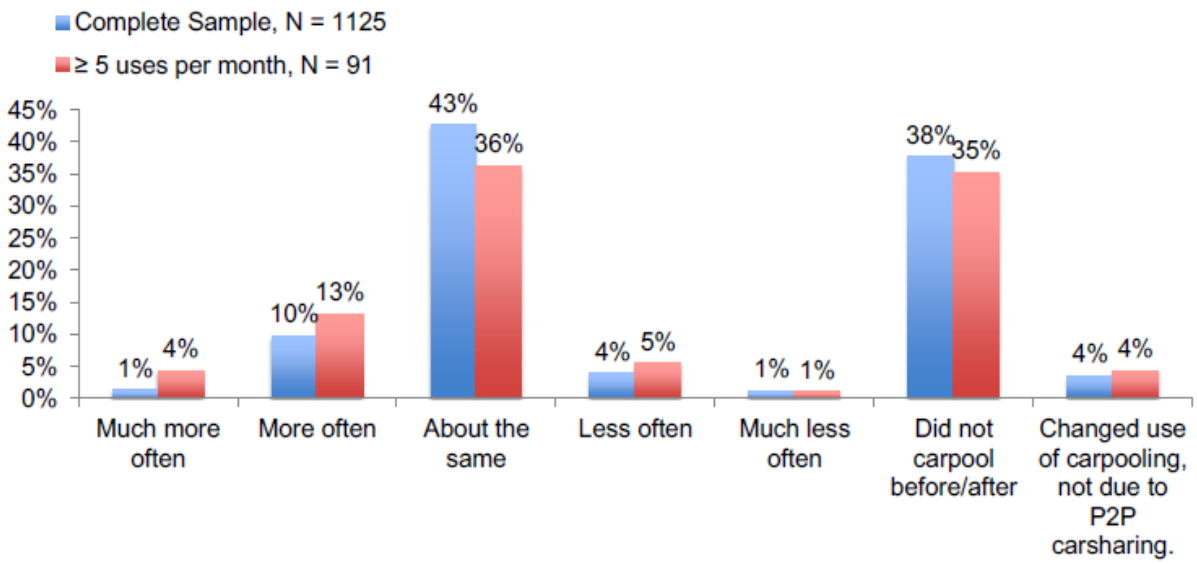
e) As a result of my membership with the P2P carsharing system, I use taxis…



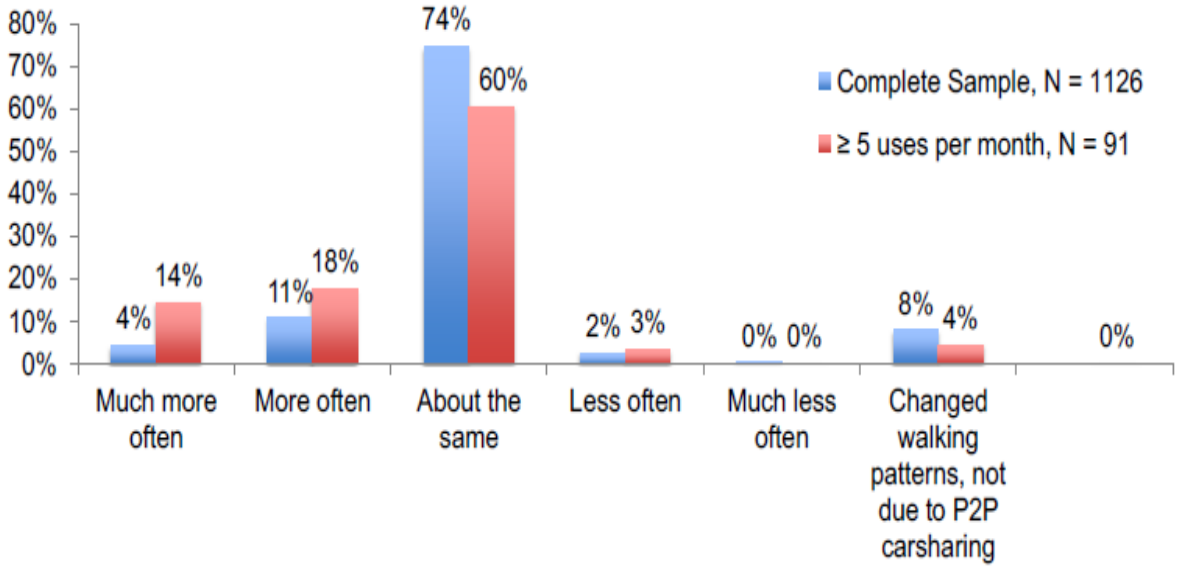
f) As a result of my membership with P2P carsharing, I use [ridesourcing/TNC] services (e.g., Lyft, Sidecar, Uber, etc)…



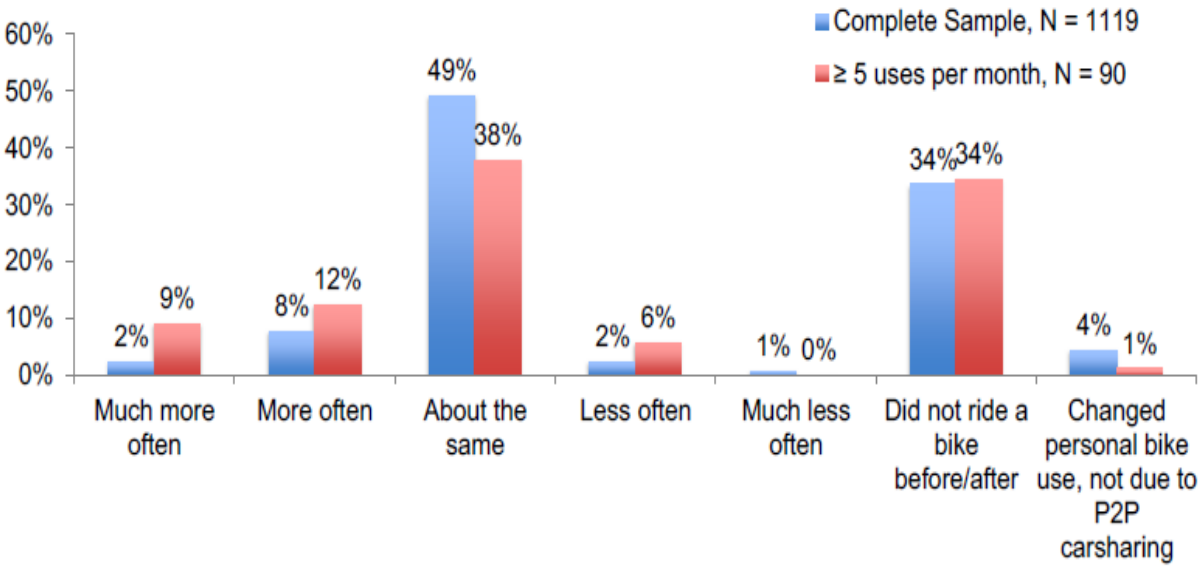
g) As a result of my membership with the P2P carsharing system, I carpool/rideshare…



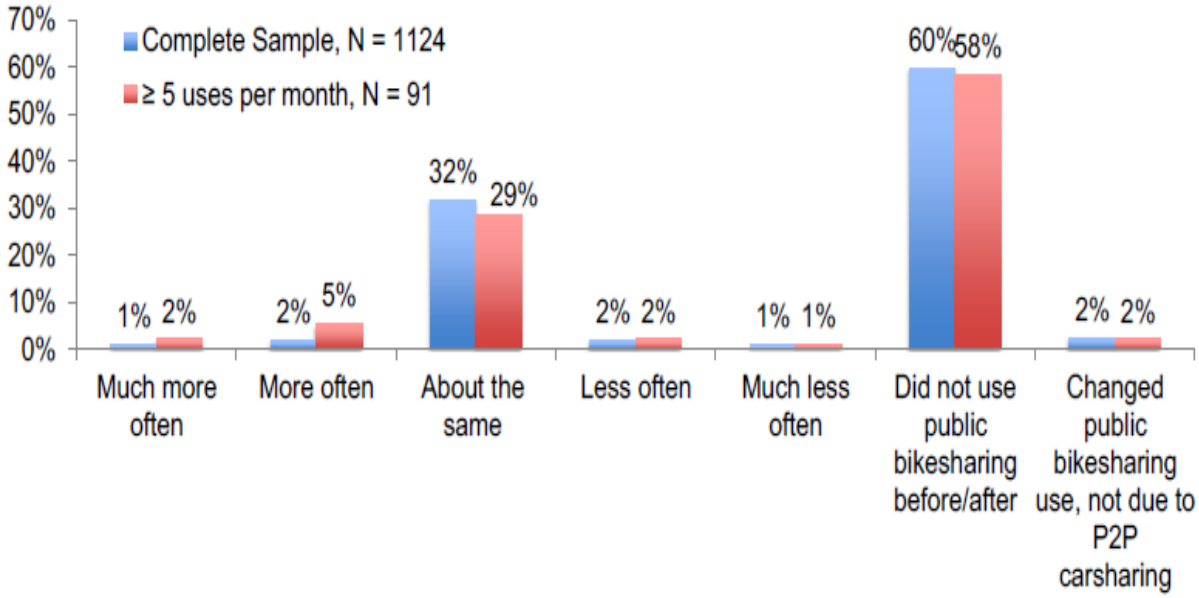
h) Modal Shift in Walking, Bicycling, and Public Bikesharing: As a result of my membership with the P2P carsharing system, I walk…



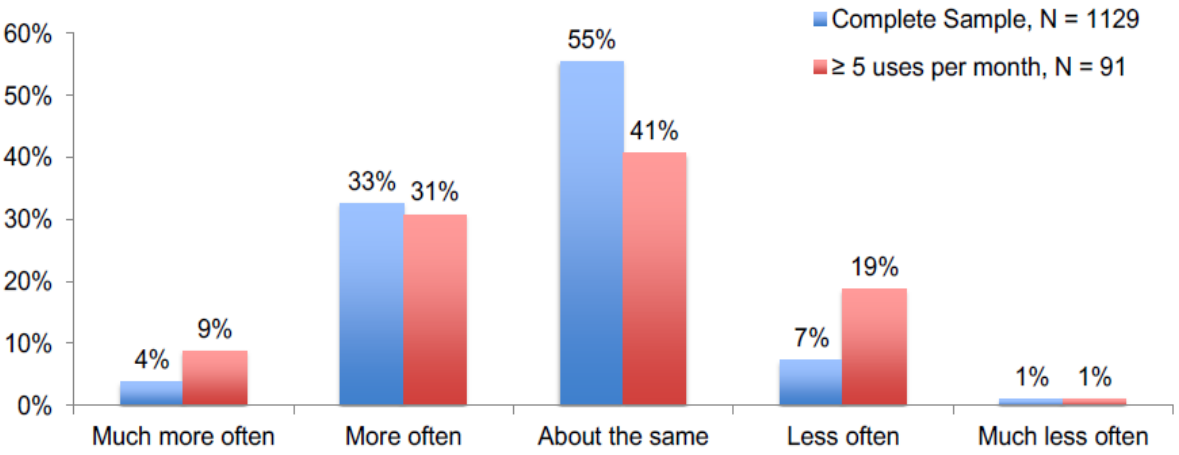
i) As a result of my membership with the P2P carsharing system, I use a personal bicycle…



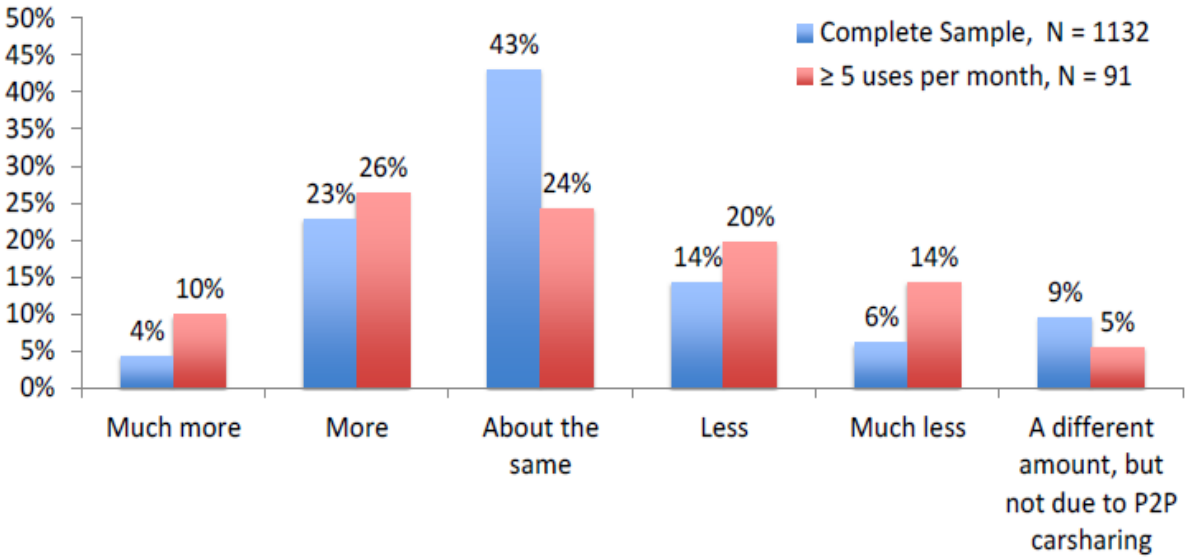
j) As a result of my membership with the P2P carsharing system, I use public bikesharing…



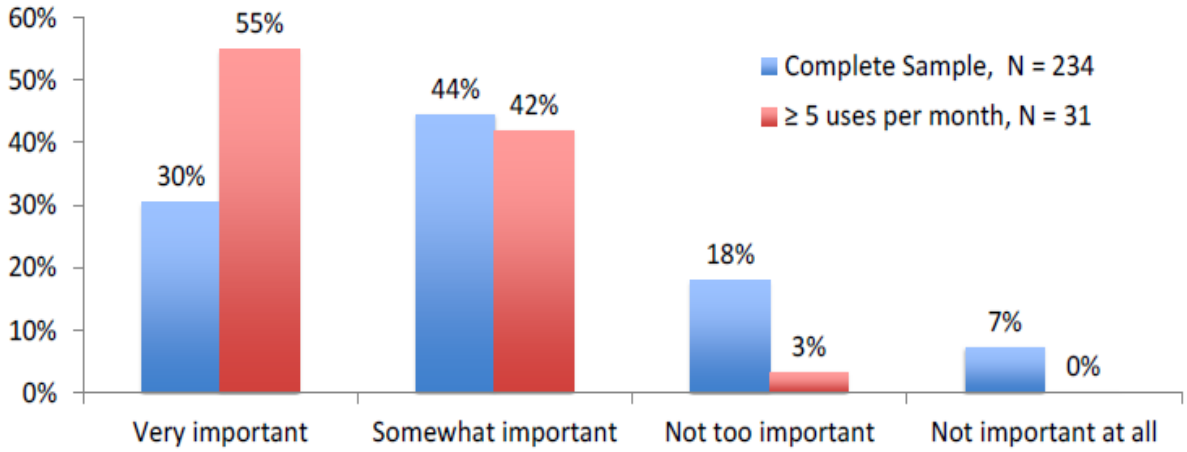
k) Shift in Tripmaking As A Result of P2P Carsharing: As a result of my membership with the P2P carsharing system, I make trips…



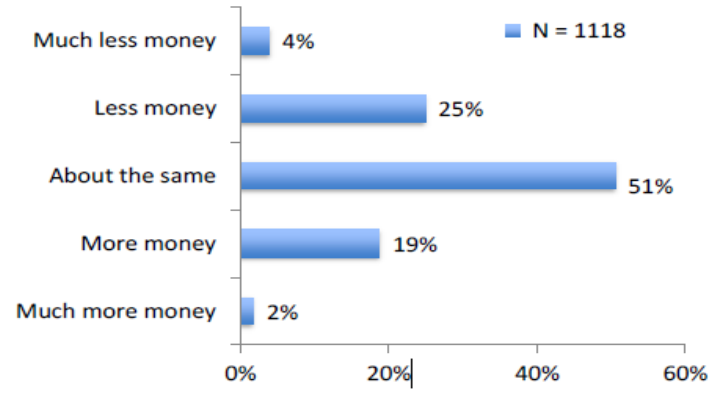
l) P2P Carsharing Influence on Driving: As a result of my membership with P2P carsharing, I drive overall…



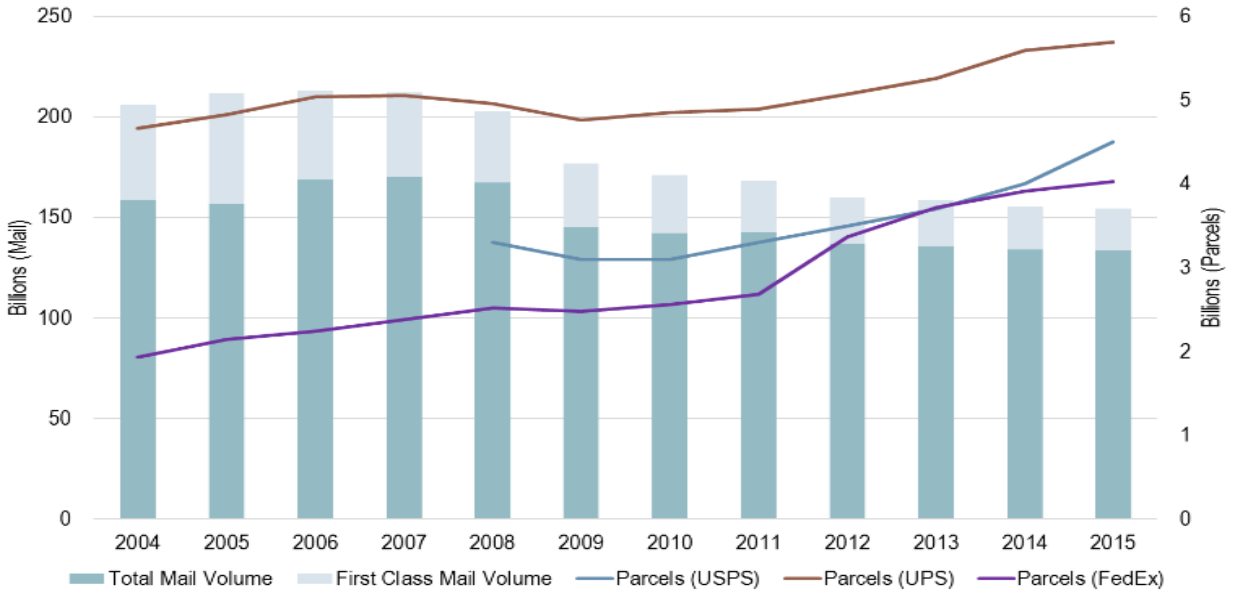
m) How important has P2P carsharing been in contributing to your REDUCTION in driving?



n) Because of P2P carsharing, I am spending on transportation...

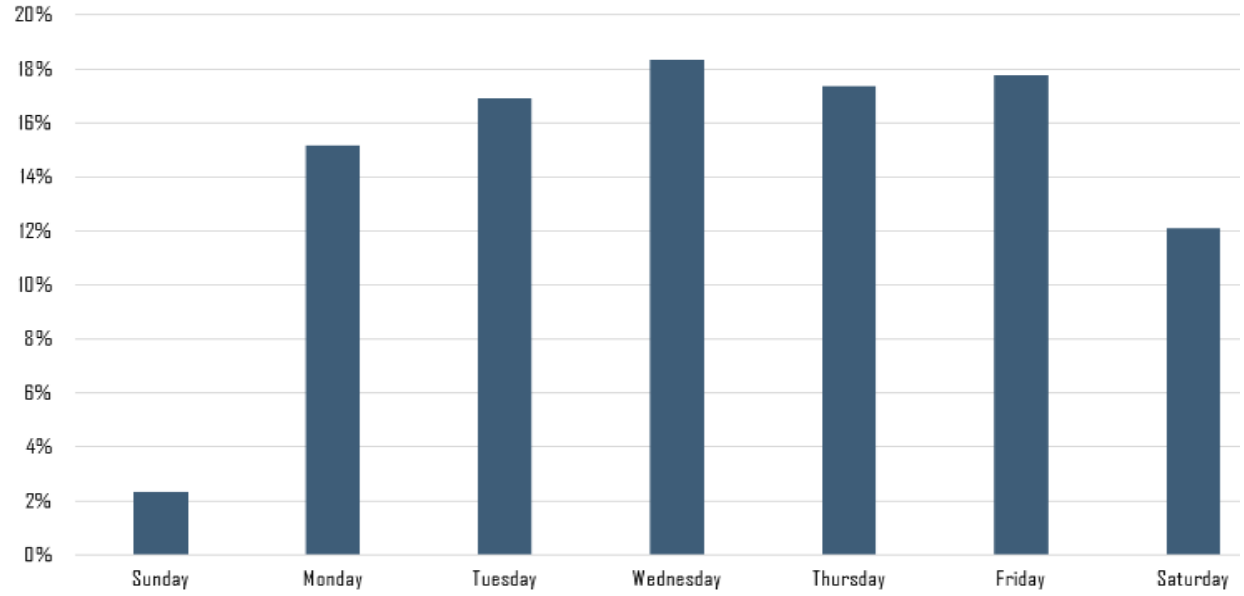


Plot 17: Mail Carried by USPS and Parcels Carried by Major Carriers, United States, 2004-2015

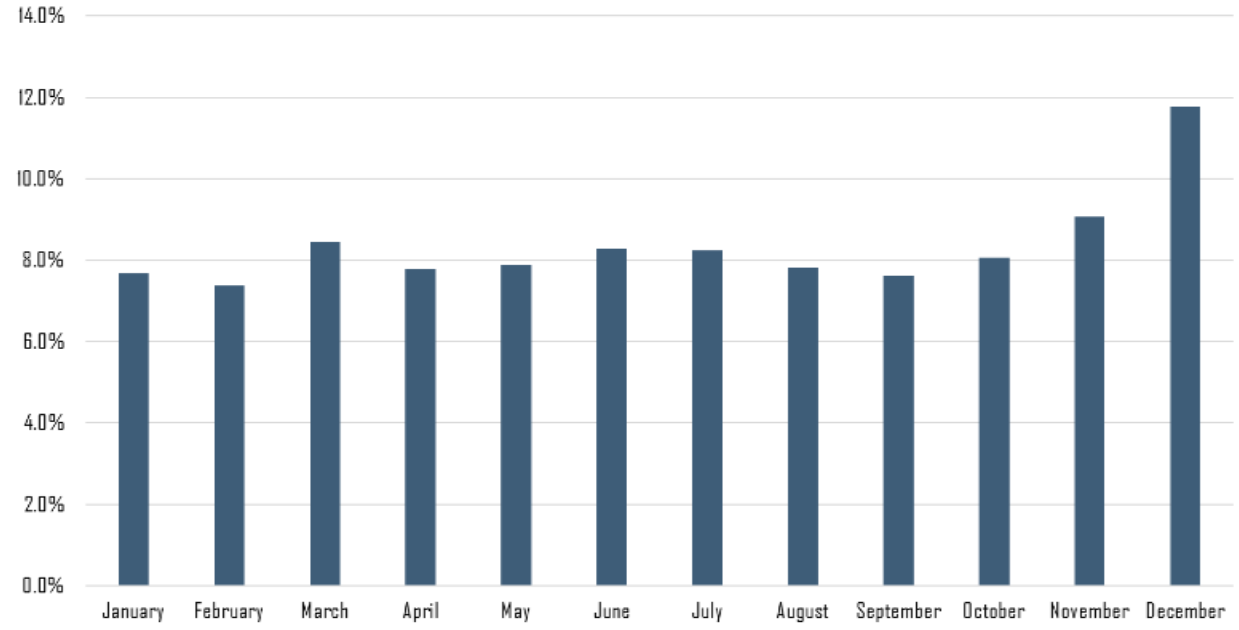


Plots 18:

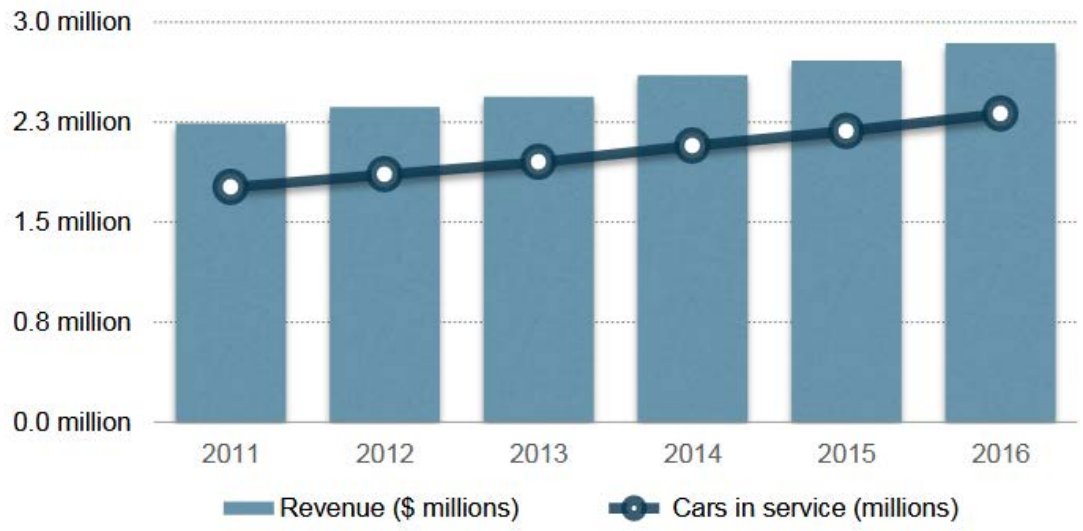
a) Weekly Delivery Frequency of Parcels for the Sampled Apartment Complex, 2016



b) Monthly Delivery Frequency of Parcels, 2016



Plot 19: The US Rental Car Market is Growing at 5.6% per year



Title: **Literature Review in Support of SB19-239**

PI: Erika Miller, PhD
Systems Engineering and Mechanical Engineering
Colorado State University, Fort Collins, CO 80523
erika.miller@colostate.edu
(970) 491-3346

Overview and Objectives:

CSU was tasked to conduct a literature review for CDOT to provide background and practical information on how other states, entities, and transportation entities have examined the transportation system impacts of adoption of new and emerging technologies and business models. Specifically, the literature review focused on collecting prior information regarding:
Breadth of knowledge on how other states, transportation agencies or transit agencies have addressed congestion model pricing in general and related to commercial vehicles, such as ride-sharing/ride-hailing or other transportation network companies;
Generate sufficient revenue for the state and local governments to mitigate specified impacts to the transportation system;
Adoption of zero-emissions vehicles for utilization as motor vehicles used for commercial purposes;
Incentivize multiple passenger ride sharing for motor vehicles used for commercial purposes and the use of such vehicles as a first and last mile solution for users of public transit; and
Vehicle automation adoption rates.

Methods:

The predominant focus of this literature review was finding sources available online, with an emphasis on academic publications, journal articles, and publications by cities, states, transit agencies, and for-profit companies. Several subject matter experts in the field were also interviewed to provide depth on available resources and key concepts to include in the online searches.
This document is organized into five key themes: Electric Vehicles, Emerging Mobility, Congestion Pricing, Road Usage Charge, and Multiple Passenger. The supporting figures referenced in this document are provided in th Appendix of the Word Document. The content included in these tables include the source of the reference, a summary of the key findings from the source, and a theme/subtheme for ease of sorting.

Literature Review in Support of SB19-239: ELECTRIC VEHICLES

Source	Notes	Theme	Subtheme
https://iopscience.iop.org/article/10.1088/1748-9326/aad0f8/pdf	The transport sector is responsible for 23% of global greenhouse gas (GHG) emissions and is expected to more than double by 2050. Transit sector is also the leading cause of local air pollution, with near-term damage from non-GHG air pollutants more severe than those from climate change. In the US, transport sector is responsible for 28% of GHG emissions; with 60% coming from light duty vehicles (LDVs).	Electric Vehicles	Environmental
https://iopscience.iop.org/article/10.1088/1748-9326/aad0f8/pdf	Transitioning from conventional gasoline vehicles to electric drivetrains is one solution to reduce GHG emissions and improve urban air quality and economic security. If plug-in electric vehicles (PEV) make up at least 40% of new vehicle sales globally by 2040, it will cause stabilizing GHG concentrations at 450 ppm.	Electric Vehicles	Environmental
http://calcleancars.org/about/zero-emission-vehicle-program/	Zero Emission Vehicles – or ZEVs – are vehicles that do not emit tailpipe pollution while being driven. ZEVs include three types of vehicles: pure battery electric vehicles (BEVs), hydrogen fuel cell vehicles, and “transitional” ZEVs such as plug-in hybrid electric vehicles (PHEVs) that operate part of the time on electricity. We need a large ZEV fleet on the road to help California meet its 2030 and 2050 greenhouse gas emissions reduction and air quality goals.	Electric Vehicles	Terminology
http://calcleancars.org/about/zero-emission-vehicle-program/	International ZEV Alliance In 2015, California led the founding of the International ZEV Alliance, a collaboration of countries and subnational governments to accelerate the global development of ZEVs. The 14 states and countries in the ZEV Alliance are working together to share best practices for incentives, utility programs and consumer outreach. In December 2015 at the United Nations Climate Change negotiations, California joined 12 countries, states and provinces announcing that it would strive to make all passenger vehicle sales ZEVs as quickly as possible, and no later than 2050. In October 2016, Quebec’s legislature unanimously adopted a zero emission vehicle standard to help get 100,000 ZEVs on the road by 2020.	Electric Vehicles	Case Study
http://www.zevalliance.org/wp-content/uploads/2015/12/ZEV-Alliance-COP21-Announcement_12032015.pdf	The International ZEV alliance has participants from different countries and cities including Baden-Württemberg, British Columbia, California, Connecticut, Germany, Maryland, Massachusetts, Netherlands, New Jersey, New York, Norway, Oregon, Québec, Rhode Island, United Kingdom, Vermont and Washington. International ZEV alliance’s goals: Provide incentives to encourage the purchase of ZEVs, and use fiscal policy on vehicles to aid environmental objectives Plan for and invest in growing ZEV infrastructure Perform public outreach to increase consumer awareness and acceptance Remove any government barriers to ZEVs Lead by example through the inclusion of ZEVs in government and public sector fleets Implement policies that require the deployment of ZEVs Deploy ZEVs when possible in medium- and heavy-duty transportation, including public transit Perform and commission research and development in ZEV technology and social science	Electric Vehicles	Case Study
https://iopscience.iop.org/article/10.1088/1748-9326/aad0f8/pdf	Since 2008, the US federal government and numerous states have offered a variety of PEV purchase incentives including: Monetary tax incentives such as income tax credits, rebate, and sales tax waiver Non-monetary incentives such as HOV lane access, Electric vehicle supply equipment (EVSE) installation credits, Home charging rate discounts offered by local utilities	Electric Vehicles	Incentivize
Diamond D 2008 Impact of high occupancy vehicle (HOV) lane incentives for hybrids in Virginia J. Public Transport.113 Diamond D 2009 The impact of government incentives for hybrid-electric vehicles: Evidence from US states Energy Pol.37972–83 Jenn A, Azevedo I L and Ferreira P 2013 The impact of federal incentives on the adoption of hybrid electric vehicles in the United States Energy Econ.40936–942 Gallagher K S and Muehlegger E 2011 Giving green to get green? Incentives and consumer adoption of hybrid vehicle technology J. Environ. Econ. Manage.611–15 Zhou Y, Levin T and Plotkin S E 2016Plug-in Electric Vehicle Policy Effectiveness: Literature Review ANL/ESD-16/8(Argonne, IL: Argonne National Laboratory)	Several studies that examined hybrid electric vehicle(HEV) adoption in the 2000’s found that incentives such as High Occupancy Vehicle(HOV) lane access and environmentalism, federal tax credits, state level sales tax waivers, gasoline price, income and age were all significant predictors of HEV sales in US. The availability of public charging is identified as necessary to increase adoption of plug-in electric vehicle, PEVs.	Electric Vehicles	Incentivize
https://iopscience.iop.org/article/10.1088/1748-9326/aad0f8/pdf	Several factors hinder adoption of electric vehicles in U.S such as lack of awareness about policy incentives, high upfront cost, long recharging time and range anxiety of owning battery electric vehicle, BEVs.	Electric Vehicles	Adoption
https://theicct.org/sites/default/files/publications/EV-charging-best-practices_ICCT-white-paper_04102017_vF.pdf	Public charging is an important part of the electric vehicle ecosystem and a key to growing the electric vehicle market. Norway and the Netherlands, which have seen electric vehicle shares higher than 5% of new sales, have public charging infrastructure per capita that is several times that of other leading markets. China, the world’s largest electric vehicle market by volume, has the highest number of charging stations, with more than 100,000 Level 2 and 38,000 direct current (DC) fast charge points. Multifaceted and collaborative approaches have been most successful in promoting early charging infrastructure buildout.	Electric Vehicles	Case Study
https://theicct.org/sites/default/files/publications/EV-charging-best-practices_ICCT-white-paper_04102017_vF.pdf	The availability of public charging is generally linked with electric vehicle uptake. Different types of public charging stations: Level 1 Charging : for up to 2 miles, Charging time: 30 minutes Level 2 Charging : for up to 10 miles, Charging time: 30 minutes DC Fast Charging : for up to 90 miles, Charging time: 30 minutes National vehicle markets with higher electric vehicle uptake tend to have more publicly available charging infrastructure. The basic national statistics indicate the need to build charging stations to help meet charging demand and increase electric vehicle consumer confidence as the market develops. Since the introduction of modern electric vehicles, many governments at the local and national level have promoted electric vehicle charging infrastructure in recognition of the necessity of charging stations for a mature market.	Electric Vehicles	Case Study
https://theicct.org/sites/default/files/publications/EV-charging-best-practices_ICCT-white-paper_04102017_vF.pdf	China: The central government, local governments, and utilities, have been active in quickly building a charging infrastructure network in China. The market, with more than 300,000 electric car sales and 1% of new sales in 2016, is set to meet increasing New Energy Vehicle quotas that are under development to at least triple electric sales in the 2020 period. The goal of central government is having electric vehicles reach 20% of national vehicle production, or about 7 million electric vehicles per year, by 2025. Japan: Since 2011, the government and the country’s major automakers have supported charging infrastructure as a key requirement for increased electric vehicle sales. In 2013, the government created the massive Next Generation Vehicle Charging Infrastructure Deployment Promotion Project to fund charging stations around cities and highway rest stations in 2013 and 2014. Almost 7,500 stations are now part of this network. France: In 2017, the French government in 2017 has stated a goal of shifting all vehicle sales to electric by 2040. Promotional programs for charging infrastructure have been in place for several years in France. The primary program, operated by the French Environment and Energy Management Agency to fund more than 12,000 charge points. Germany: Germany has sought to ramp up its charging infrastructure to match its electric mobility ambitions. Sales of electric vehicles had reached 100,000 by early 2017, and the German federal government has goals to reach 1 million by 2020 and 5 million by 2030. The Netherlands:As a global leader in electro mobility, the Netherlands has been on the forefront of charging infrastructure for several years, and many of its cities already have a dense network of charging stations in place. The Netherlands has ambitions to have electric vehicles reach 10% of new vehicles by 2020 and 50% by 2025. Norway:Norway is the global leader in national electric vehicle sales share, with approximately 30% in 2016, and it seeks to shift to 100% electric vehicle sales by 2025.The government has been a key driver of charging infrastructure through the early stages of the electric vehicle market and will continue to invest in this area.	Electric Vehicles	Case Study

Literature Review in Support of SB19-239: ELECTRIC VEHICLES

Source	Notes	Theme	Subtheme
https://theicct.org/sites/default/files/publications/EV-charging-best-practices_ICCT-white-paper_04102017_vF.pdf	United Kingdom:These plans have been announced to take forward legislative measures to ensure that sufficient charging infrastructure is available at Motorway Service Areas. Canada: Canada's electric vehicle market, driven by early growth in Québec and British Columbia, reached cumulative sales of more than 30,000 electric vehicles in early 2017. The government is working to write a national zero-emission vehicle strategy and has already committed $182.5 million for electric vehicle charging and hydrogen fueling infrastructure through 2017. United States:The U.S. electric vehicle market continues to grow.By the end of 2014, there were about 18,000 public Level 2 and DC fast electric charge points in the United States. Since then, charging infrastructure has been deployed with funding and authority from many different federal, state, and local agencies and has increased to more than 27,000 charge points by the end of 2015, and to 36,000 charge points at the end of 2016.California developed the EVI-Pro model, a tool that projects the number of home, workplace, and public charge points needed by 2025 in each county to correspond to the expected growth in the electric vehicle fleet.California developed the EVI-Pro model, a tool that projects the number of home, workplace, and public charge points needed by 2025 in each county to correspond to the expected growth in the electric vehicle fleet.Volkswagen will invest approximately $2 billion in charging infrastructure and other programs to support clean transportation across the United States for a 10-year period commencing in 2017, 40% of which will be invested in projects in California.	Electric Vehicles	Case Study
https://theicct.org/sites/default/files/publications/Consumer-EV-Awareness_ICCT_Working-Paper_23032017_vF.pdf	There is a general lack of knowledge and awareness about electric vehicles and this includes lack of familiarity with the new technology, lack of knowledge of available incentives and models, and misperception about the potential savings from lower fuel and maintenance costs. Less than half of U.S. consumers are able to name a specific plug-in electric vehicle make and model (Singer, 2015), Less than 35% of California households are aware of incentives offered for the purchase of electric vehicles. In a survey of 21 U.S. cities, about two-thirds of the respondents had misunderstandings about the basic characteristics of plug-in electric vehicles, and about 95% of them were not aware of available incentives. An IBM consumer survey similarly found that 45% of the surveyed drivers had little to no understanding of electric vehicles. The U.S. focused study found that only 49% of California new-car buyers were aware of the federal tax incentive, and only about 33% were aware of California's state-level incentive. Nationwide, only 44% of people were aware of the federal tax incentive. Based on a survey by Consumer Federation of America: greater consumer knowledge about electric vehicles and their desire to purchase one are correlated.	Electric Vehicles	Adoption
https://theicct.org/sites/default/files/publications/Consumer-EV-Awareness_ICCT_Working-Paper_23032017_vF.pdf	There are a wide range of awareness actions that are currently being implemented around the world: Information and Tools:Five distinct elements of electric vehicle awareness that relate to information and tools: general information, cost comparison, public charger location, incentives, and model avail-ability. General information:Electric vehicle informational materials are available on websites in Norway, the Netherlands, British Columbia, Québec and many others. Cost comparison tools: Based on the results of a survey in California of recipients of electric vehicle purchase rebates fuel cost savings are the primary motivation for selecting an electric vehicle. Availability of public charging infrastructure:There are many charging availability maps available, and related mobile applications in Norway, Netherlands, the United States, and France that provide additional convenience.Public events:Ride-and-drives and electric vehicle showcases are effective ways to draw media attention and allow consumers to experience electric vehicles. Examples:-California's Experience Electric campaign and Best.Ride.Ever.-Ride-and-drive series; National Test Drive Day in the Netherlands. -Mass Drive Clean in Québec.-The Electric Vehicle Symposium and Exhibition, Oregon's EV Fest.-Shanghai's EV Zone.Exposure to Electric Vehicles from fleets:Germany, Netherlands, Norway, United Kingdom, California, Oregon, Northeast U.S. States, British Columbia, Québec, Beijing and Shanghai have incorporated electric vehicles into public and government fleets to some extent, and there are electric vehicles available in car sharing/rental services in these regions.Regional Planning:Most governments now have some form of action plans for electric vehicles, and most have associated demonstration projects for the new technology.Examples:-California's ZEV action plan, California, 2016 -The Multi-State ZEV Action Plan, ZEV Program Implementation Task Force, 2015. -Oregon's Electric Avenue demonstration,2015-Québec's Transportation Electrification Action Plan 2015-2020. This action plan has a budget of more than $420 million.-Québec's Transportation Electrification Action Plan 2015-2020. This action plan has a budget of more than $420 million. -Germany's Electro mobility Model Regions and Showcase Regions for Electric Mobility. This project has a budget of €180 million (about $202 million), which has been allocated to four regions from 2012-2016 to spark public interest in electric mobility. China's "Ten Cities and 1,000 New Energy Vehicles" project. Consumer Awareness Campaigns:The goal of these campaigns is to raise consumer awareness of electric vehicles. Examples:United Kingdom's Go Ultra Low campaign -British Columbia's Emotive campaign; The E-mazing race in Canada; Social media marketing actions in Vermont and Québec.	Electric Vehicles	Case Study
https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&uact=8&ved=2ahUKEwjvh_7KiLrjAhWTGc0KHS5QAZkQFjAAegQIABAC&url=https%3A%2F%2Fgreet.es.anl.gov%2Ffiles%2Fincentivizing_pev&usg=AOvVaw1BpoOz9sl2MSJDwoILdHu0	Motivations for promoting PEV adoption include: Reducing petroleum use/dependence Reducing greenhouse gas (GHG) and other air pollutant emissions. Promoting economic growth. Categories of incentives and policies that promote PEVs MONETARY VEHICLE PURCHASE INCENTIVES: Monetary vehicle purchase incentives are direct payments, discounts, rebates, or tax credits to new PEV purchasers. These can be paid to the consumer at the time of purchase, or may be applied as a discount to the PEV purchase price, or as a rebate (redeemable after the vehicle purchase). Another incentive is reduction of income tax in the form of a tax credit to PEV purchasers. MONETARY VEHICLE USE/OWNERSHIP INCENTIVES: Vehicle ownership taxes or fees, including annual taxes, registration fees, or license plate fees may be reduced or waived. Some jurisdictions charge a registration fee for PEVs to cover reduced gasoline tax revenues. Other forms may include reduced or waived tolls on toll roads, or, in the case of company cars, reduced tax on a vehicle supplied by the company to employees. MONETARY INFRASTRUCTURE INCENTIVES: Subsidies, rebates, or tax credits to defer purchase and installation costs of electric vehicle supply equipment (EVSE, also called charging stations). It helps address the issues of limited BEV range and inability to charge the vehicle at home. Some PEV manufacturers and electric utility companies offer free or discounted PEV charging. NON-MONETARY INCENTIVES: Policies that allow PEV drivers to use dedicated bus lanes, high-occupancy vehicle (HOV) lanes, and parking areas. Other incentives focus on fuel economy or GHG emission standards and give preference to PEVs. Other methods offer relief from quotas or restrictions on vehicle purchase, registration, or daily use, such as relief from the lottery for license plates for PEV purchasers in some Chinese cities.	Electric Vehicles	Incentivize
https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=2&cad=rja&uact=8&ved=2ahUKEwi0-oPB27njAhUMVs0KHaqKCwkQFjABegQIBRAC&url=https%3A%2F%2Fwww.nescaum.org%2Fdocuments%2Fmulti-state-zev-action-plan.pdf%2F&usg=AOvVaw1QJ_RQMexKs_WmqzsGJ9jT	ZEV programs in United States: On October 2013, the governors of California, Connecticut, Maryland, Massachusetts, New York, Oregon, Rhode Island, and Vermont signed a memorandum of understanding (MOU) committing to coordinated action to ensure the successful implementation of their state zero-emission vehicle (ZEV) programs. The multi-state ZEV Program Implementation Task Force. These states are committed to having at least 3.3 million ZEVs operating on their roadways by 2025. The first Multi-State ZEV Action Plan, released in May 2014 and had significant progress: It guided many initiatives to support growth in the early market for ZEVs It made a new partnership with automakers to educate consumers about the many benefits of driving electric. It formed important international partnerships to promote transportation electrification. The multi-state ZEV Program identifies a series of partnership opportunities among states and key stakeholders that are critical to market acceleration. ZEVs will enhance energy security, diversity, and reliability by reducing our dependence on petroleum products for transportation fuel.	Electric Vehicles	Case Study

Literature Review in Support of SB19-239: ELECTRIC VEHICLES

Source	Notes	Theme	Subtheme
https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=2&cad=rja&uact=8&ved=2ahUKEwi0-oPB27njAhUMVs0KHaqKCwkQFjABegQIBRAC&url=https%3A%2F%2Fwww.nescaum.org%2Fdocuments%2Fmulti-state-zev-action-plan.pdf%2F&usg=AOvVaw1QJ_RQMexKs_WmqzsGJ9jT	In 2013, about 96,000 PEVs were sold in U.S, nearly double 2012 sales of 53,000 and more than five times first year sales of 17,500 in 2011. Sales of full battery-electric vehicles increased by more than 330 percent, from 14,251 in 2012 to 47,694 in 2013. Additional Actions for Consideration by Individual States: ZEV Incentives: -State rebates, sales tax credits, and other programs such as excise tax exemptions -Alternative models such as electric utility tariffs that compensate owners of electric vehicles for services provided. -High Occupancy Vehicle (HOV) lane access for ZEVs regardless of number of passengers. -Toll reduction for ZEVs in the early years of the program -Statewide policy to provide parking benefits for ZEVs in the near term at government-owned buildings, parking lots, and other properties, including preferential parking and reduced or waived parking fees. Partnership Opportunities -Making effective partnerships among our states and a host of stakeholders, including municipalities, the federal government, the private sector, academia, and the nonprofit community: 1-Collaboration with automobile manufacturers to grow the knowledge base and build consumer and dealer awareness 2-Collaboration with automobile dealers and their associations to explore and develop effective ZEV marketing strategies and opportunities 3-Collaboration with EVSE, The Electric Vehicle Supply Equipment manufacturers and providers 4-Development of partnerships with electricity providers 5-Collaboration with academic and government research institutions 6-Collaboration with nonprofit partners and federal agencies to promote ZEV deployment	Electric Vehicles	Incentivize
https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=2&cad=rja&uact=8&ved=2ahUKEwi0-oPB27njAhUMVs0KHaqKCwkQFjABegQIBRAC&url=https%3A%2F%2Fwww.nescaum.org%2Fdocuments%2Fmulti-state-zev-action-plan.pdf%2F&usg=AOvVaw1QJ_RQMexKs_WmqzsGJ9jT	Key initiatives of Multi-State ZEV Action Plan: Incentivizing Charging Stations. Most Task Force states offer grants, tax credits or rebates to public agencies, businesses and large institutions for EVSE deployment Encouraging Business Investment. Through outreach, ride and drive events and recognition programs, states are showcasing private sector leadership Enabling Utility Investment. State public utility commissions have exempted EVSE providers from regulation as utilities and utility proposals for rate-payer funded charging infrastructure programs have been approved or are pending in a majority of the Task Force states.	Electric Vehicles	Incentivize
https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&uact=8&ved=2ahUKEwj-zs-WzLfjAhWRXc0KHY0pBgsQFjAAegQIAhAC&url=https%3A%2F%2Fwww.nescaum.org%2Fdocuments%2F2018-zev-action-plan.pdf&usg=AOvVaw0MeREgesFUeJmnbh57Jsud	In March 2018, northeast states and automakers jointly launched Drive Change. Drive Electric. A brand-neutral campaign to increase awareness, consideration and acceptance of EVs in the Northeast. Drive Change. Drive Electric activities: Showcasing the convenience, affordability, technology, sustainability and performance of ZEVs Robust brand-specific advertising and marketing by automakers and dealers across the Task Force states.	Electric Vehicles	Adoption
http://sustainhv.org/programs/marketplace-empowerment/drive-electric-hudson-valley/	The New York State set the goal of getting a million electric vehicles on the road by 2025. With support from the New York State Energy Research and Development Authority (NYSERDA). Drive Electric Hudson Valley empowers drivers, car dealers and communities with: -Consumer education through workshops and the media, -Group purchases and discounts, -Car dealer training and mentoring, -Help for communities with infrastructure planning and municipal procurement. The plan provided individual help for consumers, raised awareness through social media, trained dealerships, and advised potential charging site hosts. This coordinated effort produced 152 ZEV sales in this semi-rural area in nine months. Nissan USA is offering Central Hudson customers a $5,000 dealer incentive. New York is offering electric car buyers the Drive Clean Rebate of up to $2,000 for new car purchases or leases. Combine that with a Federal Tax Credit of up to $7,500. There is over 2,000 public charging stations across New York State.	Electric Vehicles	Case Study
https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&uact=8&ved=2ahUKEwj-zs-WzLfjAhWRXc0KHY0pBgsQFjAAegQIAhAC&url=https%3A%2F%2Fwww.nescaum.org%2Fdocuments%2F2018-zev-action-plan.pdf&usg=AOvVaw0MeREgesFUeJmnbh57Jsud	New York's Drive Clean Rebate have helped more than 6,500 residents buy or lease a BEV or PHEV in just 12 months. Those vehicles saved 17,000 metric tons of GHG emissions.	Electric Vehicles	Environmental
https://www.greencarcongress.com/2018/10/20181004-veloz.html	In California, public and private stakeholders in the transportation sector launched a new organization-Veloz-to accelerate the adoption of EVs. Electrify America has announced a commitment of $2 million in matching funds to the Veloz campaign. Veloz members include: -Automakers, including GM, BMW Group, Honda, Nissan, Kia, Subaru, Daimler, Fiat Chrysler Automobiles and Ford. -Electricity providers, including Pacific Gas and Electric, Southern California Edison, San Diego Gas & Electric, the Los Angeles Department of Water and Power and Sacramento Municipal Utility District. -Charging network providers, including EVgo, Greenlots and Electrify America. -Policymakers representing the California Energy Commission, California Air Resources Board, California Public Utilities Commission, California Department of Transportation, California ISO and other key offices. -Local government: Bay Area Air Quality Management District. -Nonprofit organizations, including the Sierra Club, CALSTART, NextGen Policy Center, The Greenlining Institute and World Resources Institute. -Others: AECOM, Uber, Lyft, California New Car Dealers Association, Center for Sustainable Energy, EDF Renewable Energy, Electric Power Research Institute, Hubject, PlugShare and Proterra.	Electric Vehicles	Case Study
https://www.electricforall.org/about-us	"Electric For All", the first project of Veloz, is the largest multi-stakeholder, multi-million dollar public awareness campaign in North America. In 2018, Veloz rolled out the first phase of Electric For All with its "Opposites Attract" social and digital media campaign using short form video and memes to communicate directly to target audiences across the state.	Electric Vehicles	Adoption
https://www.veloz.org/initiatives/electric-for-all/	In summer 2019, Arnold Schwarzenegger, teamed up with Veloz to launch the Kicking Gas campaign—an edgy, funny series of movie shorts designed to bust barriers and kick down the norms of traditional electric car campaigns.	Electric Vehicles	Adoption
https://energycenter.org/program/clean-vehicle-rebate-project	Clean Vehicle Rebate Project Center of Sustainable Energy (CSE), is statewide administrator of the Clean Vehicle Rebate Project (CVRP), an initiative of the California Environmental Protection Agency's Air Resources Board providing rebates for the purchase or lease of zero-emission and plug-in hybrid light-duty vehicles. -Since program inception in 2009, CSE has issued over $621 million to fund rebates for individuals, nonprofits, government entities and business owners. -CSE has administered and processed more than $621,000,000 in rebates for plug-in, electric and alternative fuel vehicles in California. -CSE has administered and processed more than 277,000 rebates for plug-in, electric and alternative fuel vehicles in California -CVRP attended over 650 education and outreach events to promote the adoption of zero-emission vehicles.	Electric Vehicles	Incentivize

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https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&uact=8&ved=2ahUKEwj-zs-WzLfjAhWRXc0KHY0pBgsQFjAAegQIAhAC&url=https%3A%2F%2Fwww.nescaum.org%2Fdocuments%2F2018-zev-action-plan.pdf&usg=AOvVaw0MeREgesFUeJmnbh57Jsud	According to surveys of California's Clean Vehicle Rebate: Purchase incentives play a crucial role in early ZEV adoption and should be maintained or expanded to sustain growth in the ZEV market. For nearly all, the rebate was essential for making their purchase possible. 52%: Rebate moderately to extremely important to make purchase/lease possible. 38%: Would not have purchased without the rebate. Carpool lane access was also a major motivating factor. According to a Similar national surveys: In 2008, a tax credit of up to $7500 for PHEV (plug-in hybrid electric vehicle) and BEV (battery electric vehicle) purchases has enabled hundreds of thousands of car buyers to choose a ZEV rather than a comparable car with an internal combustion engine that is less expensive.	Electric Vehicles	Case Study
https://www.mass.gov/files/mdc-2016-final-report-final_1.pdf	Massachusetts' MASS DRIVE CLEAN Campaign MASS DRIVE CLEAN (MDC) is the nation's longest running and largest statewide plug-in electric vehicle (PEV) education campaign. Since its inception in 2015, MDC has introduced hundreds of thousands of people to the benefits of driving electric and the latest generation of PEVs. The campaign is a private-public partnership including the Commonwealth of Massachusetts, REACH Strategies, Plug In America, National Grid, Ever source, and others. The post-event surveys have shown the impact of a first-hand experience can produce a consumer conversion rate to PEV purchase/lease of up to 12.5%. -In 2016, MASS DRIVE CLEAN (MDC) completed its second year. -Through thirteen events conducted with eleven different site hosts, MASS DRIVE CLEAN: •Delivered a safe and positive EV test drive experience to over 1,100 people; •Provided the first EV test drive ever for the overwhelming majority of participants - at least 79% of those taking test drives reported it was their first ever experience driving a plug-in electric vehicle (PEV); •Reached at least another 50,000 or more residents with information about the campaign and Massachusetts PEV incentives via campaign-related outreach and handouts. -The campaign has proven beneficial for a range of Massachusetts businesses. Leading companies like Analog, Raytheon, National Grid, and educational institutions like Worcester Polytechnic Institute and UMass Amherst participated as site hosts. -Quirk Chevrolet, a regular participant in MDC events, has become one of the leading Chevy Bolt dealers in the nation. 2015 Impact Survey findings: •75% had never before driven a PEV; •83% had a more favorable view of PEVs after their test drive; •73% had never before been a passenger in a PEV; •68% stated they were more likely to purchase a PEV post-test drive 2016 IMPACT Survey findings: •79% had never before driven a PEV; •84% had a more favorable view of PEVs after their test drive; •72% stated they were more likely to purchase a PEV post-test drive; •12.5% of follow-up survey respondents leased/purchased vehicles within six months of their experience; •74% stated that they would probably make an EV their next vehicle purchase; •82% of participants had spoken with family or associates about electric vehicles and 70% looked online for information about electric vehicles after the event; •52% drove another electric vehicle and 28% had visited an electric vehicle dealership in person in the months following the event. MASS DRIVE CLEAN 2017 Survey results: •75% of consumers know little or nothing at all about electric vehicle State-sponsored ride and drive campaign show its effectiveness in changing consumer receptivity to ZEVs: •70% had never before driven a PEV; •84% had a more favorable view of PEVs after their test drive; •79% stated they were more likely to purchase a PEV post-test drive; Based on 1,076 Pre-Test Drive Surveys and 632 Post-Test Drive Surveys: •81% stated they would probably make a PEV their next vehicle purchase Based on 20% response rate more than 6 months after Test Drive Event: •11% leased/purchased vehicles within six months of their experience.	Electric Vehicles	Case Study
https://mde.maryland.gov/MarylandGreen/Documents/EV_dealershipflyer_online.pdf	Available incentives to Maryland citizens and businesses that purchase or lease these vehicles: ●Federal Income Tax Credit for buyers of new plug-in electric vehicles which ranges from $2,500 to $7,500. Toyota Prius Prime: $4,502 Chevrolet Volt, Chrysler Pacifica, Nissan Leaf, others:$7,500 ● Maryland Excise Tax Credit: A Maryland excise titling tax credit of $100/kWh of battery capacity up to $3,000 is available to buyers and leasers of qualifying new plug-in electric vehicles whose purchase price does not exceed $60,000 The credit is effective July 1, 2017 through June 30, 2020. ● Use of High Occupancy Vehicle (HOV) Lanes Drivers of a plug-in electric vehicles titled and registered in Maryland, are allowed to use all HOV lanes in Maryland regardless of the number of passengers. The permit will be valid from October 1,2010 through October 31, 2022. ● Rebates for Charging Stations Rebates are available for all of charging systems and cover 40 percent of the equipment and installation cost up to a limit ($700 for residential, $4,000 for commercial and $5,000 for service stations) for systems purchased and installed between July 1,2017and June 30, 2020.	Electric Vehicles	Incentivize
https://www.merkley.senate.gov/news/press-releases/merkley-welch-introduce-bicameral-legislation-to-extend-electric-vehicle-tax-credit-2019	In April 2019, Oregon's Senator and Congressman introduced the Electric Cars Act of 2019, bicameral legislation to fully extend the electric vehicle tax credit for 10 years, and help deploy critical alternative fuel charging infrastructure. A recent survey found: 74%: The tax credit would affect their decision to buy an EV, 63%: The credit is an important measure to support EV adoption. The Electric Cars Act would improve the tax credit by: ●Eliminating the per manufacturer cap, allowing consumers access to the tax credit for the next 10 years, regardless of the manufacturer from which they purchase their car. ●Allowing buyers to use the tax credit over a 5-year period, or apply the credit at the point of sale, making the credit more applicable to those without large tax liability. ●Providing a 10-year extension of tax credits for alternative fuel vehicles and charging infrastructure.	Electric Vehicles	Case Study
https://sonomacleanpower.org/news/drive-ev-results	Sonoma electric vehicle (EV) incentive program, Drive EV As an effort to reduce local greenhouse gas emissions, Sonoma Clean Power has helped incentivize 1,258 electric vehicles for customers over the past 3 years. -With Drive EV program, SCP customers were eligible to receive a combination of incentives, dealer discounts, and manufacturer discounts of up to $13,000 towards the purchase or lease of an electric vehicle or plug-in hybrid. Drive EV results: -A significant increase in the number of vehicles that were purchased with the program versus leased. -In 2016, only 14% of the incentives went towards purchasing vehicles. However, in this last year, 53% of the incentives were used to purchase vehicles. -This trend supports the car industry's prediction that more people will commit to making the switch to an electric vehicle as the technology, range, and batteries continue to improve.	Electric Vehicles	Incentivize

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https://theicct.org/sites/default/files/publications/Consumer-EV-Awareness_ICCT_Working-Paper_23032017_vF.pdf	Case studies on consumer electric vehicle programs -United Kingdom: Go Ultra low National Campaign: www.goultralow.com -United States: National Drive Electric Week City events: Three nongovernmental organizations (Plug-In America, the Sierra Club, and the Electric Auto Association) serve as the national team to support the various events across the country. -Shanghai, China: EV Demonstration Zone Shanghai is one of China's chosen pilot cities with special goals, incentives, and local actions to spur the electric vehicle market. Amsterdam, Netherlands: Local exposure and visibility actions. Quebec, Canada: Government actions to promote electric vehicles. Results from Electric Vehicle consumer awareness activities: 1-Action to increase consumer awareness is a key part of supporting the growth in the early electric vehicle market 2-Stakeholders would ideally collaborate to leverage strengths and effectively utilize limited resources on electric vehicle awareness campaigns. 3-Sustained programs that utilize a broad range of outreach and awareness actions are more likely to capture a wider audience of prospective electric vehicle consumers. 4-Local context and resources can be important in assessing the feasibility and effectiveness of an electric vehicle consumer awareness program.	Electric Vehicles	Case Study
https://www.eia.gov/analysis/studies/transportation/zeroemissions/pdf/zero_emissions.pdf	Many U.S. states offer incentives to promote ZEV (Zero emission vehicle) and PHEV (Plug-in hybrid electric vehicle) adoption including: Financial subsidies, such as rebates, tax exemptions, grants, and loans, Incentives for vehicle use, such as free parking, high occupancy vehicle (HOV) lane access, and emission inspection exemptions. Incentives that target electric vehicle supply equipment (EVSE) such as rebates and tax credits for installing charging equipment.	Electric Vehicles	Incentivize
https://www.eei.org/issuesandpolicy/electrictransportation/Documents/Accelerating_EV_Adoption_final_Feb2018.pdf	Electric Company Role Electric companies can: Expand customer access to EVs. Help to make EVs available to all customers and address the need for broad access to EV charging. Help to expand the use of EVs across multiple modes of transportation, including passenger vehicles, fleets, trucks, and buses, by lowering barriers. Integrate EVs into the energy grid in an efficient and cost-effective manner. Accelerate the transition to widespread EV adoption Develop a system of charging infrastructure that works. Home and workplace charging must be easy and affordable since this is where most charging occurs. Support the build-out of public charging infrastructure that can be used by car-sharing or ride-hailing programs, providing the benefits of EVs to those who may not even own a car.	Electric Vehicles	Adoption
https://www.nyserda.ny.gov/All-Programs/Programs/Drive-Clean-Rebate/About-Electric-Cars	Top 5 Reasons to Consider an Electric Car Exhilarating: Electric cars deliver fast and smooth acceleration. For pickup that is intuitive and responsive to the driver, the electric car cannot be beat. Captivating: Electric cars offer a technology-rich experience. Whether it's to preheat your car without garage emissions, or to turn up the bass on your speakers without engine distortions, electric cars are at the cutting edge of comfort. Satisfying: Electric cars keep saving you time and money, because you will take fewer or no trips to the gas station. Electric motors also do not need oil changes, so they require less maintenance than conventional gas-powered cars. Inspiring: By driving a clean car, you help drive towards a cleaner future. Transportation still accounts for 42% of NYS' greenhouse gas emissions today, so each electric car that replaces a gas vehicle will make a positive difference. Rewarding: With the Drive Clean Rebate, you can get a point-of-sale rebate of up to $2,000 on your new electric car. Combine that with a Federal Tax Credit of up to $7,500, and it is a very rewarding time to be an electric car owner.	Electric Vehicles	Adoption
https://www.eei.org/issuesandpolicy/electrictransportation/Documents/Accelerating_EV_Adoption_final_Feb2018.pdf	ZEV benefits EVs provide major benefits for the environment, for customers, for the nation's energy grid, and for national security. ●Environmental Benefits: -Reducing carbon dioxide (CO_2) emissions due to an increasingly clean energy mix. In 2016, the electric power industry's CO_2 emissions were nearly 25 percent below 2005 levels. For the first time in more than 40 years, CO_2 emissions for the power sector were below CO_2 emissions for transportation. ●Customer Benefits: -Fuel-cost savings: EVs are cheaper to operate than gasoline vehicles due to the lower cost of electricity on and lower maintenance costs. ●Energy Grid Benefits: EVs, coupled with managed charging, result in more efficient utilization of the energy grid, which lowers the average cost to serve for all customers. ●National Security Benefits: EVs are 100 percent powered by a domestic mix of energy sources, including natural gas, coal, nuclear, hydropower, wind, and solar. This is in stark contrast to gasoline-fueled vehicles, which depend solely on oil—only40 percent of which is domestically.	Electric Vehicles	Environmental
https://drive.google.com/file/d/1mqRd_JfcDpFeMXvRzshX1mWxnYw4hOw0/view	ZEV benefits Electric vehicles cost more than a comparable gasoline car but not for long, concluded the state Air Pollution Control Division report. -The average electric vehicle will cost $6,303 more than a gasoline vehicle in 2023. However; fuel savings and lower maintenance translates into consumer savings of $3,874 after 150,000 miles. -The cost of gasoline fuel is 2.5 times higher than electric fuel. -The cost of EVs are expected to decline until they are priced about the same as a gasoline vehicle in 2028. -A ZEV mandate would reduce greenhouse gas emissions by 2.2 million metric tons by 2030.	Electric Vehicles	Environmental
https://www.cnet.com/roadshow/news/colorado-mandates-zero-emission-vehicle-program/	Colorado already offers a $5,000 state-level incentive for EV purchases. Colorado goal is utilizing 100 percent renewable energy by 2040 and transitioning to EVs by 2050 on a large scale, which could save billions of dollars in lower vehicle operating costs, health savings and reduced electricity bills.	Electric Vehicles	Case Study

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https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&uact=8&ved=2ahUKEwjvh_7KiLrjAhWTGc0KHS5QAZkQFjAAegQIABAC&url=https%3A%2F%2Fgreet.es.anl.gov%2Ffiles%2Fincentivizing_pev&usg=AOvVaw1BpoOz9sl2MSJDwoILdHu0	ZEV incentives: Financial incentives appear to be generally effective if sufficiently generous or if combined with other policies. -The U.S. Federal government incentivizes PEV adoption through an income tax credit for consumers purchasing a qualified PEV. A qualified PEV (plug-in electric vehicle) is one that draws propulsion energy from a battery with at least 5 kilowatt hours (kWh) of capacity. The amount of the credit for PEVs: $2,500 plus $417 for each additional kilowatt-hour of battery capacity, not to exceed $7,500. From 2010 through February 2018both GM and Tesla have sold more than 170,000 vehicles From 2013 TO 2017:: -The State of California offers several PEV incentives: ●Under the California Clean Vehicle Rebate Program, California residents receive up to $2,500 for the purchase or lease of a new, eligible light-duty BEV and up to $1,500 for a new, eligible light-duty PHEV ●Sales shares of both BEVs and PHEVs have doubled since 2013. Georgia: ●The State of Georgia offered a tax credit of 10% of the cost of PEVs up to $2,500, which expired in June 2015. ●Plug-in electric vehicles are allowed to use HOV lanes and high occupancy toll (HOT) lanes without paying a toll, regardless of the number of passengers. ●Businesses that install publicly accessible EVSEs can claim an income tax credit for the purchase or lease of the EVSE for 10% of its cost up to $2,500.00 ●Annual BEV sales shares increased and were high while the tax credit was offered, but have dropped off since the credit ended. New York: ●The State of New York offers rebates of up to $2,000 for the purchase or lease of a new, eligible PEV. ●An income tax credit for 50% of the cost of alternative fueling infrastructure, including electric vehicle supply equipment, for up to $5,000. ●PEVs are eligible for a discounted toll rate on Port Authority of New York and New Jersey off peak hour crossings. ●Eligible PEVs and hybrid electric vehicles can use the Long Island Expressway HOV lanes, regardless of the number of occupants in the vehicle. ●Municipality may receive up to $5,000 per ZEV with an electric range of 50 miles or greater and $2,500 per ZEV with an electric range of 10 to 50 miles. ●Municipalities may also receive up to $250,000 for EVSE installation.	Electric Vehicles	Incentivize
https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&uact=8&ved=2ahUKEwjvh_7KiLrjAhWTGc0KHS5QAZkQFjAAegQIABAC&url=https%3A%2F%2Fgreet.es.anl.gov%2Ffiles%2Fincentivizing_pev&usg=AOvVaw1BpoOz9sl2MSJDwoILdHu0	Michigan: ●Michigan exempts PEVs from emissions inspection requirements. Washington: ●New, qualifying PEVs are exempt from state motor vehicle sales tax. ●In Washington State, both BEV and PHEV sales shares are higher than the U.S. average. Norway: ●Several tax benefits that significantly reduce the acquisition cost of PEVs. ●BEVs have had an exemption from the VAT on new vehicles. ●BEVs are exempt from the one-time registration tax that can account for about 30% of the purchase price. ●PHEV registration taxes can be reduced up to 10,000 euros ($12,000). ●Because of the registration incentive, PHEV sales doubled from 2015 to 2016. Sales of both BEVs and PHEVs increased in 2017. Netherlands: ●In 2009, the Dutch government developed an action plan to increase PEV ownership, and set a goal of 200,000 PEVs by 2020 and 1 million PEVs by 2025 ●Significant funding was earmarked—65 million euros ($78.3 million) for direct incentives and 500 million euros ($602 million) for economic stimulus for industry. ●PHEV sales spiked at the end of 2013, 2015, and 2016 in anticipation of changing incentives. ●In December 2016, sales of PHEVs were 10,500 units, and 2017 sales averaged 100 PHEVs per month. Sweden: ●Super Green Car Premium purchase rebate program provides a 4,000 euro ($4,820) purchase incentive for vehicles with emissions lower than 50 g CO2/km. ●The “Super Green Car Premium” program with a new bonus-malus system, starting in July 2018, based on the vehicle’s carbon emissions certification level. For BEVs, the bonus is 6,000 euros ($7,230) and decreases linearly to 1,000 euros ($1,200) for vehicles at 60 g CO2/km.	Electric Vehicles	Incentivize
https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&uact=8&ved=2ahUKEwjvh_7KiLrjAhWTGc0KHS5QAZkQFjAAegQIABAC&url=https%3A%2F%2Fgreet.es.anl.gov%2Ffiles%2Fincentivizing_pev&usg=AOvVaw1BpoOz9sl2MSJDwoILdHu0	UK: ●In 2011, the UK enacted the Plug-in Car Grant, which provided a purchase discount up to 5,000 pounds (~5,700 euros or $6,900), depending on vehicle range, for PEVs with emissions lower than 75 g CO2/km. ●The UK exempts PEVs from the annual ownership tax that can be up to 600 euros, as well as company car taxes. ●Local incentives include PEV exemptions from London’s congestion fee, an amount of nearly 3,000 pounds (~3,400 euros or $4,100) per year. France: ●In 2008, France enacted a bonus-malus purchase rebate program based on the vehicle’s carbon emissions (g CO2/km). ●The program provided 5,000 euros ($6,000) for PEVs and penalized high emitting vehicles by 2,600 euros ($3,130). ●The program provided a bonus of 6,300 euros for BEVs, and an additional 4,000 euros ($4,820) for scrapping an 11-year-old diesel; and a bonus of 1,000 euros ($1,200) for PHEVs, and an additional 3,500 euros ($4,220) for diesel scrappage. ●Starting in 2018, BEVs are eligible for a bonus of 6,000 euros ($7,230) and an additional 2,500 euros ($3,000) for scrappage of pre-2001 diesels or pre-1997 gasoline vehicles. Germany: ●In May 2016, Germany launched a new program that offers purchase incentives of 4,000 euros ($4,820) for BEVs and 3,000 euros ($3,600) for PHEVs for vehicles with list prices less than 60,000 euros ($72,300) ●The government and automakers set aside 600 million euros ($723 million) each for a total of 1.2 billion euros ($1.45 billion) of funding. ●The program ends by 2020 and funds a maximum of 400,000 cars. ●In 2017, both BEV and PHEV sales doubled. China: ●In April 2015, China central government issued a notice outlining Phase 3, covering years 2016 to 2020, of the financial support policies for the promotion and application of new energy vehicles NEVs. ●This phase covers 88 metropolitan areas designated as NEV pilot cities and provides over 20 types of financial and non-financial incentives toward private NEV purchase/use and EVSE purchase/installation. ●The central government purchase incentive for NEVs was further decreased to 45,000 RMB ($7,050) per vehicle, but waives purchase taxes, registration fees, license fees, annual usage taxes, and import taxes.	Electric Vehicles	Incentivize

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https://www.c2es.org/document/us-state-clean-vehicle-policies-and-incentives/	To reduce greenhouse gas emissions several states have enacted vehicle GHG emissions standards, adopted goals for zero-emission vehicle (ZEV) deployment, which include both plug-in electric vehicles (EVs) and fuel cell electric vehicles (FCEVs), and provided rebates for ZEVs and incentives for ZEV infrastructure, such as EV supply equipment (EVSE) and hydrogen fueling infrastructure. California has unique authority to maintain motor vehicle emission standards. As of December 2018, nine states have adopted both California's ZEV program as well as Low-Emission Vehicle (LEV) standards: Connecticut, Maine, Maryland, Massachusetts, New Jersey, New York, Oregon, Rhode Island, and Vermont. Four other states—Colorado, Delaware, Pennsylvania, and Washington – and the District of Columbia are following California's LEV standards, but have not adopted the ZEV program.	Electric Vehicles	Case Study
https://www.autonews.com/article/20181119/OEM11/181119724/colorado-adopts-california-clean-car-standard	Colorado would become the 11th state, along with the District of Columbia, to adopt low-emission vehicle standards based on those of California. The state's Air Quality Control Commission approved the new emissions standards for light- and medium-duty motor vehicles sold in Colorado beginning with the 2022 model year. This new rules would reduce carbon dioxide emissions by nearly 2 million tons per year by 2030.	Electric Vehicles	Case Study
https://www.eia.gov/analysis/studies/transportation/zeroemissions/pdf/zero_emissions.pdf	ZEV and PHEV incentive programs in U.S. Rebates: Nine states offered monetary rebates for the purchase or lease of a ZEV or PHEV - $1,500 for the purchase of a PHEV and $3,500 for the purchase of a ZEV in Delaware. - A $3,500 rebate was offered in Texas - Some states allow purchasers to individually submit rebate applications - In California ZEV rebates, purchasers are not eligible for rebates if their annual incomes are above than $150,000. Tax Credits Five states, Colorado, Louisiana, Maryland, South Carolina, and Utah, offered tax credits for the purchase or lease of a ZEV or PHEV. -Tax credit amounts ranged from $1,000 for the purchase or lease of a PHEV in Utah to $6,000 towards the purchase of a ZEV in Colorado. State Sales Tax Exemption Three states, New Jersey, South Carolina, and Washington, and the District of Columbia, exempted ZEVs and/or PHEVs from state sales tax. Free Parking Three states, Arizona, Hawaii, and Nevada, offered free parking for drivers of ZEVs and PHEVs. Inspection Exemption As of December 2016, 33 states and the District of Columbia required vehicle emission inspections High Occupancy Vehicle (HOV) Lane Access Twelve states offered ZEVs and PHEVs access to HOV lanes regardless of the number of passengers in the vehicle. -The primary benefit of this incentive is the time saved by avoiding congestion on non-HOV travel lanes. While travel time savings may also reduce vehicle operating costs. Electric Vehicle Supply Equipment (EVSE) Incentives Eight states offered rebates or tax credits for the purchase and installation of residential EVSE.	Electric Vehicles	Incentivize
https://ctmirror.org/2019/03/19/climate-change-and-connecticuts-gas-tax/	Electric Vehicles (EVs): EV sales were on pace to top 1.6 million in 2018, up from just a few hundred thousand four years earlier Sales of electric vehicles increasing from 1.1 million worldwide in 2017 to 11 million in 2025, and then surging to 30 million in 2030. in 2040, 55 percent of new car sales and 33 percent of the overall fleet will be electric. Gas tax revenue is decreasing, due both to increased sales of fuel-efficient and hybrid vehicles Electric Vehicle owners need to pay into the transportation system they use – roads, bridges, things like that – Annual fees on EVs are already collected in about 20 states and the idea of a road usage charge in the form of a mileage-based fee is being widely tested.	Electric Vehicles	Current State
https://thedriven.io/2019/07/15/shenzen-a-city-miles-ahead-on-electric-vehicles/	Shenzhen's Innovative Policies Driving EV Adoption Driving Shenzhen's rapid growth is a novel portfolio of economic policies designed to make electric logistics vehicles an economically viable alternative to their fossil fuel counterparts. Shenzhen's multipronged policy approach includes: Subsidies for electric vehicles, which create near cost parity between ELVs and internal combustion engine (ICE) vehicles. Subsidies for charging infrastructure, resulting in rapid growth of a robust charging network. Road restrictions on vehicles with internal combustion engines, creating a strong incentive to shift to lower-emission delivery vehicles. Preferential electricity rates and fee exemptions for charging operators, providing ELV operators lower fuel costs. Mandates and targets at the city and district levels for the number of chargers to support growth of the charging network. The effects of these policies are taking hold and the ELV market is seeing economies of scale in manufacturing and a resulting drop in prices. Shenzhen is now beginning to take its foot off the gas, reducing subsidies and allowing the market forces that they set in motion to take over. As cities across the world set ambitious targets to reduce emissions, they should consider the electrification of logistics vehicles as a critical element in their carbon-reduction strategies. Similar to taxis and public fleets, the higher utilization and faster capital recovery of logistics vehicles make a strong economic case for their electrification.	Electric Vehicles	Case Study
https://www.nber.org/papers/w26072	On the one hand, there are externalities from driving including traffic congestion and accidents that imply a mileage tax is efficient. On the other hand, gasoline tends to be underpriced, so a low (or even negative) mileage tax might be justified to encourage substitution away from gasoline- powered vehicles. Using newly available nationally- representative microdata we calculate that electric vehicles have reduced gasoline tax revenues by $250 million annually. We show that the foregone tax revenue is highly concentrated in a handful of states and is highly regressive, as most electric vehicles are driven by high-income households	Electric Vehicles	Adoption
https://www.statista.com/statistics/744946/us-electric-vehicle-market-growth/	See plot 15: Project US EV Market Share	Electric Vehicles	Adoption

Literature Review in Support of SB19-239: EMERGING MOBILITY

Source	Notes	Theme	Subtheme
https://www.huffpost.com/entry/uber-and-lyft-say-theyre-solving-traffic-while-making-it-worse_n_5bdb3662e4b0da7bfc181c32?guce_referrer=aHR0cHM6Ly93d3cuZ29vZ2xlLmNvbS8&guce_referrer_sig=AQAAAAvlbbqbX6FNtAaMPAOswB2HEhCBliYXXOAHUfQ_bjN2guakYLDxPS6Vmf73O-jx_LAJrBboOsHm4053EYQEVewXlcoNc0-d0w7Io20EZ0sd5GAAPWfF0G2t5b7ZWfilX8BAez13zp-2-NhoMb-_PzIMs4sJVZiGcl7NlpyWHx3m&guccounter=2	Several studies show ride hailing and ride-sharing companies are worsening traffic conditions in US cities.	TNCs	Congestion
http://digital.auraria.edu/content/AA/00/00/60/55/00001/Henao_ucdenver_0765D_10823.pdf	One of the latest news releases shows that Lyft is giving rides at a rate of 17 million U.S. rides per month.	TNCs	Congestion
http://www.schallerconsult.com/rideservices/automobility.htm	TNCs transported 2.61 billion passengers in 2017, a 37 percent increase from 1.90 billion in 2016. - 70 percent of Uber and Lyft trips are in nine large, densely-populated metropolitan areas (Boston, Chicago, Los Angeles, Miami, New York, Philadelphia, San Francisco, Seattle and Washington DC.) -TNCs account for 90 percent of TNC/taxi trips in eight of these nine large metro areas (New York is the exception), but taxis serve slightly more passengers than TNCs in suburban and rural areas. - An annual rate of 4.74 billion trips in ride-hailing and rise-sharing vehicles is predicted by the end of 2018, 241 percent more than through the last six years. That will decrease 4.66 billion rides on local buses.	TNCs	Congestion
https://muchneeded.com/uber-statistics/	In the U.S. in 2016, 25% of users stated they use Uber at least once per month. -Uber users in the United States amounted to 41.8 million in March 2018 -Uber fulfills 40 million rides monthly -Lyft has 32 million use	TNCs	Congestion
http://usa.streetsblog.org/wp-content/uploads/sites/5/2017/10/2017_UCD-ITS-RR-17-07.pdf	According to a comprehensive travel and residential survey deployed in seven major U.S. cities, in two phases from 2014to 2016: -21% of adults personally use ride-hailing services; an additional 9% use ride-hailing with friends. -24%of ride-hailing adopters in metropolitan areas use ride-hailing on a weekly or daily basis. -4% of ride-hailing users are 65 and older and 36% of those are 18 to 29 -College-educated, affluent Americans have adopted ride-hailing services at double the rate of less educated, lower income populations. -The average net change in transit use is a 6% reduction. -Ride-hailing attracts Americans away from bus services (a 6% reduction) and light rail services (a 3%reduction). -49% to 61% of ride-hailing trips would have not been made at all, or by walking, biking, or transit.	TNCs	Congestion
Henao, A. (2017).Impacts of Ride-sourcing-Lyft and Uber-on Transportation Including VMT, Mode Replacement, Parking, and Travel Behavior(Doctoral dissertation, University of Colorado at Denver)	34% of people would have walked, biked, or used public transit instead of using ride-hailing. An additional 12% would not have made the trip at all.	TNCs	Congestion
https://sf.curbed.com/2018/7/27/17622178/uber-lyft-cause-traffic-streets-congestion-bruce-schaller-tnc-report	Lyft's recently announced goal of 50 percent of rides being shared by 2022 would produce 2.2 TNC miles being added to city streets for each personal auto mile taken off the road."	TNCs	Congestion
https://nyc.streetsblog.org/2018/07/25/uber-and-lyft-are-overwhelming-urban-streets-and-cities-need-to-act-fast/	Fully 70 percent of Uber and Lyft trips are in nine major metropolitan areas, adding 5.7 billion vehicle miles annually.	TNCs	Congestion
https://www.inquirer.com/philly/business/transportation/uber-lyft-traffic-bus-service-bruce-schaller-20180727.html	-Ride share vehicles were adding 200 million extra miles traveled on Philadelphia's roads in 2017	TNCs	Congestion
https://www.inquirer.com/philly/business/transportation/septa-lost-riders-bus-train-trolley-transit-fta-20180323.html	-The rise of ride-hailing companies caused a 10 percent decline in bus ridership in Philadelphia in 2017.	TNCs	Congestion
https://www.sfcta.org/projects/tncs-today	Uber and Lyft make more than 170,000 vehicle trips within San Francisco, approximately 12 times the number of taxi trips, representing 15 percent of all intra-San Francisco vehicle trips. -At peak periods, ride-hail vehicles are estimated to make 20-26 percent of vehicle trips in Downtown areas and the South of Market of San Francisco. On weekdays, more than 5,700 ride-hail and on Friday 6500 ride-hail vehicles operate on San Francisco streets during the peak period. -Ride-hail vehicles drive approximately 570,000 vehicle miles within San Francisco on a typical weekday.	TNCs	Congestion
https://www.sfchronicle.com/bayarea/article/Uber-Lyft-account-for-of-traffic-increase-in-13830608.php	Uber and Lyft accounted for two-thirds of a 62% rise in congestion in San Francisco from 2010 to 2016. - Hours of delay would cause by Uber and Lyft would have gone up 22% in their absence.	TNCs	Congestion
https://boston.curbed.com/2018/7/25/17611468/uber-lyft-boston-traffic-congestion	Uber and Lyft provided more than 65 million car trips, in Massachusetts in 2017. Of those rides, nearly 35 million, average of 96,000 a day were in Boston area.	TNCs	Congestion
http://www.schallerconsult.com/rideservices/automobility.pdf	Shared ride services such as Uber POOL, Uber Express POOL and Lyft Shared Rides, while touted as reducing traffic, in fact add mileage to city streets. -TNCs added 976 million miles of driving to New York City streets from 2013 to 2017. - UberX and Lyft put 2.8 new vehicle-miles on the road for each mile of personal driving they eliminate. It causes 180% increase in driving and traffic congestion on city streets since the car has to travel a few miles to pick the passenger up. - Studies forecast an annual rate of 4.74 billion trips in for-hire vehicles by the end of 2018, 241 percent more than through the last six years. That will eclipse the predicted 4.66 billion rides on local buses	TNCs	Congestion
Regina R. Clewlow and Gouri Shankar Mishra, "Disruptive Transportation: The Adoption, Utilization and Impacts of Ride-Hailing in the United States," Institute of Transportation Studies, University of California, Davis, October 2017.	Ride-hailing is likely adding vehicle miles traveled in seven major cities: Boston, Chicago, Los Angeles, New York, San Francisco, Seattle and Washington DC areas	TNCs	Congestion
Alejandro Henao, "Impacts of Ride sourcing–Lyft and Uber –on Transportation including VMT, Mode Replacement, Parking, and Travel Behavior," Doctoral Dissertation Defense, January 2017. http://digital.auraria.edu/content/AA/00/00/60/55/00001/Henao_ucdenver_0765D_10823.pdf	TNC usage increased vehicle miles traveled in Denver area by 185% which has significant implications for our cities in terms of congestion and environmental concerns. the VMT impact of ride-sourcing would be around 5.5billion extra miles per year in the U.S	TNCs	Congestion
https://www.mapc.org/farechoices/	Ride hailing is adding new auto trips and exacerbating congestion on the Boston region's roadways.	TNCs	Congestion
http://www.schallerconsult.com/rideservices/automobility.pdf	There are some potential strategies to reduce heavy traffic congestion made by network transportation companies (TNCs) such as Uber and Lyft. Some of these approaches like shared trips, street management and congestion pricing can mitigate current traffic conditions in US cities and roads.	TNCs	Congestion Pricing
https://www.uber.com/newsroom/campaign-sustainable-mobility/	In September 2018, Uber's CEO announced that his company is now ready to spend $10 million over the next three years to promote congestion-pricing strategies in major cities. Uber have advocated congestion-pricing plan in New York For years.	TNCs	Congestion Pricing
https://www.seattletimes.com/seattle-news/politics/ride-hail-companies-to-lobby-for-congestion-pricing-in-seattle-as-city-considers-tolling-downtown-streets/	-Ride-hailing companies such as Uber and Lyft were responsible for 94 million additional miles in the Seattle area in 2017. -Uber spent $350,000 to pay for ads and phone calls to support New York congestion pricing in 2018 and $8,800 for lobbying work at Seattle City Hall since 2016.	TNCs	Congestion Pricing

Literature Review in Support of SB19-239: EMERGING MOBILITY

Source	Notes	Theme	Subtheme
Research/Lit Review from Lyft (Jake Swanton)	● 35% of Lyft users across the country do not own or lease a personal vehicle; ○ 50% of those say they are more likely to purchase one if services like Lyft become unavailable; ○ 64% of those say Lyft has impacted their decision not to own or lease a personal vehicle; ● 53% of Colorado respondents report using their cars less because of Lyft; ● 54% of Lyft rides in Colorado begin or end in low-income/underserved areas; ● 39% of Colorado Lyft riders take public transit at least once per week; ● Filling Late Night Gap/Addressing DUIs; ○ 23% of Colorado Lyft riders take Lyft to get around when public transit does not operate; ○ Late night rides account for 11% of rides on the Lyft platform in Colorado While we don't have a published number for Denver, Research shows that Lyft is just 4% of total vehicle trips in Chicago and vehicle speeds were at their lowest in 2014, prior to the growth of Lyft in the city. According to the most recent Census data, solo car commutes are down 6% and transit use is up 5% since Lyft arrived in Seattle. "Drive alone" down 2.5% in Denver and transit up .5% Shared Use Mobility Center looked at Lyft data from six cities (Seattle, Nashville, Los Angeles, Chicago and Washington, as well as similar modeled data from San Francisco) and found "no relationship" between Lyft and changes in transit ridership. They also found peak Lyft use came on nights and weekends when transit ridership is the lowest. This is backed up by research from the UCLA Institute of Transportation Studies that found the typical rideshare trip "does not occur when and where most transit trips occur," and that most rideshare passengers "report no change in their travel by other modes." A recent study found that while 80 percent of weekly drivers said they never use public transit, 95.5 percent of weekly rideshare riders utilize public transit. ● The American Public Transportation Association study found that "shared modes complement public transit, enhancing urban mobility" and "the more people use shared modes, the more likely they are to use public transit, own fewer cars, and spend less on transportation overall." ; ● A recent study by the University of Toronto found that rideshare's "entry increases public transit use for the average transit agency and that the effect grows over time." The study also found that rideshare "has an additional effect on social welfare through encouraging use of public transit." AlixPartners investigated this question and determined that, "each ridehailing vehicle replaces 4 vehicles." ● Shared Use Mobility Center noted that rideshare use is "associated with decreases in respondents' vehicle ownership and single occupancy vehicle trips." ; ● A University of Michigan study found 41 percent of Austin ridesharing users reported transitioning to a personal vehicle in the period rideshare services were unavailable in the city. About 9 percent reportedly purchased an additional vehicle. This is a major rebound effect of over-burdensome regulation that must be factored in. ; ● Eno Center on Transportation studied this issue and concluded, "despite the growing presence of TNCs on the streets, the vast majority of U.S. commutes are in privately owned, single-occupant vehicles (SOVs). Yet, no major city specifically taxes SOVs for their disproportionate impact." ; ● A recent study from Securing America's Future Energy found that occupancy rates of TNC trips are 50% higher than taxis and higher than personal vehicles and the same volume of demand can be met with 33% fewer vehicles if driven by TNCs rather than taxis. A recent study in Miami by StreetLight Data shows that in the densest areas, ride-hailing replaces personal vehicle trips and reduces congestion. ● US light duty vehicle sales are slumping and are projected to decrease for the next three years despite a relatively strong economy and low fuel prices. This is atypical for a non-recession period.	TNCs	Rider and Driver Survey
https://ncst.ucdavis.edu/wp-content/uploads/2016/07/NCST-TO-028-Rodier_Shared-Use-Mobility-White-Paper_APRIL-2018.pdf	Several studies shows the effects of ride hailing services such as Uber and Lyft on travel: Trip Generation: Availability of ride-hailing causes 8% to 22% increase in amount of vehicles trips in U.S. cities: Network Vehicle Travel without Passengers: -10% to 20% of network vehicle travels are without passenger in high density downtown urban areas -45%to 60% of network vehicle travels are without passenger in lower density suburban areas -The San Francisco study shows an overall increase in VMT without passenger of 6.5% on a typical weekday and of 10% on the weekend and, in Austin, the increase ranges from 8% to 11% for a typical weekday.	TNCs	Congestion
http://www.schallerconsult.com/rideservices/automobility.htm	Transportation Network Companies (TNCs): -TNCs transported 2.61 billion passengers in 2017, a 37 percent increase from 1.90 billion in 2016. - 70 percent of Uber and Lyft trips are in nine large, densely populated metropolitan areas (Boston, Chicago, Los Angeles, Miami, New York, Philadelphia, San Francisco, Seattle and Washington DC.) -TNCs account for 90 percent of TNC/taxi trips in eight of these nine large metro areas (New York is the exception), but taxis serve slightly more passengers than TNCs in suburban and rural areas. - An annual rate of 4.74 billion trips in ride-hailing and rise-sharing vehicles is predicted by the end of 2018, 241 percent more than through the last six years. That will decrease 4.66 billion rides on local buses.	TNCS	Congestion
https://muchneeded.com/uber-statistics/	In the U.S. in 2016, 25% of users stated they use Uber at least once per month. -Uber users in the United States amounted to 41.8 million in March 2018 -Uber fulfills 40 million rides monthly -Lyft has 32 million use	TNCs	Usage
http://www.schallerconsult.com/rideservices/automobility.pdf	Shared ride services such as Uber POOL, Uber Express POOL and Lyft Shared Rides, while touted as reducing traffic, in fact add mileage to city streets. -TNCs added 976 million miles of driving to New York City streets from 2013 to 2017. - UberX and Lyft put 2.8 new vehicle-miles on the road for each mile of personal driving they eliminate. It causes 180% increase in driving and traffic congestion on city streets since the car has to travel a few miles to pick the passenger up. - Studies forecast an annual rate of 4.74 billion trips in for-hire vehicles by the end of 2018, 241 percent more than through the last six years. That will eclipse the predicted 4.66 billion rides on local buses	TNCs	Congestion
Regina R. Clewlow and Gouri Shankar Mishra, "Disruptive Transportation: The Adoption, Utilization and Impacts of Ride-Hailing in the United States," Institute of Transportation Studies, University of California, Davis, October 2017.	Ride-hailing is likely adding vehicle miles traveled in seven major cities: Boston, Chicago, Los Angeles, New York, San Francisco, Seattle and Washington DC areas	TNCs	Congestion
Alejandro Henao, "Impacts of Ride sourcing–Lyft and Uber –on Transportation including VMT, Mode Replacement, Parking, and Travel Behavior," Doctoral Dissertation Defense, January 2017. http://digital.auraria.edu/content/AA/00/00/60/55/00001/Henao_ucdenver_0765D_10823.pdf	TNC usage increased vehicle miles traveled in Denver area by 185% which has significant implications for our cities in terms of congestion and environmental concerns. the VMT impact of ride-sourcing would be around 5.5billion extra miles per year in the U.S	TNCs	Congestion
http://usa.streetsblog.org/wp-content/uploads/sites/5/2019/01/19-04931-Transit-Trends.pdf	Expansion of Transportation Network Companies (TNCs) such as Uber and Lyft have several negative impacts such as: -Public transit ridership in major US cities has been flat or declining over the past few years in seven large US cities: Boston, New York, Washington, DC, Chicago, Denver, San Francisco and Los 7 Angeles. -Heavy rail ridership decreases by 1.29% per year. -Bus ridership decreases by 1.70% 38 percent per year.	TNCs	Congestion
https://www.earth.com/news/ridesharing-culture-environment/			
https://www.independent.co.uk/news/business/analysis-and-features/uber-lyft-climate-change-ipo-environment-global-warming-a8852396.html	Calling a car on Uber or Lyft has become so cheap and convenient that more people are opting out of public transportation for ride sharing, prompting higher emissions.	TNCs	Congestion
EIR 2019 State: Economic Impact 2019: Colorado and Lyft	38% of riders spend more at local businesses as a result of using Lyft 40% of riders are more likely to attend community events as a result of using Lyft. 27% of healthcare riders state that without Lyft they would be less likely to make it to their appointments regularly. 76% are less likely to drive substance impaired due to the availability of Lyft. 54% of rides start or end in low income areas. 48% of riders use Lyft to get to the airport. 18% do not own or lease a personal vehicle. 39% of riders take public transit at least once a week. 11% of Lyft drivers are veterans of the armed forces. 27% of Lyft drivers are over age 50 91% of Lyft drivers drive fewer than 20 hours per week.	TNCs	Rider Driver Survey

Literature Review in Support of SB19-239: EMERGING MOBILITY

Source	Notes	Theme	Subtheme
https://www.mdpi.com/2413-8851/2/3/79/htm	From 2009–2017, the for-hire vehicle market share doubled. While for-hire vehicles still only account for 0.5% of all trips, the percent of all Americans who use ridehailing in any given month is nearly 10%. Within the for-hire vehicle market, this trend of growth has not been uniformly distributed across demographic groups or geographies; it has been greater in mid-sized and large cities, and among younger individuals and wealthier households.	TNCs	
https://techcrunch.com/2019/07/02/waymo-is-now-allowed-to-transport-passengers-in-its-se	Waymo is now allowed to transport passengers in its self-driving vehicles on California roads	TNCs	AVS
https://kjzz.org/content/1030676/lyft-riders-phoenix-area-can-now-pick-waymo-self-driving-v	Lyft Riders In Phoenix Area Can Now Pick Waymo Self-Driving Vans	TNCs	AVS
TNC VMT Findings Memo 08.01.2019 from Fehr and Peers	See plot 14: estimated TNC VMT percentage by Metropolitan Region	TNCs	Congestion
https://link.springer.com/article/10.1007/s11116-018-9923-2	Denver Ride Hailing Occupancy Study (n=416): avg number of passengers per ride 1.36; almost 75% of fares had only 1 passenger	TNCs	Congestion

Literature Review in Support of SB19-239: EMERGING MOBILITY

Source	Notes	Theme	Subtheme
https://escholarship.org/uc/item/7s8207tb	It has been over 20 years since car sharing first emerged as an innovative transportation mode in North America. Beginning in Montreal, Quebec in 1994, carsharing has since spread across the continent, populating cities across Canada and United States (US), Mexico City, and college towns in both the US and Canada. Peer-to-Peer (P2P) carsharing in which individuals access a privately owned vehicle fleet through a third party launched in 2010 in Cambridge, Massachusetts. P2P carsharing systems bring personal cars into the network of carsharing vehicles. P2P carsharing systems allow hosts of personal vehicles to share them with other people for an established price. The hosts typically define schedules for when the vehicle is available and can confirm or deny member requests for access. Hosts receive a share of the money that the guest pays for their vehicle use, which encourages host-side participation, and lowers their vehicle ownership costs. While P2P carsharing emerged early this decade, versions of it were introduced in Boulder, Colorado, New York City, and Germany as early as 2001. In Boulder, P2P vehicles were integrated into an operator-owned roundtrip carsharing fleet. In NY and Germany, a P2P marketplace was introduced that facilitated direct P2P vehicle exchanges between individuals via the Internet.	Emerging Mobility	Peer to Peer car sharing definition and history
https://escholarship.org/uc/item/7s8207tb	Carsharing is one of the more established components of the sharing economy and operates within a number of different frameworks. At present, there are four forms of carsharing: 1)roundtrip carsharing; 2) one-way (or point-to-point) carsharing; 3) P2P carsharing; and 4)fractional ownership.	Emerging Mobility	Car sharing
https://studiesandreports.ccrpcvt.org/wp-content/uploads/2017/01/Peer_to_Peer_Final_Report_June2014.pdf	P2P is defined as “short-term access to privately owned vehicles.” There are four models of P2P that have developed in the United States, including: •Fractional ownership Individuals sublease a vehicle owned by a third party(usually a dealership or carsharing organization) and pay for a portion of the vehicles expenses. This model allows access to vehicles and individual might not otherwise be able to afford. •Hybrid P2P-traditional carsharing Individuals join a carsharing organization that maintains a fleet of shared vehicles, including some privately owned vehicles, and pays for usage. Car owners earn a portion of the proceeds for sharing their vehicle with other carshare members. •P2P carsharing Members of P2P organizations have access to privately owned vehicles, which are made available for temporary use by car owners for a fee. •P2P marketplace P2P exchanges are conducting via online technology between car owners and car users. This model may include the sharing of other products and services.	Emerging Mobility	Peer to Peer car sharing
https://studiesandreports.ccrpcvt.org/wp-content/uploads/2017/01/Peer_to_Peer_Final_Report_June2014.pdf	The Evolution of P2P CarSharing in the United States: The first hybrid-P2P program was launched in 2001by Ego in Boulder, CO with their Location Program. It added privately owned vehicles into their carsharing fleet and offered car owners driving credits in exchange. Significant P2P expansion in the U.S. began in 2010 with the launch of RelayRides and continued in 2011 with the launch of Getaround. These companies put P2P carsharing into the national limelight and raised the profile significantly. As of June 2013, there were nine P2P operators, three planned, and eight defunct in the United States. Some have contributed P2P growth to the prevalence of the new “sharing economy” that has been made possible by technology and the ability for individuals to use the internet and social media to connect and share more freely. It has also been said that P2P signals an even greater shift in how people, especially Millennials, view car ownership	Emerging Mobility	Peer to Peer car sharing
https://studiesandreports.ccrpcvt.org/wp-content/uploads/2017/01/Peer_to_Peer_Final_Report_June2014.pdf	This could theoretically help reduce car ownership levels and VMT impacts in these areas and also help expand the demographics served by traditional carsharing. -P2P also generally offers a wider selection of vehicle types, locations, and driving rates when compared to traditional carsharing. -P2P organizations can be successful with a lower member to vehicle ratio because the organization does not take on the huge expense of purchasing the vehicle and thus does not take on as much risk or need to earn as much revenue to break even. This further supports its application in less dense areas where a traditional model is not sustainable. -The potential to earn money and reduce environmental impacts are the primary motivating factors for individual car owners to participate in P2P programs. -Generally, any profits made are split between the owner and the P2P operator.	Emerging Mobility	Peer to Peer car sharing: benefits
https://studiesandreports.ccrpcvt.org/wp-content/uploads/2017/01/Peer_to_Peer_Final_Report_June2014.pdf	Households would have incentive to hold on to the extra vehicles in the hopes to make a profit; and vehicle ownership is the primary factor that contributes to excess driving. -Another concern raised by experts in the industry is in regards to balancing earned revenue vs. the cost of the service for the user. If P2P wants to remain less expensive than traditional carsharing, more rentals are needed to generate the same returns. However, if too many people place their cars in P2P networks, no one will make a profit because they will be competing with each other. Simultaneously, P2P also struggles with limited availability within the fleet if car owners only make their vehicles available at non-peak times(e.g. weekday evenings)when there is less demand. -Many states do not allow private vehicles to be used commercially and some insurance companies will actually waive coverage if a vehicle is being used for “commercial purposes”.	Emerging Mobility	Peer to Peer car sharing: potential drawbacks

Literature Review in Support of SB19-239: EMERGING MOBILITY

Source	Notes	Theme	Subtheme
https://studiesandreports.ccrpcvt.org/wp-content/uploads/2017/01/Peer_to_Peer_Final_Report_June2014.pdf	In Massachusetts, a Relay rides member learned this the hard way when her vehicle was involved in a fatal accident. Although Relay rides provides 1 million dollars in liability insurance coverage, this accident caused damage well beyond this amount. -The uncertainty of whether or not a vehicle owner's insurance would be responsible for the additional damages is a major source of contention and confusion. Recent legislation in California, Oregon, and Washington has helped to address these liability concerns. This legislation marks a turning point for P2P carsharing and exempts P2P vehicles from being designated as commercial vehicles. This limits personal liability for the car owner and also protects car owners from having their insurance waived so long as they are connected with a P2P organization that provides insurance coverage. -In some states, P2P users are still at risk if their vehicle is involved in an accident while being used by an individual not covered under the owner's car insurance company. -Vehicle maintenance is often still the responsibility of the car owner and may not be as consistent. This can make the service less safe and less reliable for the user further adding to concerns regarding liability. -Investing in vehicle technology is costly ($500-1000 per unit), but without this technology, operators are not able to remotely lock/unlock, enable/disable ignitions, check vehicle status, etc., which increases the risk for the car owner. These things have to be weighed when deciding whether or not P2P is feasible and sustainable in the long-term.	Emerging Mobility	Peer to Peer car sharing: potential drawbacks example
https://www.jobmonkey.com/shared-economy/carsharing/	With carsharing, car owners can make extra money from owning a valuable asset, while anyone that needs a car now has an affordable, convenient, and hassle free way to access a vehicle when they need it. Carsharing is expected to be a multi-billion dollar, global industry in the near future. Peer-to-peer carsharing services exist in the USA, Australia, Denmark, Russia, United Kingdom, Brazil, Austria, France, Germany, Estonia, Netherlands, New Zealand, Canada, Turkey, and other countries.	Emerging Mobility	Peer to Peer car sharing
http://www.ncsl.org/research/transportation/car-sharing-state-laws-and-legislation.aspx	As of July 2015, in the United States there were 22 roundtrip car-sharing operators in 51 cities, such as Zipcar, with about 1.17 million members. One-way car-sharing operators, such as Car2Go, had about 311,000 members in the U.S. The number of peer-to-peer (P2P) car-sharing members is unknown. -The average annual cost to own and operate a car is $8,698. Car sharing has the potential to significantly reduce individual transportation costs. -Monthly transportation savings ranging from $154 to $435 for round trip car-sharing members in the United States.	Emerging Mobility	Peer to Peer car sharing
https://www.autotrader.com/car-shopping/the-good-bad-and-ugly-of-peer-to-peer-car-sharing-234961	Peer-to-peer (P2P) car sharing, in which ordinary people rent out their personal cars, is the next step toward more affordable car rentals in the new sharing economy. Car owners interested in renting out their vehicles can register at one of the P2P sharing sites, such as RelayRides or Just Share It. Sites determine rental fees based on the type of car, locality and so on, while owners specify the car's availability. Depending on the P2P site, an owner may choose to have his car picked up at his house, deliver the vehicle or, where available, have it picked up at an airport. Owners typically receive between 65 and 75 percent of rental fees, which usually run between $5 and $15 an hour. Most payments are through direct deposit. Renters also register with the P2P site. The rental process involves choosing an available car, reserving a rental date and time and providing credit card information if it isn't already on file. At the end of the rental period, the driver replaces any consumed fuel before returning the car to its pickup location.	Emerging Mobility	Peer to Peer car sharing
https://www.autotrader.com/car-shopping/the-good-bad-and-ugly-of-peer-to-peer-car-sharing-234961	Benefits: Through P2P car sharing, a car owner can recover a portion of his or her monthly vehicle costs. Renters benefit from using a car for as little as an hour at a time at a very affordable rate, without the hassle and expense of car ownership. They are also often able to access cars within walking distance. Risks: Owners face the most risk with P2P sharing and must come to grips with strangers driving their cars. P2P sites maintain additional insurance (RelayRides carries $1 million, for example) for the car, as well as liability for accidents involving other cars and drivers. But only a handful of states have addressed P2P insurance complications, such as who pays for what in the case of an accident. To play it safe, anyone offering their car for rent may want to beef up their liability coverage.	Emerging Mobility	Peer to Peer car sharing: benefits
https://www.ridester.com/peer-to-peer-car-rental/	Getaround -Getaround offers hourly and daily rentals in a range of cities across the United States. -Currently, the service is available in the following cities: San Francisco, Oakland, Berkeley, Los Angeles, Portland, Chicago, Washington, D.C. , New Jersey, Philadelphia, Seattle, Boston, New York City and Miami -There is no monthly or annual fee to use Getaround -All rentals with the company include insurance and roadside assistance. -Getaround is notable for their focus on convenience. They install smart technology in all vehicles on their platform that allows you to unlock the car with your phone. This saves the car owner the trouble of having to be present when the renter picks up the car.	Emerging Mobility	Peer to Peer car sharing: company
https://www.ridester.com/peer-to-peer-car-rental/	Turo -Turo is currently available in more than 5,000 locations around the world. -Turo offers an impressive range of cars, from high-end Teslas and BMWs to practical, everyday Toyotas and Hondas. The app also has an interface that looks very much like Airbnb, meaning that users of that service will feel right at home. -Turo is set up to allow rentals for terms longer than by the hour or by the day.	Emerging Mobility	Peer to Peer car sharing: company

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https://www.ridester.com/peer-to-peer-car-rental/	Maven -Maven is available in these cities: •Ann Arbor •Baltimore •Boston •Chicago •Detroit •Denver •Los Angeles •New York City •Orlando •San Francisco •Washington, D.C. -Maven is notable for its focus on sustainability and reducing environmental impact. It offers a wide range of electric and hybrid vehicles for rent, with a particularly large selection of Chevy vehicles.	Emerging Mobility	Peer to Peer car sharing: company
https://www.ridester.com/peer-to-peer-car-rental/	HyreCar -It uses the same basic business model (owners rent their cars to drivers), but it's only for people who wish to rent cars to drive for Uber, Lyft, or a delivery service like Instacart. -HyreCar is currently available in 35 states. The company claims that, after rental fees, drivers still make $1,000 per week on average.	Emerging Mobility	Peer to Peer car sharing: company
http://www.ncsl.org/research/transportation/car-sharing-state-laws-and-legislation.aspx	A 2015 study by the NYU Stern School of Business indicates that "peer-to-peer markets improve consumer welfare" by providing more choices and helping individuals reduce costs related with car-ownership. -The P2P model may have particular value in rural or suburban settings given its flexibility and not being as dependent on a large number of vehicles to scale up the system. -P2P's impact on VMT, transportation choice and car-ownership is not well explored or understood at this point in time and requires further research.	Emerging Mobility	Peer to Peer car sharing
http://www.ncsl.org/research/transportation/car-sharing-state-laws-and-legislation.aspx	Legislatures in California, Oregon and Washington have enacted laws to help increase P2P car sharing and clarify how it works. -the laws create insurance standards and a regulatory framework for personal car-sharing programs in the three states. -Each state's law requires the vehicle owner to be part of a personal car-sharing program, defined as a business that facilitates sharing private passenger motor vehicles for noncommercial use. -Each state requires the insurance coverage offered by the personal car-sharing program to be at least three times the minimum requirement for a private vehicle. -to address rental car agency concerns that P2P could be a form of competition, Each law clarifies that the annual revenue generated by an individual who participates in a P2P program cannot exceed the annual expenses of operating a vehicle, including maintenance, fuel, depreciation, insurance and any costs associated with P2P participation. -New York has recently considered, but has not enacted legislation to create a regulatory framework for personal car sharing.	Emerging Mobility	Peer to Peer car sharing: state legislation
https://escholarship.org/uc/item/7s8207tb	P2P carsharing is a more direct manifestation of collaborative consumption than roundtrip or one-way carsharing as it promotes the sharing of already owned underused assets in contrast to a Company-maintained vehicle fleet. -To facilitating the sharing of existing resources, the P2P model can significantly reduce operating costs: vehicle capital comprises almost 70% of total operating expenses for roundtrip carsharing companies	Emerging Mobility	Peer to Peer car sharing: benefits
https://escholarship.org/uc/item/7s8207tb	Results from a survey of three hundred (N = 300) respondents in San Francisco and Oakland, splitting the respondent sample equally between each city: -60% of respondents in San Francisco and 75% of respondents in Oakland would consider using a P2P vehicle, although fewer than 50% of residents in San Francisco and fewer than 25% of residents had heard of the term.	Emerging Mobility	Peer to Peer car Sharing: survey
https://escholarship.org/uc/item/7s8207tb	Data from 224 car hosts in the City of Portland who were part of a pilot P2P program: -P2P carsharing model may reach a higher share of low-income households than classic carsharing. -There was a potential through P2P carsharing to shift driving to off-peak times.	Emerging Mobility	Peer to Peer car Sharing: survey
https://escholarship.org/uc/item/7s8207tb	One P2P carsharing survey was administered to members online. Participating P2P carsharing operators sent an email to their members containing a link to the survey URL. Across the three operators, a total of N = 1,151 survey responses were collected. N = 1,151 survey (see Plots 16) The results demonstrate that the vast majority of respondents reported using the system less than twice a month. Within the sample of N = 1,123 respondents, 91 respondents (~8%) indicated using P2P carsharing five or more times per month, which was split rather evenly among the three surveyed operators. A total of 287 respondents (~25%) used it two or more times per month. This suggests that P2P carsharing provided occasional service for the vast majority of users (~75%) who used it one to two times per month or less.	Emerging Mobility	Peer to Peer car Sharing: survey
https://escholarship.org/uc/item/7s8207tb	The most practical benefit of P2P carsharing is its reduction in the costs of automobile use. -The P2P carsharing model allows some companies to gain access to vehicles that they would otherwise not be able to afford. -P2P carsharing fleets are far more diverse in nature versus those of other carsharing services. -Among P2P systems, guests can choose from budget cars to high-end luxury vehicles to pick-up trucks. -For hosts, P2P carsharing allows them to recoup expenses and make money from a car that is depreciating and sitting idle approximately 95% of the time, on average.	Emerging Mobility	Peer to Peer car sharing: benefits
http://www.ncsl.org/research/fiscal-policy/rental-car-taxes.aspx	In total, more than 40 states levy a charge on rental cars, either by imposing an additional excise tax, daily fee, or both. At least 15 states authorize local governments to impose their own taxes or fees and rental car companies add on charges for off-site rentals, airport fees, and insurance coverage. As states grapple with budget cuts and seek to raise revenues, rental car taxes that are perceived as targeting visitors are more palatable than other options.	Emerging Mobility	Peer to Peer car sharing: state legislation

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http://www.ncsl.org/research/fiscal-policy/rental-car-taxes-lb.aspx	More than 40 states levy a charge on short-term rental cars. -State rental car tax rates range from less than 2 percent to more than 11 percent. -At least 33 stadiums have been partially financed by local rental car taxes. -Over the years, state and local governments have added extra taxes and fees to the process in an effort to boost revenues. Like most purchases, short-term rental cars—typically defined as passenger vehicles rented for less than 30 days—generally are subject to state and local sales taxes. -Many states also impose an additional tax specifically on the vehicle. -In total, more than 40 states levy an extra charge on rental cars, either by imposing an additional tax, a daily fee or both. -The nature of the tax varies from state to state, with states imposing a surcharge, automobile rental tax or tourism tax. -Regardless of what the taxes are called, they are meant to boost state revenues. Depending on where one rents a vehicle, consumers can expect to pay state taxes on rental cars ranging from less than 2 percent to more than 11 percent. -Some states—such as Iowa, New York, Virginia and Washington—funnel rental car tax revenues into transportation-related funds. Others, including Montana and North Carolina, deposit the revenues into the general fund, allowing them to be used at the discretion of the legislature.	Emerging Mobility	Peer to Peer car sharing: state legislation
http://www.ncsl.org/research/fiscal-policy/rental-car-taxes-lb.aspx	In addition to rental car taxes levied by the state, the total price at point of rental often includes a number of additional fees and taxes. -At least 15 states authorize local governments to impose their own taxes or fees, and rental car companies can add on charges for off-site rentals, airport fees and insurance coverage. -Over the years, several cities have used their local option to tax rental cars to fund specific projects, such as financing the construction of a stadium or convention center. -According to the Curb Auto Rental Taxes Coalition, at least 33 stadiums have been built that were, in part, financed by rental car taxes. -Over the past two decades, short-term rental car taxes were increased in several states. -In 2011, Hawaii increased its rental car fee for two years in order to raise revenues, and Minnesota increased its tax rate in 2013.	Emerging Mobility	Peer to Peer car sharing: state legislation
https://www.autoslash.com/blog-and-tips/posts/states-with-highest-car-rental-taxes-and-fees	10 States With the Highest Rental Car Taxes and Fees 1. Nevada: Estimated taxes and fees: 16.85%-$18.85% Rental cars: 10% surcharge. There is also a 6.85% state sales tax and Clark and Washoe counties (home to Las Vegas and Reno, respectively) charge an additional 2%. 2. Minnesota: Estimated taxes and fees: 16.63% Rental cars: 9.2% surcharge. There is a 6.875% state sales tax and localities can add as much as 2%, for an average combined rate of 7.43%. 3. Arkansas: Estimated taxes and fees: 16.5% 4. District of Columbia: Estimated taxes and fees: 16% Rental cars: 10% surcharge plus 6.5% sales tax. Rental cars: 10.25% surcharge on rental cars plus 5.75% sales tax. 5. Rhode Island: Estimated taxes and fees: 15% Rental cars: 8% surcharge plus 7% state sales tax. 6. North Carolina: Estimated taxes and fees: 14.95% Rental cars: 8% surcharge. There is also a 4.75% state tax and localities can add as much as 2.75%, for an average combined rate of 6.95%. 7. Tennessee: Estimated taxes and fees: 12.46% Rental cars: 3% surcharge. There is also a 7% state sales tax and localities can add up to 2.75%, for an average combined rate of 9.46%. 8. South Carolina: Estimated taxes and fees: 12.43% 9. Connecticut: Estimated taxes and fees: 12.35% + $1/day Rental cars: 3% state surcharge on top of 9.35% sales tax. A $1 per day "tourism surcharge" is also levied. 10. Kansas: Estimated taxes and fees: 12.18% Rental cars: 3.5% surcharge. There is a 6.5% state sales tax and localities can add as much as 4%, for an average combined rate of 8.68%.	Emerging Mobility	Peer to Peer car sharing: state legislation

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https://www.autoslash.com/blog-and-tips/posts/states-with-highest-car-rental-taxes-and-fees	Rental Car Taxes and Fees by State Alabama: Rental cars: 1.5% surcharge in addition to local taxes. 4% sales tax is also due. Gasoline Tax: $0.21 per gallon. Alaska: Rental cars: 10% statewide surcharge. Gasoline Tax: $0.15 per gallon. Arizona: Rental cars: No state surcharge, but some counties levy their own. (For example, Pima County adds $3.50 per rental; Maricopa County adds $2.50 or 3.25%, whichever is greater.) 5.6% sales tax is also due. Gasoline Tax: $0.19 per gallon. Arkansas: Rental cars: 10% surcharge plus 6.5% sales tax. Gasoline Tax: $0.22 per gallon. California: Rental cars: No statewide surcharge, but localities may levy them. 7.25% sales tax in many localities. In Los Angeles, the local sales tax rate is 9.5%. Gasoline Tax: $0.56 per gallon. Colorado: Rental cars: $2 per day rental fee. Localities can add their own surcharge; Denver adds 7.25%. 2.9% sales tax is also due. Gasoline Tax: $0.22 per gallon. Connecticut: Rental cars: 3% state surcharge on top of 9.35% sales tax. A $1 per day "tourism surcharge" is also levied. Gasoline Tax: $0.44 per gallon. Delaware: Rental Cars: 2% state surcharge. Gasoline Tax: $0.23 per gallon. District of Columbia: Rental cars: 10.25% surcharge on rental cars plus 5.75% sales tax. Gasoline Tax: $0.24 per gallon.	Emerging Mobility	Peer to Peer car sharing: state legislation
https://www.autoslash.com/blog-and-tips/posts/states-with-highest-car-rental-taxes-and-fees	Fees by State (cont) Florida: Rental cars: $2-per-day surcharge, plus 6-8% sales tax depending on the county you're renting in. Gasoline Tax: $0.41 per gallon (varies by county). Georgia: Rental cars: No statewide tax, but localities may levy them; 4% sales tax is due. Gasoline Tax: $0.31 per gallon. Hawaii: Rental cars: $3 per day, plus excise tax. Gasoline Tax: $0.48 per gallon (varies by county). Idaho: Rental cars: No statewide tax but there's a 6% sales tax due. Gasoline Tax: $0.33 per gallon. Illinois: Rental cars: 5% surcharge, with additional taxes levied by localities. Gasoline Tax: $0.34 per gallon. Indiana: Rental cars: 4% auto rental excise tax plus 7% sales tax. Marion County (Indianapolis) adds another 6%. Gasoline Tax: $0.42. Iowa: Rental cars: 5% surcharge. There is a 6% state sales tax plus localities can add as much as 1%, for an average combined rate of 6.82%. Gasoline Tax: $0.31 per gallon.	Emerging Mobility	Peer to Peer car sharing: state legislation

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https://www.autoslash.com/blog-and-tips/posts/states-with-highest-car-rental-taxes-and-fees	Fees by State (cont) Kansas: Rental cars: 3.5% surcharge. There is a 6.5% state sales tax plus localities can add as much as 4%, for an average combined rate of 8.68%. Gasoline Tax: $0.24 per gallon. Kentucky: Rental cars: 6% "U Drive It" tax. No sales tax on rental cars. Gasoline Tax: $0.26 per gallon. Louisiana: Rental cars: No specific rental car surcharge but there is a 4.45% state sales tax plus localities can add as much as 7%, for an average combined rate of 9.45%. Gasoline Tax: $0.20 per gallon. Maine: Rental cars: 10% state surcharge in lieu of sales tax. Gasoline Tax: $0.30 per gallon. Maryland: Rental cars: 11.5% surcharge. No additional sales tax. Gasoline Tax: $0.35 per gallon. Massachusetts: Rental cars: $2 statewide surcharge. In addition, Boston collects a $10 fee per rental to fund a convention center. In addition, renters pay a 6.25% state sales tax. Gasoline Tax: $0.27 per gallon. Michigan: Rental cars: 6% surcharge plus 6% state sales tax. Also, the Detroit area imposes a 2% tax to help fund a stadium. Gasoline Tax: $0.41 per gallon. Minnesota: Rental cars: 9.2% surcharge. There's a 6.875% state sales tax plus localities can add as much as 2%, for an average combined rate of 7.43%. Gasoline Tax: $0.29 per gallon.	Emerging Mobility	Peer to Peer car sharing: state legislation
https://www.autoslash.com/blog-and-tips/posts/states-with-highest-car-rental-taxes-and-fees	Fees by State (cont) Mississippi: Rental cars: 6% surcharge, plus 5% state sales tax (which is 2% below the general sales tax). Gasoline Tax: $0.19-$0.22 per gallon, depending on the county Missouri: Rental cars: 4% surcharge. Gasoline Tax: $0.17 per gallon. Montana: Rental cars: 4% surcharge plus 4% state sales tax. Gasoline Tax: $0.32 per gallon. Nebraska: Rental cars: 4.5% surcharge. There's also a 5.5% sales tax plus localities can add as much as 2.0%, for an average combined rate of 6.89%. Gasoline Tax: $0.28 per gallon. Nevada: Rental cars: 10% surcharge. There is also a 6.85% state sales tax and Clark and Washoe counties (home to Las Vegas and Reno, respectively) charge an additional 2%. Gasoline Tax: $0.34 per gallon. New Hampshire: Rental cars: 9% surcharge, but no sales tax. Gasoline Tax: $0.24 per gallon. New Jersey: Rental cars: Flat $5 per day "domestic security fee" on rental cars. There is a 6.625% state sales tax, plus some municipalities (including Newark) add another 5% tax. Gasoline Tax: $0.41 per gallon. New Mexico: Rental cars: 5% surcharge plus $2 per day. There is also a 5.125% state tax and localities can add as much as 4.13%, for an average combined rate of 7.78%. Gasoline Tax: $0.19 per gallon.	Emerging Mobility	Peer to Peer car sharing: state legislation

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https://www.autoslash.com/blog-and-tips/posts/states-with-highest-car-rental-taxes-and-fees	Fees by State (Cont) New York: Rental cars: 6% rental car tax, plus the New York City metro area adds another 5%. Gasoline Tax: $0.46 per gallon (varies by county) North Carolina: Rental cars: 8% surcharge. There is also a 4.75% state tax plus localities can add as much as 2.75%, for an average combined rate of 6.95%. Gasoline Tax: $0.35 per gallon. North Dakota: Rental cars: 3% surcharge. There is also a 5% state tax plus localities can add as much as 3.5%, for an average combined rate of 6.83%. Three cities (Bismarck, Grand Forks, and Minot) add an additional 1% tax on car rentals at the airport. Gasoline Tax: $0.23 per gallon. Ohio: Rental cars: No rental car surcharge. There is a 5.75% state tax plus localities can add as much as 2.25%, for an average combined rate of 7.15%. Gasoline Tax: 0.28 per gallon. Oklahoma: Rental cars: 6% surcharge. There is also a 4.5% state tax plus localities can add as much as 6.5%, for an average combined rate of 8.93%. Gasoline Tax: $0.17 per gallon. Oregon: Rental cars: No statewide surcharge or sales tax, but Multnomah County (including Portland) imposes a 17% tax. Gasoline Tax: $0.37 per gallon. Pennsylvania: Rental cars: 2% surcharge plus $2 per day. Philadelphia adds an additional 2%. Gasoline Tax: $0.59 per gallon.	Emerging Mobility	Peer to Peer car sharing: state legislation
https://www.autoslash.com/blog-and-tips/posts/states-with-highest-car-rental-taxes-and-fees	Fees by State (cont) Rhode Island: Rental cars: 8% surcharge plus 7% state sales tax. Gasoline Tax: $0.34 per gallon. South Carolina: Rental cars: 5% surcharge. There is also a 6% state sales tax plus localities can add as much as 3%, for an average combined rate of 7.43%. Gasoline Tax: $0.21. South Dakota: Rental cars: 4.5% excise tax as well as a 1.5% tourism tax. Gasoline Tax: $0.30 per gallon. Tennessee: Rental cars: 3% surcharge. There is also a 7% state sales tax plus localities can add up to 2.75%, for an average combined rate of 9.46%. Gasoline Tax: $0.26 per gallon. Texas: Rental cars: 10% rental car surcharge. Gasoline Tax: $0.20 per gallon. Utah: Rental cars: 2.5% statewide tax. Counties can add up to 7%. Gasoline Tax: $0.29 per gallon. Vermont: Rental cars: 9% surcharge. Gasoline Tax: $0.32 per gallon. Virginia: Rental cars: 10% surcharge. No state sales tax on rental cars. Gasoline Tax: $0.21 per gallon.	Emerging Mobility	Peer to Peer car sharing: state legislation
https://www.autoslash.com/blog-and-tips/posts/states-with-highest-car-rental-taxes-and-fees	Fees by State (cont) Washington: Rental cars: 5.9% statewide tax on rental cars. Franklin, Pierce, King and Spokane Counties add 1%. There's an additional 0.8% transit-authority tax in Pierce, King and Snohomish Counties. Gasoline Tax: $0.49 per gallon. Wisconsin: Rental cars: State tax on rental cars is 5% plus localities can add more. For example, Milwaukee charges an additional 3%. Gasoline Tax: $0.33 per gallon. Wyoming: Rental cars: 4% surcharge. Gasoline Tax: $0.24 per gallon.	Emerging Mobility	Peer to Peer car sharing: state legislation
https://taxfoundation.org/florida-rental-car-tax-florida-car-sharing/	Florida's urban sprawl and limited public transportation makes car sharing and peer-to-peer car-sharing arrangements appealing to residents and nonresidents alike. Thousands of Floridians have participated in peer-to-peer car- sharing transactions since the firms became active in the state. Rental cars and car shares use state transportation infrastructure, so the tax has a connection to the benefits drivers receive. However, these drivers are also paying Florida's gas tax, which is levied on all vehicles and is a broader and more efficient tax base than targeting one group of road users. Recently, the Florida State Senate Committee on Infrastructure and Security approved Senate Bill 1148 by a 5-3 vote. The bill makes peer-to-peer car sharing firms liable for the state's $2 per day rental car excise tax and related taxes and fees.	Emerging Mobility	Peer to Peer car sharing: state legislation

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https://www.orlandosentinel.com/politics/os-ne-rental-car-fight-legislature-20190321-story.html	Florida passed a bill that defines peer-to-peer car rental companies such as Turo and Getaround as rental car companies, which would require them to pay the $2 rental car surcharge to the state. About 21,000 Floridians have signed up to be hosts with Turo. Depending on the car, the cost for rental ranges from about $35 to $55 per day. The rental car surcharge brought in $138.4 million to the state in 2018. The money goes to help pay for new roads and road maintenance.	Emerging Mobility	Peer to Peer car sharing: state legislation
https://taxfoundation.org/texas-car-sharing-tax/	Texas legislature is examining a proposal to extend the state's 10 percent rental car excise tax onto peer-to-peer car-sharing firms.	Emerging Mobility	Peer to Peer car sharing: state legislation
https://www.autoblog.com/2019/05/02/car-sharing-services-tax-free/	Rental car tax actions: -Forty-four states levy excise taxes on rental cars — on top of the standard sales tax, if one applies — and most allow local governments to levy their own as well, according to a March study by the Tax Foundation, a conservative think tank. Airports often add surcharges to pay for sprawling rental-car facilities. -Taxes, fees and surcharges can add as much as 30 percent to the cost of renting a car while generating millions of dollars. -Rental car taxes help cover debt payments for some of the Cactus League's facilities and for the Arizona Cardinals football stadium. -California, Oregon and Washington passed legislation on car-sharing years before the industry took off, and Maryland did so last year. Bills governing the practice have been introduced in more than 30 other states, with the fight especially contentious in Alaska, Arizona, Colorado, Florida, Illinois, New Mexico and Ohio. -Turo is fighting in court with Los Angeles and San Francisco airport authorities, which contend the company should pay fees. -Chicago tax authorities wrote that car-sharing is subject to rental car taxes in response to questions from an Enterprise lawyer, according to a letter provided by the company. -In Arizona, Enterprise is backing legislation that would tax car-sharing like rental cars and require them to enter agreements with airports to use their facilities, while Turo supports a proposal that would exempt car-sharing companies from most taxes. -In Ohio, a detailed package of new regulations on car-sharing companies was tucked into the House version of the state transportation budget. It came as the Columbus Regional Airport Authority broke ground on a new $140 million car rental facility that relies on a steady stream of car rental user fees.	Emerging Mobility	Peer to Peer car sharing: state legislation
https://www.localdvm.com/news/maryland/new-law-requires-taxes-for-peer-to-peer-car-sharing-programs/	A new law that went into effect Jan 2019, will require peer-to-peer car sharing programs to pay taxes and other fees in the state of Maryland. Online car platforms like Turo will now be ordered to pay taxes similar to other car rental places like Hertz and Enterprise Rent-A-Car.	Emerging Mobility	Peer to Peer car sharing: state legislation
https://taxes.marylandtaxes.gov/Resource_Library/	As result of legislation passed during the 2018 Session of the Maryland General Assembly, the definition of "short-term vehicle rental" for sales tax purposes was expanded to include a shared motor vehicle used for peer-to-peer car sharing and made available on a peer-to-peer car sharing program. Effective July 1, 2018, Senate Bill 743established a regulatory framework for peer-to-peer car sharing in the State, impacting not only the Tax-General Article, but the Commercial Law, Insurance & Transportation Articles as well. The legislation set the sales tax rate for charges made in connection with a shared motor vehicle used for peer-to-peer car sharing and made available on a peer-to-peer car sharing program at 8%.The taxable price for charges made in connection with a shared motor vehicle used for peer-to-peer car sharing made available on a peer-to-peer car sharing program includes all sales and charges.	Emerging Mobility	Peer to Peer car sharing: state legislation
https://www.autorentalnews.com/326544/utah-lawmakers-move-to-regulate-p2p-carsharing	Utah's Senate Transportation Committee voted to endorse a bill that would impose taxes on peer-to-peer (P2P) carsharing companies that are similar to traditional car rental firms. Similarly, Salt Lake City is expected to pass an ordinance today that will levy fines between $500 and $1,000 on P2P carsharing companies that operate at Salt Lake City International Airport without authorization.	Emerging Mobility	Peer to Peer car sharing: state legislation
https://taxfoundation.org/reforming-rental-car-excise-taxes/	Arizona: SB 1305 applies 5% rental car tax to car-sharing firms HB 2559 creates a separate regulatory and tax structure for peer-to-peer car-sharing firms; Bill pending (SB 1305) Bill pending (HB 2559) Colorado: Extends airport concession fees to car-sharing firms; Bill pending (SB 19-090) Florida: Defines peer-to-peer car sharing as a car rental; Bill pending (SB 1148) Hawaii: Treats car sharing and car rentals the same for tax purposes Maryland: Existing statute regulates peer-to-peer car sharing as a separate market. Minnesota: Exempts car-sharing firms from rental car tax; Bill pending (HF 1357) New Mexico: Repeals the 5% leased vehicle surcharge, requires concession fee agreements with airports; Bill pending (SB 556) Ohio: Assesses sales tax and relevant airport concession fees (negotiated by airports) on peer-to-peer car-sharing firms; Bill pending (HB 62) Texas: Requires peer-to-peer car-sharing firms to pay rental car excise taxes; Bill pending (HB 2872) Utah: Requires peer-to-peer car-sharing firms to pay rental car excise taxes; SB 190 failed in the Senate West Virginia: Requests a study on the feasibility of peer-to-peer car-sharing regulations (no mention of tax); HCR 108 was enacted in March 2019	Emerging Mobility	Peer to Peer car sharing: state legislation
https://arcb.com/blog/what-is-residential-delivery-and-how-does-it-work	As the shift to e-commerce shopping grows, consumers are more confident in what they purchase online. -It has become normal to buy large items like mattresses, treadmills, electronics or other home furnishings via the Internet. This way, shoppers can have their order delivered directly to their home instead of handling heavy items themselves. -With residential delivery, the carrier transports freight directly to a residence or business.	Emerging Mobility	Residential Delivery
https://www.researchgate.net/publication/265845119_Home_Delivery_and_the_Impacts_on_Urban_Freight_Transport_A_Review	Home delivery is growing since the rise of internet shopping and could become an attractive market for providers of city logistics. Internet shopping or home delivery is one of the trends that have an impact on freight traffic in urban areas.	Emerging Mobility	Residential Delivery

Literature Review in Support of SB19-239: EMERGING MOBILITY

Source	Notes	Theme	Subtheme
https://www.citylab.com/transportation/2017/04/cities-seek-deliverance-from-the-e-commerce-boom/523671/	Since 2010, online retail sales in the U.S. have increased about 15 percent every year and there are more delivery vehicles on the roads. -Every 25 people produce one Internet delivery. -According to the National Capital Region Transportation Planning Board It's estimated that, on average, every person in the U.S. generates demand for roughly 60 tons of freight each year. -In 2010, the United States Post Office—, which has overtaken both FedEx and UPS as the largest parcel-delivery service in the country—delivered 3.1 billion packages nationwide. -In 2010, UPS delivered 1.1 million packages around D.C. in the month of March. It is now dropping off 6,500 more packages each day than it did then. -In 2016, the USPS delivered more than 5.1 billion packages. -Delivery services industry such as Amazon, Ups, Usps and FedEX are increasing traffic congestion in urban areas. -Truck traffic currently represents about 7 percent of urban traffic in American cities and causes congestion cost of $28 billion, or about 17 percent of the total U.S. congestion costs, in wasted hours and gas. -As more goods are ordered, more delivery trucks are dispatched on narrow city streets. -In a place like New York City, where more than 120,000 packages are delivered daily in Manhattan below 60th Street, according to the city's department of transportation, these missing accommodations compound the congestion problem. -In Seattle, non-work trips increased from 10.3 million trips per day in 2006 to 12.6 million trips per day in 2014. - UPS paid New York City $18.7 million in parking fines in 2006; in 2011 in Washington, D.C., UPS alone received 32,000 tickets. -Delivery companies are also experimenting with ways to reduce their impact. Late last year, UPS introduced its first "eBike" deliveries in (of course) Portland, Oregon. The aim is twofold: Reduce carbon emissions while putting a delivery vehicle on the road small enough to take advantage of curb space. UPS is also integrating across its U.S. routes its new big-data tool, Orion, or On-Road Integrated Optimization and Navigation. -In New York City, a slow shift to off-hour deliveries is taking place. Of the Big Apple's roughly 18,000 restaurants, about 400 restaurants now take deliveries between the off-peak hours of 7 p.m. and 6 a.m. -A truck traveling at night produced 60 percent less pollution, or a greenhouse-gas reduction of more than 6,000 tons a year, than a truck traveling in the morning.	Emerging Mobility	Residential Delivery
https://www.metrans.org/sites/default/files/MF%205.1a_Residential%20Parcel%20Deliveries_Final%20Report_030717.pdf	B2C (business-to-consumer) and Parcel Deliveries Online sales have been the main driver of retail growth in recent years. Online retail sales (B2C) in the United States are growing at the rate of about 15% per year and accounted for 7.3% of total retail sales in 2015 (US DOC),which is65% of all the growth in retail sales between 2014 and 2015. The emergence of e-commerce is associated with a growth of parcel deliveries, including USPS that delivered more than 4.5 billion units in 2015, a growth of 45%from 2010. The two other major carriers, UPS and FedEx, experienced a respective growth of 17% and 50% during the same period. The growth of home deliveries has incited online retailers such as Amazon to enter the parcel delivery market since they are able to generate enough cargo to offer own account transport services. See plot 17	Emerging Mobility	Residential Delivery
https://www.metrans.org/sites/default/files/MF%205.1a_Residential%20Parcel%20Deliveries_Final%20Report_030717.pdf	Survey: A building of about 300 apartment units with 800 residents in Northern New Jersey, in the inner suburbs of New York, a neighborhood characterized by an upper middle income (median income of $67,000) with the two most significant ethnic groups being whites (43%) and Asians(40%). Scale and Scope of Parcel Deliveries: -For 2016(January to December), 23,613 parcels were delivered. This accounts for 1,967deliveries per month, 454 deliveries per week and 65 deliveries per day. -On a per apartment unit basis, 1.53 parcel deliveries were done per week. Based upon the size of the sample, it is suggested that 1.5 parcel deliveries per week per apartment can be used as a parameter for freight traffic generation models in a similar socioeconomic context (middle to upper middle class neighborhoods). -Alternatively, each resident generates about 0.5 to 0.6 parcel deliveries per week. -Comparing parcel deliveries between January 2015, 2016 and 2017 revealed an annual growth of 17%, which is much in line with the 15% annual growth of online retail sales in the United States (US DOC).	Emerging Mobility	Residential Delivery
https://www.metrans.org/sites/default/files/MF%205.1a_Residential%20Parcel%20Deliveries_Final%20Report_030717.pdf	See plots 18: Weekly Delivery Frequency of Parcels for the Sampled Apartment Complex, 2016 Each apartment unit generates about 1.5parcel deliveries per week. This is about 0.5 to 0.6 deliveries per resident per week. •Comparing January 2015 with January 2016 and January 2017 reveals a consistent annual growth of 17%of parcel deliveries, which is in line with the 15% annual growth of online retail sales in the United States. •Parcel deliveries during weekdays are relatively uniform with an increase until the Wednesday peak of 19% of all deliveries. 10 •Only 14.1% of parcel deliveries are made on weekends, with Sundays being the lowest activity day (2% or all deliveries). •The months of November and December are peak periods for home deliveries, with 20.9% of all deliveries. •February is the month of lowest activity with 7.4% of home deliveries. •There is a notable decline of home deliveries in the week around major federal holidays such as Memorial Day, the 4thof July and Labor Day. The United States Postal Service still accountsfor 47% of all parcel deliveries. •The specialized parcel companies, UPS and FedEx, account for 28% and 11% ofdeliveries respectively. •Amazon is a new entrant that accounts for 11% of all parcel deliveries and the only private provider offering 7 day deliveries	Emerging Mobility	Residential Delivery

Literature Review in Support of SB19-239: EMERGING MOBILITY

Source	Notes	Theme	Subtheme
https://www.greenbiz.com/article/cities-mobilize-avert-peak-delivery-congestion	Online sales in the United States will grow from an estimated $409 billion to over $603 billion in 2021. -With those sales come material deliveries. The United States alone accounted for an annual 13 billion parcel shipments — just over 40 packages a year for every man, woman and child in America — and that number likely will double in the next three to four years. -In the German city of Hamburg, UPS sends out electric vehicles that act as micro depots and then uses walkers, conventional tricycles and eBikes to make deliveries throughout the city center and in pedestrian-only zones. -Japan's Chiba City plans to eliminate delivery vans entirely as large drones bring packages from a portside warehouse, dropping them off at a staging area where smaller drones deliver packages to balconies on high-rise condominiums. -With more people, moving to urban areas and doing more shopping online, delivery vehicles are becoming a serious concern in traffic congestion. -947,000 hours of vehicle delay can be attributed to delivery trucks parked curbside in dense urban areas. -The U.S. Freight Transportation Forecast predicts a truck freight increase by roughly 27 percent between 2016 and 2027. With such looming statistics suggesting more traffic in areas with severe congestion in the first place, many cities and agencies are looking into various methods to decrease congestion from the high demand for deliveries.	Emerging Mobility	Residential Delivery
https://www.vox.com/2017/7/5/15916688/ohio-fifth-state-delivery-food-robots-starship-law	Delivery robots: -Ohio is now the fifth U.S. state to pass a law permitting the use of delivery robots on sidewalks and in crosswalks statewide. -The Ohio statute comes less than a week after Florida became the fourth state in the country to create a similar law. -Wisconsin, Idaho and Virginia likewise passed state legislation to allow for the use of delivery robots earlier this year — all with the help of Starship Technologies. -Ohio's new robot law allows the machines to operate on sidewalks and in crosswalks in the state, so long as they weigh less than 90 pounds and travel at speeds of less than 10 miles per hour. -The robots can rove unmanned, but a person is required to be in the loop remotely to take over operation in case something goes awry.	Emerging Mobility	Residential Delivery
https://netchoice.org/wp-content/uploads/netchoice-policy-note-v9.pdf	Travelers are renting more cars than ever, and Americans are increasingly renting special-purpose vehicles to meet their special needs. The U.S. rental car market is growing at over 5.6 percent per year. The big rental car companies are expanding their fleets and adding new locations, too. See Plot 18	Emerging Mobility	Car sharing

Literature Review in Support of SB19-239: CONGESTION PRICING

Source	Notes	Theme	Subtheme
https://mobilitylab.org/2018/02/06/u-s-is-the-world-leader-in-traffic-jams/	United States ranked as the most traffic-congested developed country in the world. US drivers spend an average of 41 hours a year battling traffic during peak travel times of 6 a.m. to 9 a.m. and 3 p.m. to 6 p.m. Los Angeles, New York, San Francisco, Atlanta, and Miami are five of the top 10 most-gridlocked cities in the world.	Congestion Pricing	Current State
http://inrix.com/press-releases/scorecard-2018-us/	Total congestion costs in US was $87 billion in 2018. Congestion Costs Each American 97 hours, $1,348 in 2018. -Most congested urban area in the US: Boston: 164 hours- $2,291 per driver Washington D.C. : 155 hours- $2,161 per driver Seattle: 138 hours-$1,932 per driver Chicago: 138 hours- $1920 per driver New York city: 133hours- $1859 per driver Los Angeles: 128 hours- $1788 Denver: 83 hours- $1,152 per driver	Congestion Pricing	Current State
https://www.citylab.com/transportation/2017/04/cities-seek-deliverance-from-the-e-commerce-boom/523671/	Since 2010, online retail sales in the U.S. have increased about 15 percent every year and there are more delivery vehicles on the roads. -Every 25 people produce one Internet delivery. Delivery services industry such as Amazon, Ups, Usps and FedEX are increasing traffic congestion in urban areas. Truck traffic currently represents about 7 percent of urban traffic in American cities	Congestion Pricing	Current State
https://www.transportation.gov/sites/dot.dev/files/docs/Costs%20of%20Surface%20Transportation%20Congestion.pdf	Studies have identified several direct and indirect costs of traffic congestion including excess fuel usage, emissions and environmental damage, Higher accident rates and safety cost, increased travel time, Excess vehicle operating costs, Higher frequency of cargo delays and Loss of productivity.	Congestion Pricing	Benefits
https://traveltips.usatoday.com/effects-traffic-congestion-61043.html	Heavy traffic congestion causes serious problems in US crowded cities and streets like fuel Consumption, pollution, road rage and delay.	Congestion Pricing	Current State
https://ops.fhwa.dot.gov/publications/congestionpricing/congestionpricing.pdf	Congestion pricing is a potential solution for serious problems caused by heavy traffic congestion. By removing a fraction (even as small as 5%) of the vehicles from a congested roadway, pricing enables the system to flow much more efficiently, allowing more cars to move through the same physical space.	Congestion Pricing	Benefits
https://ops.fhwa.dot.gov/publications/congestionpricing/sec2.htm	There are four main types of pricing strategies that have been implemented or are being considered for implementation in the United States: -Variably priced lanes, involving variable tolls on separated lanes within a highway, such as Express Toll Lanes or HOT Lanes, i.e. High Occupancy Toll lanes -Variable tolls on entire roadways - both on toll roads and bridges, as well as on existing toll-free facilities during rush hours -Cordon charges - either variable or fixed charges to drive within or into a congested area within a city -Area-wide charges - per-mile charges on all roads within an area that may vary by level of congestion.	Congestion Pricing	Methods
https://www.transportation.gov/sites/dot.dev/files/docs/Costs%20of%20Surface%20Transportation%20Congestion.pdf	Several countries are using different techniques to reduce traffic congestion since 1975, including Singapore, Norway and England. Singapore is implemented ALS, Area License Scheme from 1975 to 1998 by requiring motorist to have a license for commuting into business district's restricted zone. In 1998 Electronic Road Pricing (EPR) system was replaced with ALS.	Congestion Pricing	Case Study
https://www.researchgate.net/publication/222434541_Norway's_urban_toll_rings_Evolving_towards_congestion_charging	The first Norwegian urban toll ring was established in Bergen in 1986 to raise finance to accelerate the implementation of a wide-ranging program of transport investments. -A number of other Norwegian cities have adopted the scheme including: Oslo, Trondheim, Stavanger and Kristiansand. Both Oslo (1990) and Trondheim (1991) use automatic toll collection, made possible with modern electronic permits. -In mid-1980, Norway implemented a road tolling system called toll rings in seven cities to reduce roadway congestion and finance transportation projects. The world's first fully automated toll ring was implemented in Trondheim 1991 and a zone-based tolling system was introduced in 1998.	Congestion Pricing	Case Study
http://nyc.streetsblog.org/wp-content/uploads/2018/01/TSTC_A_Way_Forward_CPreport_1.4.18_medium.pdf	London's congestion pricing cordon scheme was launched in February 2003 to reduce congestion, improve bus service, improve journey time reliability for car trips, and make the distribution of goods and services more efficient. A congestion charge program was established for Stockholm in 2006 which required vehicle owners to pay 20 krona per passage (USD $3.00) into or out of the Stockholm inner city on weekdays between 6:30 a.m.-6:29 p.m.	Congestion Pricing	Case Study
https://www.researchgate.net/publication/325987968_The_Ecopass_pollution_charge_and_Area_C_congestion_charge_-_comparing_experiences_with_cordon_pricing_over_time	Milan congestion charge scheme: -In 2008, Milan introduced a cordon pricing scheme called Ecopass in the city center, by which vehicles entering the area had to pay a pollution charge, -In March 2013, Ecopass was replaced by a congestion-pricing scheme, Area C. All vehicles entering the area between 7:30 and 19:30 have to pay a five-euro charge for travelling the whole day in the charged area.	Congestion Pricing	Case Study
https://link.springer.com/article/10.1007/s11116-017-9853-4	The Gothenburg congestion charge scheme implemented in January 2013 to finance infrastructural investments, reduce traffic congestion and air pollution. The congestion charge is a time-of-day dependent cordon-based system and encompasses the entire Gothenburg city center and the E6 highway connecting to it.	Congestion Pricing	Case Study

Literature Review in Support of SB19-239: CONGESTION PRICING

Source	Notes	Theme	Subtheme
https://scholar.utc.edu/cgi/viewcontent.cgi?article=1060&context=honors-theses	London Congestion pricing scheme benefits From2002 to 2003: -Decline of carbon dioxide (CO2) emissions by 16%, -Decline of nitrogen oxide (NOX) emissions by 13.5%, -Decline of particulate matter (PM10) by 15.5% From 2003 to 2013: - 30% reduction of traffic congestion -Improvement of air quality and public health - creating a long-term funding source for future transportation improvements. - Gross revenue from 2003 to 2013:£2.6 billion (USD $3.9 billion) - 46% or £1.2 billion (USD $1.8 billion) of net revenue has been invested in public transport, road and bridge improvement, and walking and cycling schemes The annual operating costs= £130 million (USD $172 million), The annual net revenue is roughly £137 million (USD $182.1 million). -Traffic entering the zone during charging hours has declined by 18%, and traffic circulating within the zone has declined by 15%11. -Increasing bus service by 23%	Congestion Pricing	Case Study
http://nyc.streetsblog.org/wp-content/uploads/2018/01/TSTC_A_Way_Forward_CPreport_1.4.18_medium.pdf	Stockholm cordon congestion pricing results: - Traffic to and from the inner city cordon was reduced by 20%, - Traffic delays decreased by 30-50%. - Vehicle miles traveled decreased by 14% in the cordon and decreased by 1% outside the cordon. - Reductions of 14% in carbon dioxide (CO2), 7% in nitrogen oxide (NOX) and 9% in particulate matter (PM10) -2.5% Reduction of greenhouse gases of outside of the cordon. -Estimation of be 20-25 fewer premature deaths per year in Stockholm's inner city and a total of 25-30 fewer premature deaths annually in the Stockholm metropolitan area. -Increase of net revenue from 500 million krona to 1.3 billion krona (USD $155 million) -Reduction of annual operating cost from 250 million krona/year (USD $29.7 million) to 100 million krona/year (USD $11.8 million) - Before 2016, the highest peak charge per passage was 20 krona, while after 2016 the highest peak charge is now 35 krona per passage.	Congestion Pricing	Case Study
http://nyc.streetsblog.org/wp-content/uploads/2018/01/TSTC_A_Way_Forward_CPreport_1.4.18_medium.pdf	Singapore congestion pricing plan results: -Decline of traffic in the inner city by 24% despite of strong population growth. -Increase of average speed from 30-35 KPH to 40-45 KPH (18-22 MPH to 24-28 MPH) -Extensive public transit improvements -Bus and train ridership has increased by 15%. -Social benefits including better accessibility, connectivity, improved public health, and support for economic development. -Levels of CO2 and other greenhouse gas emission have been reduced by 10-15% within the inner city. - ERP have supported public transit, street safety, and transit-oriented development. -Creating a comprehensive bicycle and pedestrian network with a focus on first-and-last mile connectivity projects. -Increase of parking fees and taxes and fees related to car ownership.	Congestion Pricing	Case Study
https://www.transport.govt.nz/assets/Uploads/Land/Documents/d7e225bc6a/DArtagnan-appendices-to-be-released.pdf	Singapore congestion pricing plan results: -The ALS originally reduced morning peak traffic volumes by 60% -ERP reduced traffic volumes by an average of 7% -Overall traffic volumes have reduced by between 17% and 4% depending on the charging point.	Congestion Pricing	Case Study
https://www.researchgate.net/publication/325987968_The_Ecopass_pollution_charge_and_Area_C_congestion_charge_-_comparing_experiences_with_cordon_pricing_over_time	Benefits from Milan cordon congestion pricing scheme: -Reduction of traffic inside the tolled area by 16.2% with Ecopass and a further 30.7% with Area C. -Decrease of road accident whiten the tolled area by 21.3% with Ecopass and a further 20.8% with Area C. -Decline of number of high polluter vehicles by 48.1% -Increase of low emission vehicles by 478% -The daily average of vehicles entering the area during the first year of Area C was reduced by 30.7% with respect to the period of Ecopass, amounting to 41.000 vehicles less per day. -Reduction of road accident by 23.8% with respect to 2011. - Increasing the number of subway stations inside the tolled area by 12.5%. - the average speed of public transport such as buses and trams increased by 11.8% and Ecopass and a further 5% with Area C between 8:00 and18:00. Outside the Area C the velocity of busses and trams increased by only 2-3% in the same period. -Estimation of PM10 reduction by 15% with Ecopass scheme and another 18% reduction with Area C toll system. -During the period between January to June 2012, the revenues under the Area C scheme amounted to 11.2 million Euro.	Congestion Pricing	Case Study

Literature Review in Support of SB19-239: CONGESTION PRICING

Source	Notes	Theme	Subtheme
https://www.sciencedirect.com/science/article/pii/S0965856415000531	Gothenburg's congestion pricing scheme results: -12% Reduction in traffic volume across the cordon during charged hours after approximately 8 months. -Generating 72 million EUR revenue in first year. -The operating cost of the system was approximately 12 million EUR in 2013. This corresponds to 17% of the revenues. - Reduction of the emissions from car traffic, such as nitrogen dioxide (NO2) and particles. Total number of trips by mode and purpose affected by the charges – before (2012) and after (2013) introduction of congestion charges: Passenger Vehice -9percent; Public Transportation +24percent; Cycle -36percent	Congestion Pricing	Case Study
https://www.6sqft.com/starting-in-january-it-will-cost-5-80-just-to-sit-in-a-yellow-cab-in-parts-of-manhattan/	In January 2018, New York city implemented a congestion pricing scheme to charge yellow cabs, ride hailing and app based companies like Uber to enter the congested parts of Manhattan. Revenue from the fee is estimated to bring in $400 million each year to the Metropolitan Transportation Authority.	Congestion Pricing	Case Study
https://www.pri.org/stories/2019-05-30/new-york-city-gets-nations-first-congestion-pricing-plan	In April 2019, New York City has passed a new congestion pricing scheme after a decade of struggle to reduce traffic congestion in Manhattan. The fee of commuting in congestion zone will likely be between $11 and $14.	Congestion Pricing	Case Study
https://www.theguardian.com/us-news/2019/apr/01/new-york-congestion-pricing-manhattan	Manhattan congestion pricing plan plan is expected to raise $15Billion for the Metropolitan Transportation, which is struggling to modernize decades-old subway infrastructure and reduce rampant delays. -The plan will implement from 2021 for first time in United States to charge cars around $12 and trucks around $25 to enter Manhattan south of 60th Street. -It will charge all of the cars, which enter into Midtown and Lower Manhattan during peak business hours including private cars, trucks, yellow taxis, Uber and Lyft.	Congestion Pricing	Case Study
https://www.loe.org/shows/segments.html?programID=19-P13-00020&segmentID=3	The forecasted benefits of New York congestion pricing scheme are as follows: -The number of vehicle trips into the city will reduce about 15%. -More people will bike and walk within Manhattan, as a result the amount of carbon emissions will reduce. -About $1 billion in revenue will come from cars and trucks, which enter into Manhattan's central business district. The other half a billion will come from charging yellow taxis, Ubers and Lyfts for trips within the same district. -The annual net benefits will be about $3.5 to $4 billion. -Most of the revenue will be allocated to modernizing the signal system in the subway.	Congestion Pricing	Case Study
https://www.nytimes.com/2019/03/26/nyregion/what-is-congestion-pricing.html	New York state legislators are considering some possible exemptions for Manhattan congestion pricing: -Drivers with low income, disabilities, and drivers who are going to medical appointments. -Residents of congestion zone would not pay when they drive within the zone or when they leave the zone, but they will when they return from elsewhere.	Congestion Pricing	Case Study
https://www.nytimes.com/2019/04/01/nyregion/new-york-congestion-pricing.html	Several US cities are considering congestion pricing plan to mitigate their traffic congestion problems. -Philadelphia is considering congestion pricing for the first time to improve equity, safety, sustainability and mobility. -Los Angeles are conducting studies to lay the groundwork for congestion pricing. - San Francisco is considering congestion pricing after trying other options to combat gridlock downtown, including expanded bus and rail service, installing dedicated transit lanes and added bike routes. -Seattle's mayor is leading efforts to have congestion pricing in place by 2021.	Congestion Pricing	Case Study
https://ops.fhwa.dot.gov/publications/congestionpricing/sec2.html	The revenues from Congestion pricing can pay the substantial cost of infrastructural transportation projects: -to operate the toll collection and traffic management systems. -expansion of roadway facilities, -to support alternatives to driving alone such as public transit, -to address impacts on low-income individuals by providing toll discounts or credits, or to reduce other taxes that motorists pay for highways such as fuel taxes, vehicle registration fees or sales taxes.	Congestion Pricing	Methods

Literature Review in Support of SB19-239: USAGE CHARGE

Literature Review in Support of SB19-239: Source	Notes	Theme	Subtheme
https://www.cfr.org/backgrounder/transportation-infrastructure-moving-america	U.S. transportation infrastructure requires substantial capital investment. Many of highways and bridges built decades ago are now reaching the end of their expected lifespan. U.S. transportation system suffers from insufficient investment.	Road Usage Charge	Current State
"U.S. Road and Bridge Data by State," U.S. Department of Transportation, updated October 13, 2013 https://www.transportation.gov/briefing-room/dot-fact-sheets-highlight-grim-state-us-roads-and-bridges.	In some states, nearly 3 in 4 roads are in poor or mediocre condition.	Road Usage Charge	Current State
Praveen Duddu, "The world's biggest road networks," Road Traffic Technology, January 12, 2014 https://www.roadtraffic-technology.com/features/featurethe-worlds-biggest-road-networks-4159235/	The costs of maintaining the world's largest highway network are high and growing rapidly.		
Chad Shirley, "The Status of the Highway Trust Fund and Options for Paying for Highway Spending," Congressional Budget Office, June 17, 2015 http://www.cbo.gov/sites/default/files/114th-congress-2015-2016/reports/50298-TransportationTestimony_1.pdf.	In 2014 alone, federal, state, and local governments spent $165 billion to build, operate, and maintain highways.		
2017 Infrastructure Report Card," American Society of Civil Engineers, 2017 https://www.infrastructurereportcard.org/wp-content/uploads/2017/01/Roads-Final.pdf.	As of 2017, the U.S. had an $836 billion backlog of highway and bridge capital needs.		
http://www.ncsl.org/bookstore/state-legislatures-magazine/deep-dive-transportation-funding.aspx#/	U.S. States face three big hurdles to maintaining bridges and roads, as well as building new transit lines and repairing the existing infrastructure so it remains safe and efficient. -More than half of the U.S. states have enacted legislation to increase transportation revenues since 2013. - The most common transportation revenue source in 28 states and D.C is the gas tax. -Fuel tax cannot afford transportation costs: -Cars are more fuel-efficient today compared to last decades. -Fuel economy standards were 27.5 miles per gallon in 1985, 30.2 mpg in 2011, and rose to 36.5 mpg in 2016. -Hybrid or electric vehicles use gas only part of the time—or not at all do not pay gas tax. -American electric and plug-in hybrid vehicle sales are projected to near 1.6 million units in 2018, up from just 122,000 in 2012. -55% percent of all new car sales and 33% of the global fleet will be electric by 2040. -Shared transportation services such as Uber and Lyft are expanding into rural and suburban regions -Advent of autonomous vehicles will increase road usage in U.S. streets and roads. -U.S. states are considering creating new transportation funds like road usage charge, tolling, fees and taxes for vehicles do not use gasoline.	Road Usage Charge	Current State
https://www.bts.gov/sites/bts.dot.gov/files/docs/browse-statistical-products-and-data/transportation-statistics-annual-reports/TSAR-Full-2018-Web-Final.pdf	People in the United States took over 220 billion-vehicle trips in 2017 (about 2.8 trips per person per day). -Transportation revenues declined because vehicle gas mileage improved by 13.8 percent from 2007 to 2014. In 2015, about $337.8 billion dedicated to transportation programs. More than half of the revenue ($194.3 billion, or 57.5 percent) came from taxes and charges levied on transportation-related activities. In 2015 own-source, transportation revenues covered only 59% of its costs. In 2017, Highway and street construction accounted for 74.5 percent of public spending on transportation construction ($88.9 billion). In 2017, investment in transportation infrastructure and equipment was $412 billion or 14.1% of the $2931.1 billion in investment in all infrastructure and equipment. -Increase of transportation workers' salaries by 2.6% from 2016 to 2017, increase in equipment and fuel cost, contributed to the growth of transportation services' cost.	Road Usage Charge	Current State
https://www.instituteforenergyresearch.org/regulation/gas-tax-little-road-costs/	Taxes on gasoline only covered 43 percent of total cost of state roads. Tolls and other form of tax cover the road construction and maintenance costs. In 2010, California covered 19.1 percent of total road spending by state and local gasoline taxes. In addition, explicit tolls and other direct user fees covered 3.6 percent of California's road spending. All told, gas taxes and direct user fees covered only 34.4 percent of the state's total road spending in 2010. The remaining 65.6 percent was covered out of revenues that are more general.	Road Usage Charge	Current State
https://taxfoundation.org/gasoline-taxes-and-tolls-pay-only-third-state-local-road-spending/	In 2010, U.S. state and local governments raised $37 billion in fuel taxes and $12 billion in tolls and non-fuel taxes. - The cost of U.S. highways was $155 billion in 2010. -Highway user taxes and fees made up just 32 percent of state and local expenses on roads. The rest of costs came from general revenues, including federal aid.	Road Usage Charge	Current State
https://www.ttnews.com/articles/gas-taxes-peril-more-states-study-alternatives	After more than a decade of watching Oregon, more states are joining to test alternatives to traditional gasoline taxes with the help of federal money. -Per-gallon gas tax is not a reliable source of funding for transportation projects because cars are fuel-efficient today and some do not use gasoline at all. -Lawmakers have not raised the federal government's 18.4-cent-per-gallon gas tax since 1993. - Congress dedicated $95 million in grants for states to study mileage-based fees and other alternatives to the gas tax. -Minnesota is considering the idea of imposing taxes on transportation network companies like Uber and Lyft, rather than individual drivers. -Colorado, where gas tax rates have remained the same for 22 years, in 2018, started a four-month test with 150 drivers to explore different ways of tracking mileage for motorists. -Missouri explored adjusting its vehicle registration fees to reflect their fuel efficiency, and it is now getting public feedback on equity and data security issues. -In 2017, California conducted its own test-run of 5,000 vehicles the largest experiment of its kind in the country for nine months. The test included trucking companies and motorists from every county of California state.	Road Usage Charge	Case Study
https://www.wired.com/story/gas-tax-vmt-toll-road/	More than half of U.S. states have looked into taxing VMT. -Gas tax and other form of taxes drivers are paying for their use of U.S. roads and highways, does not cover the costs of maintaining the roads on which they travel. - As cars get more efficient, drivers are pumping less gas, exacerbating the problem. -In recent decades, many experts has tried to find a potential way to fix the three big problems that come with cars: road damage, congestion, and pollution. -In 2017, the American Society of Civil Engineers gave US road infrastructure a D grade. One out of every five highway miles is in poor condition because there is no money to fix them. -In a majority of states, direct user fees (gas taxes, tire taxes, registration fees, and so on) cover less than half of road spending - Poor quality roads slow cars down and worsening traffic. -Traffic already costs American drivers an annual $75.5 billion in fuel and time. Congestion adds to the cost for businesses providing goods and services via those roads -Personal automobiles account for about 17 percent of US greenhouse gas emissions and make a variety of health problems including asthma, heart attacks, childhood leukemia, low birth weight, immune system damage, and lower fertility rates. The cost to the health care system and lost productivity comes to billions or trillions of dollars.	Road Usage Charge	Current State
https://www.theamericanconsumer.org/wp-content/uploads/2019/01/VMT-Fee-Final.pdf	Transportation investments are insufficient to maintain system deterioration and to finance demands for surface transportation. -Nationwide, the annual costs in vehicle expenses were estimated to be an additional $66.6 billion in 2013, due to driving on roads in need of repair. -Increasing the gas tax is not a long-term solution to American's need for additional transportation funding. -There are some obvious flaws in the gas tax which cause an interest in exploring other revenue sources for funding road investment: 1-Fuel efficiency of cars and trucks in the U.S. has improved markedly over the past four decades, but total motor fuel consumption has remained stable since 2005. However, tens of millions of vehicles being added to U.S. roads. 2-Electric and other alternative fuel vehicles that become more common in U.S., which are not paying gas tax and contributing to maintaining the roads they enjoy. 3- Lower-income individuals typically spend a much larger portion of their income on fuel taxes than wealthier individuals do.	Road Usage Charge	Current State

Literature Review in Support of SB19-239: USAGE CHARGE

Literature Review in Support of SB19-239: Source	Notes	Theme	Subtheme
https://cloudfront.escholarship.org/dist/prd/content/qt62f72449/qt62f72449.pdf?t=pkz4i0	Mileage-based user charge would be the easiest and least costly way of addressing the long-term decline of gasoline taxes. Since electric vehicles use no gasoline, ZEV (Zero Emission Vehicles) drivers pay no gasoline tax. As more people drive EVs, gas-tax revenue for road repairs is dwindling. -Annual registration fee for ZEVs suffers from several major drawbacks: 1-Considering 5 million EVs on the road by 2030, the current registration fee and gasoline tax will cause $500 million decrease infrastructure funding annually. 2- Plug-in hybrid electric vehicles must pay both the registration fee and the current gasoline tax (for any gasoline consumed). 3-Owners of ZEVs would pay more under the registration fee compared to what they would equivalently pay with a gasoline tax. 4- ZEV owners would pay the same amount no matter how much they drive, but gasoline tax differs based on amount of usage. ZEV exclusive road usage charge is the most promising alternative to the ZEV registration fee which has several benefits over applying RUC for all vehicles: -Eliminating double tax payments for gasoline vehicles -It allows gasoline cars to avoid extra costs for using advanced technologies to monitor vehicle miles travelled.	Road Usage Charge	Methods
https://www.theamericanconsumer.org/wp-content/uploads/2019/01/VMT-Fee-Final.pdf	Properly designed, a VMT fee could overcome many of the shortcomings of the gas tax. -Transitioning to a VMT would insulate HTF (Highway Trust Fund) revenues from improvements in fuel economy standards and will create a sustainable highway funding stream far into the future. -VMT rates can be adjusted based on vehicle weight, road type, time-of-day to better reflect the actual costs of transportation system.	Road Usage Charge	Current State
Ashley Langer, Vikram Maheshri, Clifford Winston https://www.brookings.edu/wp-content/uploads/2017/06/jpube-vmt-paper.pdf	VMT tax has several economic advantages: 1-raise revenues to significantly reduce the current and future deficits in the Highway Trust Fund, 2-increase annual social welfare $10.5 billion 3-dominate a gasoline tax designed to generate an equivalent revenue stream on efficiency, distribution-al, and political grounds.	Road Usage Charge	Benefits
http://www.ncsl.org/research/transportation/road-use-charges.aspx	The STSFA, Surface Transportation System Funding Alternatives established by Congress in the 2015 Fast Act. -STSFA provides for $95 million in competitive grants over five years (through 2020) to help state departments of transportation "demonstrate user-based alternative revenue mechanisms that utilize a use fee structure to maintain the long-term solvency of the federal Highway Trust Fund."	Road Usage Charge	Current State
https://www.fhwa.dot.gov/pressroom/fhwa1648.cfm	In Aguste 2016, the U.S. Department of Transportation's Federal Highway Administration announced $14.2 million in grants for states under a new transportation program. The Surface Transportation System Funding Alternatives (STSFA) grant program was implemented to explore potential ways for raising revenue including on-board vehicle technologies to charge drivers based on miles traveled and multi-state or regional approaches to road user charges. - STSFA was established under the Fixing America's Surface Transportation (FAST Act). - 7 states including California, Delaware, Hawaii, Minnesota, Missouri, Oregon, and Washington were selected for this program.	Road Usage Charge	Methods
https://www.fhwa.dot.gov/pressroom/fhwa1718.cfm	In October 2017, the Federal Highway Administration (FHWA) announced $15.5 million in Surface Transportation System Funding Alternatives (STSFA) grants to six states that are exploring new ways to fund highway and bridge projects including California, Colorado, Delaware, Missouri, Washington and Oregon. - Alternatives to conventional financing are essential because highway Trust Fund's gradual cannot keep pace with increasing construction and repair costs nationwide, -The aim of these projects was evaluating various user-based approaches to raising revenue, including on-board vehicle technologies to charge drivers based on miles traveled and multi-state or regional approaches to road user charges.	Road Usage Charge	Case Study
https://www.fhwa.dot.gov/pressroom/fhwa1902.cfm	In February 2019, the Federal Highway Administration (FHWA) announced $10.2 million in Surface Transportation System Funding Alternatives (STSFA) grants to seven states to test new ways to finance highway and bridge projects: California, Delaware, Minnesota, Missouri, New Hampshire, Oregon and Utah. The program's goal was to allow states to test user-based alternatives to support the Highway Trust Fund, which relies primarily on the federal gas tax and to provide states with the opportunity to explore innovative new ways to help pay for infrastructure improvements and maintenance.	Road Usage Charge	Case Study
https://studylib.net/doc/12451200/nevada-vehicle-miles-traveled--vmt--fee-study---phase-1	In 2010, Nevada started a vehicle miles traveled (VMT) fee study to examine the historical patterns of vehicle miles traveled (VMT), fuel efficiency, and gasoline sales in the USA and Nevada. -VMT has a more equitable fee structure and is more beneficiary than fuel tax as VMT directly measures the use of Nevada roads. It directly links to the cost of transportation services. -VMT fee charges various fees for different vehicle classifications and thus better reflects the direct user costs of the transportation infrastructure. -Faster growth of VMT than gasoline sales suggests that transportation cost increases faster than gas tax revenue.	Road Usage Charge	Methods
https://static.tti.tamu.edu/tti.tamu.edu/documents/PRC-14-02-P.pdf	In 2002, a Traffic Choices Study Evaluated driver response to network tolling in the Seattle metropolitan area using a GPS to apply a mileage-based fee that varied based on the type of facility and time of day. -In 2005, Oregon Tested a mileage-based fee system that relied on a GPS for the determination of miles traveled. Wireless equipment allowed participants to pay the assessed mileage fee in conjunction with fuel purchases. -In 2005, University of Iowa worked conducted National Evaluation of a Mileage-based Road User Fee study and explored a multistate mileage-based user fee as a potential replacement system for the fuel tax The pilot was carried out in 12 U.S. cities with devices that connected to vehicular on-board diagnostic ports and used GPS to determine location.	Road Usage Charge	Case Study
http://www.ncsl.org/research/transportation/road-use-charges.aspx	Road-use charges (RUCs)—also known as mileage-based user fees (MBUFs) or vehicle miles traveled (VMT) fees—are transportation funding mechanisms that seek to more closely link transportation taxes to the actual use of the roadways by a driver, as compared to traditional fuel taxes. -Several States across the U.S. are conducting or planning pilot programs as a proof-of-concept for road usage charges including Delaware, Washington, Oregon, California and Colorado.	Road Usage Charge	Methods
http://www.ncsl.org/research/transportation/road-use-charges.aspx	Delaware: Phase 1 of the pilot, which began May 1, 2018, will include 120 motorists and focus primarily on Delaware roads. Phase 2 is set to include a multi-state truck partnership to consider how a RUC program might work with commercial vehicles. The pilot will be funded in part by a $3.1 million grant from the United States Department of Transportation's Surface Transportation System Funding Alternatives program (STSFA).	Road Usage Charge	Case Study
http://www.ncsl.org/research/transportation/road-use-charges.aspx	Washington: The Washington State Department of Transportation (WSDOT) has announced a road use charge pilot program. The 12-month initiative will include 2,000 voluntary participants who will allow WSDOT to track report and analyze their driving. More than 5,000 Washington drivers volunteered for the pilot.	Road Usage Charge	Case Study
http://www.dot.ca.gov/road_charge/resources/final-report/docs/summary.pdf	California: -In July 2016, California Road Charge Pilot Program's has been launched and lasted for nine months with over 5000 participants. -5,000 volunteer drivers from across the state of California, including private citizens, fleet vehicles, commercial trucks and government vehicles -More than 37 million miles were driven as part of the pilot. - The rate used for the pilot was set at 1.8 cents per mile. Participants feedback was as follows: - 86% satisfied with mileage reporting method - 74% satisfied with account manager chosen for the pilot -62% using technology chose a location-based mileage reporting method -73% felt a road charge was a more equitable transportation funding solution than the gas tax - 87% found participating in the pilot easy - 85% overall pilot satisfaction, which is further supported by the low rate of 4% attrition -91% expressed willingness to participate in another road charge pilot.		

Literature Review in Support of SB19-239: USAGE CHARGE

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https://www.codot.gov/programs/ruc/programs/ruc/documents/rucpp-final-report	Colorado: The Colorado Department of Transportation (CDOT) is looking at a "$1 billion-a-year budgetary shortfall for the next 10 years, largely because an expected decline in gas taxes. In late 2016, CDOT conducted a four-month pilot program of the Road Usage Charge (RUC) as a possible transportation funding replacement to the state gas tax. -To measure the success of the pilot CDOT developed several goals including: 1.Demonstrate an operational RUC; 2.Identify and evaluate issues; 3. Test the feasibility of various mileage-reporting options; 4.Solicit feedback and idea -The purposes of implementing Road Usage Charge: Environmental: Reduce mobile source emissions; System: Maintenance and Preservation; Equity: Equitable distribution of costs based on impact -At the end of the pilot, a total of 140 vehicles were still participating, which met the target goal of 100 participant; -Of the 140 vehicles enrolled at the end of the pilot, 128 were reporting mileage in April; -CDOT imposed a theoretical 1.2 cents-per-mile charge during the pilot program; -Three mileage reporting options were available to participants. Summary of Mileage Reporting Device Utilization Among Participants; Mileage Reporting Device (MRD) with GPS: Participating vehicle is equipped with a device that collects travel data from vehicular systems and uses GPS to discount out-of-state travel=70 participants, 69% Mileage Reporting Device without location determining technology= Participating vehicle is equipped with a device that uses vehicle diagnostic data to determine and transmit travel data= 18 participants, 18% Self-reporting Odometer Input= Participating vehicle has its odometer read on a monthly basis by the participating driver with that information being entered into a smartphone application or website =13 participants, 13% Colorado RUCCP results: - The initial feedback from the study was generally positive. - The RUC concept enjoyed strong support. -Operational aspects of the program also enjoyed strong support -Based on the result from a survey at the end of the pilot, Participants reported high satisfaction with all aspects of the Colorado RUCPP. -73% of respondents believed that RUC is a fair way of funding transportation in Colorado; -81% in the closing survey agreed that funding Colorado's transportation system with a mileage based road usage charge is a fair funding method; - 65% agreed that they would look forward to future RUC implementation; - More than 90% of participants thought the system, which let drivers record and report their mileage manually or with a device plugged into their car, was accurate and easy to use; -35% believed that the concept needs further study and refinement prior to implementation. -RUC allows drivers to pay based on the number of miles they drive, providing a direct correlation between the motorist's use of the transportation network and the amount they pay to support the system.	Road Usage Charge	Case Study
https://www.oregon.gov/ODOT/Programs/RUF/IP-Road%20Usage%20Evaluation%20Book%20WEB_4-26.pdf	The main revenue of the Oregon State Highway Fund comes from: Driver and Motor Vehicle(DMV) fees, Motor carrier fees, and fuels tax. -Fuels tax generates the most revenue for Oregon roads and transit, over $600 million each year -In 2015, the state fuels tax was $516 million, more than 40 percent of the State Highway Fund. -Fuel tax revenue will begin to decline in 2020. -The more fuel-efficient vehicles we register in Oregon, the more vehicle owners will drive on the road without paying for their road use. Simply raising fuels tax to address the transportation funding gap will not ensure that people pay their fair share.	Road Usage Charge	Case Study
http://transweb.sjsu.edu/sites/default/files/2909_10-04.pdf	Oregon: -In 2006, Oregon conducted the first mileage fee pilot program for 12-months to test mileage fees as a replacement for the state fuel tax. -The program included 285 volunteer vehicles and two service stations in Portland that were equipped with point of sale systems to collect the data from vehicles. -The aim of program was to response to a national concern: Fuel taxes will stop serving as a reliable revenue source as a large proportion of the vehicle fleet transitions to running on little or no petroleum-based fuel. Results: -The mileage fee program led some households to reduce their overall VMT. -The results showed significant VMT reductions in Portland Weekday Peak and Oregon Weekday VMT	Road Usage Charge	Case Study
https://www.oregon.gov/ODOT/Programs/RUF/IP-Road%20Usage%20Evaluation%20Book%20WEB_4-26.pdf	In 2012-2013 the Road User Fee Task Force intended the second pilot program to show key elements of a distance-based charging system in Oregon. Results of 2013 pilot: - Efficiency of administering the road usage charge: The system was able to successfully administer the road usage charge and credit fuels tax. -Ease of use and cost of compliance with the per-mile charging system: The system was easy and affordable for drivers to use and comply with, based on interviews with vendors and survey responses by pilot participants. -Accuracy and perception of accuracy of per mile charge data: Participants believed the mileage measurement and billing were accurate, -Privacy options for per-mile charge payers: Vendors and participants felt that the system protected privacy well Ability to audit: The pilot system was auditable, and lessons about mileage accounting reporting measures were learned during the pilot System performance: There were no identified or reported lost transactions, inaccurate billing, or missed or misreported mileage in the pilot -Ease of installation of mileage reporting devices -Functionality -Reliability -Security -Energy consumption	Road Usage Charge	Case Study
https://reason.org/commentary/mileage-based-user-fees-can-replace-gas-taxes-eventually	**Oregon:** Oregon held two pilot programs for MBUFs (2006-2007 and 2012-2013) before the Road Usage Charge Program (RUCP) and also known as OReGO	Road Usage Charge	Case Study
https://www.oregon.gov/ODOT/Programs/RUF/IP-Road%20Usage%20Evaluation%20Book%20WEB_4-26.pdf	Oregon: In July 2015, Oregon has operated the largest user-fee pilot program called OReGo which was established in 2013. -Participants receive a monthly rebate for the gas taxes they pay at the pump in exchange for a bill based on the miles they drive. - Up to 5000 volunteers participated in OReGO -Passenger vehicles registered in Oregon, with no more than 1,500 vehicles having a fuel efficiency rating of less than 17 MPG, and no more than 1,500 vehicles with a fuel efficiency rating of at least 17 MPG and less than 22 MPG. -A road usage charge rate of 1.5 cents per mile for travel on public roads in Oregon to be paid by vehicle owners. -In 2017, the per-mile rate increased to 1.7 cents (up from 1.5 cents) to reflect the increase in the state motor fuels tax included in the bill. -The per-mile rate will grow to 1.9 cents by 2022 to reflect future scheduled increases in the motor fuels tax. -The program allowed electric vehicles (EVs) to participate in OReGO to avoid a new enhanced registration fee ($110) levied on EVs, although the drivers will still be charged the standard vehicle registration fee.	Road Usage Charge	Case Study
https://kobi5.com/news/oregon-receives-nearly-5-million-for-mileage-based-road-tax-61947/	Oregon: -In September 2017, The State of Oregon received millions of dollars in grants to extend road tax pilot programs. -The Oregon Department of Transportation received two separate Surface Transportation System Funding Alternatives grants, totaling $4.9 million.	Road Usage Charge	Case Study

Literature Review in Support of SB19-239: USAGE CHARGE

Literature Review in Support of SB19-239: Source	Notes	Theme	Subtheme
https://www.oregon.gov/ODOT/Programs/RUF/IP-Road%20Usage%20Evaluation%20Book%20WEB_4-26.pdf	Oregon: In 2017, ODOT released its findings from all three MBUF programs: -Charging drivers by the mile instead of gallon consumed is possible. -Most of Oregonians in a 2016 survey agreed that a mileage-based system for transportation funding is more fair than other current options -Base on Oregon State University study: -Since Drivers of high-efficiency vehicles pay very little in gas tax, would pay more road charge. -Urban drivers are more likely to use fuel-efficient vehicles, so they would pay more under the road usage charge program. -Higher income households would pay more than lower income households under a road usage charge because they drive much more then lower income households.	Road Usage Charge	Case Study
https://content.govdelivery.com/accounts/ORDOT/bulletins/24c7950	Oregon: -In June 2019, Oregon expands its Road Usage Charge Program. -A comparison of gas tax versus road charge ($0.018 per mile as of Jan.1, 2020) at 10,000 miles driven per year: Cost Comparison; Gas Tax; Road Charge; Difference Annually Veh at 20mpg; $180; $180; $0 Veh at 30mpg; $120; $180; +$60 Veh at 40mpg; $90; $180; +$90 Evs; $0; $180; +$180	Road Usage Charge	Case Study
https://reason.org/commentary/mileage-based-user-fees-can-replace-gas-taxes-eventually/	Minnesota: -In November 2012, The Minnesota Department of Transportation (MnDOT) began a six-month pilot program for collection of a mileage based user through a GPS application on smartphones. -The program found that individual motorist will be able to use their own smart phones to report miles driven. -A 2011 study from the University of Minnesota found that MBUF success is highly dependent on external factors such as : Changes in technology and the political climate, as well as the design and administration of the system.	Road Usage Charge	Case Study
https://www.nevadadot.com/home/showdocument?id=2405	Nevada: -In 2009, the Nevada Department of Transportation (NDOT) in collaboration with the University of Nevada Reno and University of Nevada Las Vegas started a “Vehicle Miles Traveled (VMT) fee” research study. The goal of study was: -To evaluate the feasibility of an alternative, sustainable, easy-to-use, equitable and cost-effective transportation funding mechanism. -Phase I of the study was initiated in 2009 and completed in 2010 -Phase II began in November 2010 and will be completed in June 2011 -Phase III will include conducting a VMT Fee Pilot Program to assess the major components of a future VMT fee collection and payment mechanism, and to develop recommendations based on the pilot program data.	Road Usage Charge	Case Study
https://www.enotrans.org/etl-material/eno-brief-taxing-new-mobility-services-whats-right-whats-next/	TNCs Tax: -Today, seven major cities and 12 states have some type of fee or tax on TNC trips. While it may be a straightforward way to raise revenue. Chicago, IL= $0.72 per TNC ride New Orleans, LA = $0.50 per trip originating inside the parish New York, NY = $2.75 per trip or $0.75 per rider if pooled Philadelphia, PA = 1.4% of total fare of trips originating inside the city Portland, OR = $0.50 per trip King County, WA= $0.33 per trip, Seattle, WA= $0.24 per trip on rides originating inside the city Tacoma, WA= $0.10 per trip originating in the city. Washington, D.C. = $0.10 per trip originating in the city. Ocean City, City of Brunswick and Frederick, Montgomery and Prince George’s County = $.25 charge per passenger trip Alabama= 1% of total fare California= 0.33% of total TNC revenue Connecticut= 4% of total fare Iowa= 6% sales tax Maryland= State law allows individual counties and municipalities to impose their own per-trip assessments up to $0.25 Massachusetts= $0.20 per trip Nevada= 3% of total fare New Jersey= $0.50 per ride surcharge, $0.25 per shared ride surcharge New York= 4% of total fare on trips originating outside NYC Rhode Island= 1% assessment on total fare South Carolina= 1% assessment on total fare South Dakota= 4.5% of total fare Wyoming= 4% of total fare	Road Usage Charge	TNCs
https://www.enotrans.org/etl-material/eno-brief-taxing-new-mobility-services-whats-right-whats-next/	The revenue from TNCs tax: -Several states deposit tax revenue into generalized state transportation funds for infrastructure including Maryland, South Carolina, and Massachusetts. -Chicago‘s new 15-cent fee increase is dedicated to the regional transportation network and will raise an expected $16 million this year in order to support the agency’s $2 billion annual operating budget. -The District of Columbia’s2019 Budget Support Act raised the TNC per-ride tax to 6 percent, up from 1 percent, in order to raise an estimated $18 million for its regional transit system’s $1.8 billion annual operating budget.	Road Usage Charge	Revenue
http://publications.iowa.gov/29142/1/EV%20RUTF%20Impact%20Report%20123118.pdf	The Impact of Electric Vehicles to the Road Use Tax Fund (RUTF) -In September 2018, there were 800 Battery Electric Vehicles (BEV) registered in Iowa which is double the number of those vehicles from April 2017. -There are another 1,900 Plug-In Hybrid Electric Vehicles (PHEV). -To mitigate RUTF impacts due to electric vehicle usage, the idea of collecting transportation revenues based on miles traveled has been studied extensively in the United States for over a decade. - An MBUF- Mileage Based User Fee- would provide a more stable source of transportation revenue for the future. -MBUF would be applied to all mileage and would mitigate impacts from all types of vehicles, including hydrogen fuel cell EVs. -MBUF eliminate issues such as fuel efficiency and fuel source, so is a more equitable way of collecting transportation revenues.	Road Usage Charge	Evs
https://www.forbes.com/sites/jeffmcmahon/2018/06/04/who-pays-for-roads-once-electric-vehicles-defunct-the-gas-tax/#7ce058c43e0a	Taxes on gasoline and diesel fuel will evaporate because most motorists will switch to electric vehicles due to their favorable economics. -The U.S. collected $44 billion in fuel taxes in 2015 but electric vehicles could wipe out this primary source of transportation funding. -Electric vehicles will be responsible for up to 90 percent of vehicle miles traveled.	Road Usage Charge	Evs
https://www.greencarcongress.com/2019/01/20190131-ndakota.html	The North Dakota state senate has passed a bill that would impose a road use fee for electric and hybrid vehicles. The bill would establish a $110 annual road fee for EVs, and a $50 fee for electrics. The money collected would flow into the highway tax distribution fund.	Road Usage Charge	Evs

Literature Review in Support of SB19-239: MULTIPLE PASSENGER

Source	Notes	Theme	Subtheme
http://css.umich.edu/sites/default/files/Personal_Transportation_Factsheet_CSS01-07_e2018.pdf	In the U.S., the predominant mode of travel is by automobile and light truck, accounting for about 86% of passenger miles traveled in 2016. The U.S. has less than 5% of the world's population, but has 14% of the world's cars, compared to 14.6% in China, 6.7% in Japan, 4.9% in Germany, and 4.4% in Russia. Miles Traveled: ●Total U.S. passenger miles traveled in 2016 was 4.58 trillion; ●U.S. population increased 30% from 1990 to 2016, while vehicle miles traveled increased 48% over the same time period. Vehicles and Occupancy: ●In 1977, the U.S. average vehicle occupancy was 1.87 persons per vehicle; ●By 2015, average vehicle occupancy had decreased to 1.6 persons per vehicle; ●In 2016, the U.S. had 269 million registered vehicles and 222 million licensed drivers; ●In 2009, 23% of U.S. households had three or more vehicles. Average Fuel Economy: ●Light-duty vehicle fuel economy peaked at 22.0 miles per gallon (mpg) in 1987, declined until the early 2000s, and then increased again, surpassing 22.0 mpg in 2009; ●The average fuel economy for a light-duty 2017 model year vehicle was 25.2 mpg: 30.0 mpg average for a new passenger car and 22.2 mpg average for a new light truck; ●Even when accounting for recent legislation, the U.S. has some of the lowest required fuel economy standards of any industrialized nation, well below the European Union, China, and Japan. See Plot 1: MPG by Model Year Vehicle Size ●From 1988 to 2017, average vehicle weight increased 23% (due to growth in SUV market share), horsepower increased by 89%, and acceleration increased (i.e., 0-60 mph times dropped) by 38%. ●The average weight of a passenger car increased 17% from 1988 to 2017, while the average weight of a pickup truck increased by 22%.8 Had vehicle weights remained at 1988 levels, model year 2010 cars could have achieved 12% higher fuel economy and trucks a 13% increase. ●SUVs and pickups accounted for 50% of new vehicles sold in the U.S. in 2017. See plot 2: Market Share by Vehicle Type	Multiple Passengers	Current State
http://css.umich.edu/sites/default/files/Personal_Transportation_Factsheet_CSS01-07_e2018.pdf	Energy Use ●The transportation sector makes up 29% of total U.S. energy use; From 1973-2017, the percentage of U.S. energy used in the transportation sector increased by 17%; ●In 2015, American cars and light trucks used 15.1 Quadrillion Btus of energy, representing 15.5% of total U.S. energy consumption; ●In 2017, 95% of total primary energy used by the transportation sector came from fossil fuels; 92% of total primary energy was from petroleum; ●The transportation sector accounted for 28.5% of U.S. greenhouse gas emissions in 2016—1,854 million metric tons CO2e; ●Passenger cars and light-duty trucks were responsible for 772 million metric tons CO2e and 334 million metric tons CO2e, respectively, together making up 60% of U.S. transportation emissions and 17% of total U.S. emissions. Life Cycle Impacts A typical passenger car is responsible for the following burdens during its lifetime—raw material extraction through end-of-life. Most of these emissions are due to fuel use while driving. See plot 3: Total life cycle burdens, 1995 midsize sedan; See plot 4: Life cycle energy consumption, 1995 midsize sedan Solutions and Sustainable Alternatives Reduce Vehicle Miles Traveled: -Live closer to work. The average commute was 12.2 miles in 2009 (up from 12.1 in 2001); -Consider telecommuting or working from home; -In 2016, 76.6% of workers in the U.S. commuted by driving alone, and only 9.0% of workers carpooled (a drop from 19.7% in 1980); -Joining a carpool can help lower household fuel costs, prevent greenhouse gas emissions, and reduce traffic congestion; -Roughly, one-fifth of vehicle trips are shopping-related. Combine errands (trip chaining) to avoid unnecessary driving; -Use alternative modes of transportation, such as bikes, buses, or trains. According to the Texas Transportation Institute, public transit saved Americans 865 million hours of travel time and 450 million gallons of gasoline in 2011 by reducing traffic congestion. See plot 5: US Modes of Transportation to Work	Multiple Passengers	Current State
Ferguson, 1997; Kelley, 2007; Morency, 2007; Chan and Shaheen, 2012)	Ridesharing refers to a mode of transportation in which individual travelers share a vehicle for a trip and split travel costs such as gas, toll, and parking fees with others that have similar itineraries and time schedules. -Ridesharing can combine the flexibility and speed of private cars with the reduced cost of public transportation systems -Ridesharing has some benefits for drivers, passengers, society and the environment: -Saving travel cost -Reducing the number of trips in roads and highways -Reducing travel time -Mitigating traffic congestions -Conserving fuel -Reducing air pollution	Multiple Passengers	Benefits
https://www.brookings.edu/blog/the-avenue/2017/10/03/americans-commuting-choices-5-major-takeaways-from-2016-census-data/	America's commuting choices: 5 major takeaways from 2016 census data: Drove alone: 76.3% Carpooled: 9.4% Public Transit: 5.1% Cycled: 0.6% Walked: 2.7% Taxi or Motorcycle: 1.2% Worked from home: 5.0% From 150 million workers in 2016, that is at least 115 million cars and trucks hitting American streets every day. Transportation is the second-highest average expense after housing. Over the last decade, 21 of the country's 50 most-populated cities saw a significant drop in driving. -Seattle has earned major headlines for seeing it's residents' solo driving rate drop below 50 percent -Oakland, Calif., Washington, D.C., and Nashville, Tenn. saw their solo driving rates fall by at least 3 percentage points.	Multiple Passengers	Current State
https://rideamigos.com/blog/incentives-increase-ridesharing/	The U.S. Census Bureau's 2013 American Community Survey: -Only 9.4% of commuters use carpools to get to work. A poll performed by ABC News: - 20% of commuters are interested in sharing rides, -51% of commuters think carpooling would be "inconvenient," - 18% of respondents do not take part in rideshare programs because they "don't know anyone to carpool with," -11% problems related to scheduling and needing to rely on others.	Multiple Passengers	Current State
https://www.citylab.com/transportation/2019/01/commuting-to-work-data-car-public-transit-bike/580507/	U.S. Census 2017 American Community Survey: Carpool: Roughly 9 percent of workers carpool to work. Around 10 or 11 percent carpool in the tech hubs of San Jose, San Francisco, and Seattle, as well as in San Antonio, Houston, and Phoenix.	Multiple Passengers	Current State

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https://ieeexplore.ieee.org/document/6943018	Recently, ridesharing mobile applications have begun to gain popularity in U.S. These services have the potential to: - Fill empty seats in cars. - Reduce emissions. - Enable transportation that is more efficient. - Reduce the total vehicular miles travelled -Transportation by single occupancy vehicles are Wasteful inefficient. -To address this inefficiency, ridesharing services are beginning to catch on: Drivers input their destinations into their phones, and are matched with passengers headed the same way. Drivers pick up and drop off other passengers along the route to their own destination, filling empty seats to conserve fuel, reduce pollution and split costs	Multiple Passengers	Benefits
https://rideamigos.com/ridesharing/	Reducing single-occupancy vehicles can substantially mitigate traffic congestion. -Multiple passenger ride sharing can reduce global warming and urban pollution. - People who typically drive to and from work on their own can use ridesharing as a way to reduce stress. - Rideshare passengers are free to form social connections with their fellow commuters. They can also read, eat, prepare for the day, or let their minds wander…all of which contribute to increases in the brain's natural feel-good chemicals.	Multiple Passengers	Benefits
https://www.bestworkplaces.org/pdf/carpool_June07.pdf	The U.S. Environmental Protection Agency (EPA) and the U.S. Department of Transportation (DOT) established a voluntary National Standard of Excellence for employer-provid¬ed commuter benefits. Commuter benefits help American workers get to and from work in ways that cut air pollution and global warming pollution, improve public health, improve employee recruiting and retention, improve employee job satisfaction, and reduce expenses and taxes for employers and employees. -Carpools consist of two or more persons driving together in a privately owned vehicle. At a workplace, employees may choose to carpool without any assistance or involvement from the employer. -Carpooling benefits both employer and employee; so many companies are interested in increasing carpooling. Employer Benefits: -Reduced Need for Parking; -Increased Productivity and Morale Employee Benefits: -Reduced cost: Carpoolers save on gas, depreciation, and general wear and tear on their vehicles. -Increased personal time: Carpool passengers can read, sleep, or converse with other carpoolers, instead of driving. -In regions with carpool lanes, reduced commute time and costs. -Decreased stress: Many drivers find solo commutes in heavy traffic stressful. Carpooling lets them arrive at work fresh and productive. Carpooling is more likely to be successful in certain cases such as: - Regions with HOV Lanes; - Employers with Limited Parking; - Employers with Large Numbers of Employees; - Employers in Urban Settings Other Carpool Incentives: In areas where parking is free and plentiful, employers can encourage carpooling through prize drawings or other rewards. Prize amounts could range from $10 to $25 to $500 depending on the size of the company and budget. Other commuter rewards could include discounts at local merchants or free merchandise (travel mugs, T-shirts, and other inexpensive items). One program in southern California has coupon books for local restaurants and entertainment specially made to distribute to ride sharers. -Employers around the country have implemented carpool incentive programs including: -Atlanta, Georgia—Emory University; -Beaverton, Oregon—Nike; -Ithaca, New York—Cornell University	Multiple Passengers	Incentivize
https://www.streetline.com/2018/01/17/smart-parking-corporate-campus-7-reducing-single-occupancy-vehicle-commuting/	Reducing Single Occupancy Vehicle Commuting with Smart Parking There are some tools can help a company reduce the percentage of their employees who commute via SOV. Smart parking: Prioritizing carpoolers by giving them close parking spaces or reserving sections for visitors. -Smart parking tool can encourage employees to look for responsible commute alternatives such as carpooling, mass transit, or making use of shuttle programs.	Multiple Passengers	Methods
https://rideamigos.com/employee-carpool-programs/	Benefits of carpooling for employees: ●Savings on parking costs ●Boosting employee productivity People who carpool arrive at work feeling better, with lower stress levels. This contributes to increased productivity throughout the day along with better health and improved job satisfaction. ●A happier workforce Employee carpool programs help build a more collegial work environment, with strengthened social connections that contribute to higher overall levels of job satisfaction. ●A reduced environmental footprint Companies that institute employee rideshare programs project ecological values in keeping with environmental responsibility ● Positive company culture and identity Companies that offer carpool programs and commuter transportation benefits that reduce pollution offer an easy, everyday path to healthier, more sustainable behavior.	Multiple Passengers	Benefits
https://theecoguide.org/carpooling	By carpooling to work with just one other person, you can save $227 per month. See plot 6: Avg Savings for Carpooling See plot 7: Cutting the commuting costs, how much can carpooling help? -Carpool and the HOV lane will definitely save commuters from traffic. -Carpooling can definitely save time by giving commuters access to HOV lanes.	Multiple Passengers	Benefits

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https://commuteseattle.com/wp-content/uploads/2015/05/ParkingMgmt_handout.pdf	Parking Management Strategies Case study: SEATTLE Children's Hospital Seattle Children's Hospital embraces parking management strategies because it plans to grow in scope and size: -Eliminating monthly parking, transitioning to a daily parking rate, and adding incentives for employees who choose not to drive alone. Transportation Demand Management (TDM) Programs Management (TDM): 1-Prioritized / Discounted Carpool and Vanpool: Free vanpool parking, in-house vanpool coordinator. 2-Space for Carpools / Vanpools: Preferred Carpool parking 3-Covered Bike Shelter: Secure bike parking close to showers and lockers. 4-Bike Amenities: Subsidized on-site bike tune-ups; company bike program for those committing to 2x per week bike commuting. 5-Car Share Program: ●Zipcar available on-site; ●Company account available for business travel for those who without a car; ●Employer provided shuttles between worksites to/from transit hubs and off-site parking lots. 6-Daily / Variable Rates: No free parking - all hours; Only daily rates; Variable prices: $3.25 - $11.50, addresses peak travel times. 7-Parking Cash-Outs: $4.50 per day commute bonus for alternative commuting (bike, walk, transit, telecommute, carpool, vanpool). 8-Transit Subsidies: Transit rides are subsidized 100%. Menu of Strategies: ●Discounted carpool and vanpool spaces: Incentivizing rideshare through rewards/financial support and reserved parking spots. ●Priority space for carpool / vanpool: Prioritizing spaces for rideshare close to amenities such as elevators or exits. ●Covered bike shelter: Allocating space to provide bike racks and tools, other bike amenities. ●Car share program: Offering vehicles or reimbursement for ride share (Uber, Lyft) or car share (Car2Go, Reach Now). ●Daily rates: Switching from monthly to daily parking passes. Eliminate "sunk cost" mentality. ●Parking cash-outs: Offering employees financial incentive to give up a monthly parking spot. ●Free parking days: Allowing employees who commit to taking an alternative mode into work the ability to park for free 3-5 days a month, giving them flexibility needed to commit to their alternative mode. ●Transit subsidy: Making other travel modes more attractive by subsidizing the cost Transit and Alternative Travel Subsidies : Transit, carpool, and bike subsidies play a critical role in mitigating impacts on traffic congestion and parking. One less car on the road, or in a parking stall, means more space for someone who depends on a vehicle. A transit subsidy provides a critical tool for achieving goals to save money or improve employee satisfaction. For example, many employees factor transit subsidies into accepting a job offer.	Multiple Passengers	Methods
https://theecoguide.org/carpooling	Carpool apps and websites: Carpool apps and websites are all free to sign up and make getting started easy. Uber: Uber is the world's largest ridesharing company. To carpool using their service people need to choose, UberPool when selecting a ride. The app will then find others that are going their way to pool with and split the costs. Lyft: When requesting a ride, commuters can choose the Lyft Line option to carpool. This lets the Lyft driver to pick up other people along their route - allowing them to split the fare with others. Scoop's network: It is an app that is focused on carpooling. Commuters can set their AM and PM rides separately up to a week in advanced, as well as schedule different pick-up locations by day too. Zimride's platform caters to universities and corporations exclusively. Commuters can create a profile, say where they want to go and Zimride finds a match in their school or company. Vanpool: The cheapest way to commute Vanpools are large carpools. With more people to split the costs, the lower your fare will be. Since there are many people taking the same van, only a few people have to commit themselves to driving. That means most vanpoolers can relax and enjoy a stress free commute. To get started commuters can contact 511 for information on local vanpool services. They can also check out the main vanpool companies to see what they offer in their area: ●Enterprise Rideshare ●vRide (Now owned by Enterprise Rideshare) ●Rideshare Company HOV lanes: Carpoolers have access to High Occupancy Vehicle (HOV) lanes. These lanes are only for vehicles with a minimum of two or more people (including the driver), which helps move more people in fewer vehicles. By doing so, HOV lanes offer people a faster, more reliable commute. Especially during times of high congestion. Carpooling also gives commuters access to High Occupancy Toll (HOT) and Express lanes free of charge.	Multiple Passengers	Methods
https://thedime.copera.org/2012/12/27/carpooling-to-work-a-look-at-the-real-benefits-and-drawbacks	According to the American Automobile Association: In 2012, the cost of owning and operating a vehicle is, on average, nearly $9,000 per year based on an estimated 1,250 miles driven each month. Compared to estimates from 2011, fuel is up 14.8%, tire costs are up 4.2%, maintenance is up .7% and insurance is up 3.4%. -If a teacher just starting out was on the high end of that number, transportation alone could consume nearly 25% of their gross income. The financial payback of carpooling is significant: Financial Benefits: -For a commute that's an average of 32 miles roundtrip, $3.50 per gallon on gas, $0 on parking, and $.12 per mile depreciation (for a vehicle that is 3-8 years old), that adds up to a $595.20 per year—$396.80 of which could be offset if a commuter commute with two other people. -According to the Commuter Tax Benefits: ●Employers can give their employees up to $125 per month to cover transit or vanpool costs, ●They can allow employees to use pre-tax income to pay for vanpooling, or they can offer a combination of the two. The result is a tax deduction and payroll tax savings for the employer and a potentially large cost savings for the employee. Saving time: Carpooling is a great way to shave off a significant amount of commute time by using HOV lanes. In addition, for the days the commuters aren't in the driver's seat, they can use that commute time for other tasks – responding to emails, reading, etc. Saving the environment: The average American car emits 23,600lbs of CO_2 per year. Cutting down just 25 miles a week by carpooling would eliminate 1,500lbs of that	Multiple Passengers	Incentivize
https://www.marsdd.com/news/ride-sharing-the-rise-of-innovative-transportation-services/	Companies working in Ride Sharing can be categorized into two main groups based on their business models. -The first group is platform-based ride sharing companies that coordinate rides through a platform, such as Uber, Lyft and BlaBlaCar. -The second type is inventory-based ride sharing companies that own assets, like fleets of cars or bikes that are shared among users, such as Bike Share Toronto, car2go and Zipcar.	Multiple Passengers	Methods

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https://scdhec.gov/sites/default/files/Library/CR-007047.pdf	Commuters can carpool with neighbors who work the same hours at a location near their place of employment. The benefits of carpooling: • Reduced stress – Instead of driving every day, people can use the commute time for the three R's – rest, reading and relaxation. • Safety– Carpooling reduces traffic congestion. • Saving money – By sharing a ride, commuters will save, on average, $864 per year over the cost of driving alone. They will save on parking fees, gasoline costs, and car maintenance. • Cleaner air – Carpooling is a fuel-efficient method of transportation, so it reduces air pollutants. • HOV lanes –"high occupancy vehicle" lanes help carpoolers avoid traffic delays.	Multiple Passengers	Benefits
https://rideamigos.com/carpool-incentive-programs/	Carpool incentive programs for employees: Preferred parking programs: Assign parking spots in premium locations to vehicles that are used in carpool and vanpool programs. Gamification: Giving participants the chance to win prizes like gift cards, sports or event tickets, dinner at local restaurants, or whatever else might get them excited about taking part. Parking pass discounts: Offering discounts to employees and commuters who make frequent use of carpool and ridesharing programs. Financial incentives are usually among the most effective.	Multiple Passengers	Incentivize
https://rideamigos.com/blog/benefits-guaranteed-ride-home-program/	Emergency/Guaranteed Ride Home program A feature of workplaces that encourage commuters to use means other than single occupant vehicles. A Guaranteed Ride Home program comes through by providing quick, reliable transportation when carpoolers need to use a taxi or on-demand ride hailing service to respond to unexpected situation. ●The program is open to employees that regularly use alternative means of transportation during their commutes. ●"Alternative means of transportation" can include cycling, walking, public transit or any other approved mode. ●Employees that use these modes for commuting at least two to three times per week qualify for the program. ●Qualified employees can get a free ride home a specified number of times per year if an emergency situation arises.	Multiple Passengers	Methods
https://www.planning.dot.gov/documents/RidesharingOptions_Toolkit.pdf	Guaranteed Ride Home (GRH): A drawback of ridesharing is that a vehicle will not be available in the event of an emergency, such as to transport a sick child needing to return home from school in the middle of the day. Many ridesharing programs offer a guaranteed ride home (GRH) provision, which allows each user to use alternative transportation (taxi, bus, rental car, etc.) in the event of an emergency. There is usually a maximum allowable benefit, but having this as an option can be a prime selling point for potential ridesharers who may have children or have reason to leave work unexpectedly on occasion. These are typically funded by groups of neighboring employers participating in a voluntary Transit Management Association (TMA) to fund and provide commute services for their employees.	Multiple Passengers	Methods
http://www.cleanairpartnerstx.org/resources/Carpool%20Incentive%20Programs%20-%20EPA.pdf	Employee benefits from carpooling include: -Cost-sharing, -Less wear and tear on vehicles, -Time savings in regions with HOV lanes, -The ability to talk, eat, sleep, or read while commuting. ●Programs to encourage carpooling, such as rideshare matching services, preferred parking for carpools, reduced parking costs for carpools, and commute awards programs qualify as additional commuter benefits under the Commuter Choice Leadership Initiative. EMPLOYER BENEFITS: ●Reduced Need for Parking Employers can save a substantial amount of money in reducing the number of parking spaces required; one study estimates that annual per-space costs vary between $250 and $2,100. ● Increased Productivity and Morale Employees, who carpool have less commute-related stress and therefore improved morale and productivity. In regions with carpool lanes, carpoolers can avoid congestion, its delays, and the congestion- induced unpredictability that interferes with scheduling. ●Tax consideration: Tax provisions that allow carpool parking costs to be taken as a tax-free fringe benefit offer potential financial savings for both employers and employees. EMPLOYEE BENEFITS: ●Reduced costs. Carpoolers save on gas, depreciation, and general wear and tear on their vehicles. ● Increased personal time. Carpool passengers can read, sleep, or converse with other carpoolers, instead of driving. ● In regions with carpool lanes, reduced commute time and costs. These lanes provide not only speed, but also often more important, reliability, by passing congestion. Toll routes and bridges often give carpool discounts, and even when they do not, the cost is split. ● Decreased stress. Many drivers find solo commutes in heavy traffic stressful. Carpooling lets them arrive at work fresh and productive.	Multiple Passengers	Benefits

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https://www.planning.dot.gov/documents/RidesharingOptions_Toolkit.pdf	Benefits and Incentives of Ridesharing Environmental protection: Multiple people taking the same trip in a single vehicle can decrease their net and per capita emissions pollution significantly, depending on the size of the vehicle and its propensity to emit greenhouse gases and other air pollutants. Affordability: Potential to live without an automobile! Ridesharing enables individuals and households to reconsider their need for an automobile, especially if the rideshare itself can account for one of the most critical attractions of owning a personal automobile -- the ability to reach places of employment more easily. The proliferation of hourly car-sharing programs, such as Zipcar, that provide occasional access to vehicles for those who do not own a car, also make owning a vehicle more of a choice than a necessity, and can be combined with ridesharing as well as transit, walking, and bicycling to reduce the need for costly ownership of automobiles. Avoidance of costly car-related expenses: Ridesharing programs allow people to pool resources or obtain fully subsidized funding for expenses including operating costs (fuel, oil, tires, etc.), maintenance, license and insurance, parking, and taxes and finance charges. Time savings: Particularly in areas that provide High Occupancy Vehicle (HOV) lanes, ridesharing allows people to reduce their driving times and increase travel time reliability through use of these facilities. Departments of Transportation (DOTs) have focused heavily on HOV lanes as a means of reducing air pollution and, when there is sufficient usage, congestion as well. Because of the excess capacity that exists on many HOV lanes, DOTs are increasingly turning to a hybrid operating model of HOT lanes that offer free access to HOVs and tolled access for single occupant vehicles (SOVs). HOV lanes and HOT lanes both lead to growing interest in ridesharing. In the case of HOT lanes, multiple occupant vehicles can avoid paying a toll. Even where HOT lanes do not exist, ridesharers can pool their money together to pay for tolls they may incur. Reduced congestion, and construction and maintenance costs: Ridesharing leads to fewer cars on the road, which has an immediate impact on congestion and, over the long-term, can reduce roadway construction and maintenance costs. Public agencies are now able to monetize these cost savings more accurately and reallocate funding to support the startup and expansion of ridesharing programs. Commuter Tax Benefits: Congress has approved legislation that allows employees of corporations to pay for parking and transit, including vanpool, with pre-tax dollars. When employees buy with pre-tax dollars, they avoid federal, state, and employment taxes, often saving up to 40%. The maximum allowable pre-tax benefit is $230 per month. Employers save money, too, since the amount provided for the benefit is not subject to payroll taxes. These commuter benefits can be used in one of three ways: 1-Employers may reimburse their employees up to $230 a month to commute to work by mass transit or eligible vanpools. The employer pays for the benefit and receives a tax deduction. Employees receive the benefit amount tax-free. 2-Employers may allow their employees to use their pre-tax income to pay for transit or vanpooling. Employers do not pay for the benefit but allow employees to take advantage of the tax savings from using their gross income to pay for qualified commuting expenses. Employees who take the maximum transit benefit can save nearly $800 in federal income taxes, and even more in Social Security and state taxes than they would otherwise pay. Employers see a reduction in their payroll costs on the amount set aside since they do not pay taxes on this amount. 3-Employers may share the cost of commuting with their employees. Employers can elect to give their employees some amount of the qualified commuting expenses tax-free and let the employees set aside their gross income to pay the remaining amount up to the federal monthly limit of $230 a month. The example below from Chicago highlights the cost savings, both to the employee and also to the employer, of a commuter tax benefit program.	Multiple Passengers	Benefits
http://www.cleanairpartnerstx.org/resources/Carpool%20Incentive%20Programs%20-%20EPA.pdf	Certain cases make carpooling programs more successful: ●Regions with high-occupancy vehicle (HOV) Lanes HOV lanes can save drivers substantial time over congested regular lanes. Depending on the length of the commute and the amount of congestion bypassed, using the HOV lanes may save 15 to 30 minutes each way. ● Employers with Limited Parking: Many employers with carpool incentive programs have implemented them because of parking shortages. Encouraging carpooling among employees can effectively reduce parking demand while still meeting employees' transportation needs. ● Employers with Large Numbers of Employees: Rideshare programs work better in organizations with more employees. Universities and hospitals often have hundreds or even thousands of personnel in a relatively compact setting, and many have very successful carpool incentive programs. ● Employers in Urban Settings: Carpooling depends on having either a single destination or close destinations, so the higher density the employment setting, the more likely a carpool program is to succeed.	Multiple Passengers	Methods
https://rideamigos.com/ridesharing/	Reducing single-occupancy vehicles can substantially mitigate traffic congestion. -Multiple passenger ride sharing can reduce global warming and urban pollution. - People who typically drive to and from work on their own can use ridesharing as a way to reduce stress. - Rideshare passengers are free to form social connections with their fellow commuters. They can also read, eat, prepare for the day, or let their minds wander…all of which contribute to increases in the brain's natural feel-good chemicals.	Multiple Passengers	Benefits
https://www.bestworkplaces.org/pdf/carpool_June07.pdf	The U.S. Environmental Protection Agency (EPA) and the U.S. Department of Transportation (DOT) established a voluntary National Standard of Excellence for employer-provid¬ed commuter benefits. Commuter benefits help American workers get to and from work in ways that cut air pollution and global warming pollution, improve public health, improve employee recruiting and retention, improve employee job satisfaction, and reduce expenses and taxes for employers and employees. -Carpools consist of two or more persons driving together in a privately owned vehicle. At a workplace, employees may choose to carpool without any assistance or involvement from the employer. -Carpooling benefits both employer and employee; so many companies are interested in increasing carpooling. Employer Benefits: -Reduced Need for Parking; -Increased Productivity and Morale Employee Benefits: -Reduced cost: Carpoolers save on gas, depreciation, and general wear and tear on their vehicles. -Increased personal time: Carpool passengers can read, sleep, or converse with other carpoolers, instead of driving. -In regions with carpool lanes, reduced commute time and costs. -Decreased stress: Many drivers find solo commutes in heavy traffic stressful. Carpooling lets them arrive at work fresh and productive. Carpooling is more likely to be successful in certain cases such as:	Multiple Passengers	Incentivize
https://www.streetline.com/2018/01/17/smart-parking-corporate-campus-7-reducing-single-occupancy-vehicle-commuting/	- Regions with HOV Lanes; - Employers with Limited Parking; - Employers with Large Numbers of Employees; - Employers in Urban Settings Other Carpool Incentives: In areas where parking is free and plentiful, employers can encourage carpooling through prize drawings or other rewards. Prize amounts could range from $10 to $25 to $500 depending on the size of the company and budget. Other commuter rewards could include discounts at local merchants or free merchandise (travel mugs, T-shirts, and other inexpensive items). One program in southern California has coupon books for local restaurants and entertainment specially made to distribute to ride sharers. -Employers around the country have implemented carpool incentive programs including: -Atlanta, Georgia—Emory University; -Beaverton, Oregon—Nike; -Ithaca, New York—Cornell University Reducing Single Occupancy Vehicle Commuting with Smart Parking There are some tools can help a company reduce the percentage of their employees who commute via SOV. Smart parking: Prioritizing carpoolers by giving them close parking spaces or reserving sections for visitors. -Smart parking tool can encourage employees to look for responsible commute alternatives such as carpooling, mass transit, or making use of shuttle programs.	Multiple Passengers	Methods

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Source	Notes	Theme	Subtheme
http://www.cleanairpartnerstx.org/resources/Carpool%20Incentive%20Programs%20-%20EPA.pdf	Beaverton, Oregon – Nike Nike, a footwear manufacturer headquartered in suburban Portland, has an extensive commuting program that includes two types of carpooling incentives. Carpools have reserved parking areas until 10 AM. Carpoolers are eligible, along with all other non-single occupant vehicle commuters, for monthly and quarterly prize drawings. Carpoolers previously received "Nike Bucks," vouchers that could be used to purchase food, merchandise, or other on-site services, every time they arrived in a carpool at the main campus. Under the Nike Bucks program, Nike spent approximately $250,000 a year on commuter incentives; currently, they spend $41,000. Prizes range from gift certificates in increments of $25, $50, of $100 for company store or local retailers to $400 for mountain bike purchase or "get-away" weekend. In an average week there are 400 trips made by carpool, meaning that at least 800 people carpooled.	Multiple Passengers	Case Study
https://www.bestworkplaces.org/pdf/carpool_June07.pdf	Results of Cornell university program: The overall result of all of Cornell's commuter benefits programs combined is approximately 2,400 fewer cars coming to campus each day. In the last 15 years, Cornell estimates that these programs have reduced commuter miles by 10 million each year, which results in numerous benefits in terms of air quality and traffic congestion. -Carpooling reduces travel and emissions compared to driving alone. -Employees get to work with fewer separate vehicle trips, thereby reducing traffic congestion and air pollution. -Nationally, about 12 percent of employees commuted to work in carpools, according to the Journey to Work survey in the 2000 census.	Multiple Passengers	Case Study
http://www.cleanairpartnerstx.org/resources/Carpool%20Incentive%20Programs%20-%20EPA.pdf	Steps to implement a carpool incentive program: 1-Determine the potential for carpooling 2-Determine possible carpooling incentives 3-Investigate rideshare options 4- Determine registration and eligibility requirements 5- Announce and implement the carpooling program 6- Monitor and maintain carpool incentive program.	Multiple Passengers	Methods
https://greenactioncentre.ca/healthy-travel/cashengers-finding-a-fair-fee-for-carpoolers/	Finding a fair fee for carpoolers How do carpoolers determine how to split costs? There are a number of online calculators and resources to help carpoolers determine what makes sense for them and their carpool partners. One such tool comes from Carpool.ca, an online carpool matching website. Once carpoolers select Manitoba within the calculator tool, average provincial costs are filled in automatically, which they can adjust as needed. Carpool.ca suggests that a realistic carpool fare include fuel and parking costs only, as adding insurance and maintenance costs may increase fares beyond what coworkers are willing to contribute, raising the overall price of cheap car insurance quotes for everyone involved. Another similar tool that carpoolers can use as a comparison comes from the Carpooling Network. They can also see what their daily carbon emissions savings could be by carpooling with 1 or more adult, or by choosing another method of travel. There are also some carpool fare apps available that carpoolers may want to test out, including My Carpool, CarPool Calculator, and vPool.	Multiple Passengers	Methods
https://www.planning.dot.gov/documents/RidesharingOptions_Toolkit.pdf	Chicago: RTA FareCheck Program The Regional Transportation Authority (RTA) in the Chicago area has a FareCheck Program. Employers can purchase RTA FareChecks in any denomination, from $10 to $230, and distribute them to employees. These are tax-deductible to employers and a pre-tax benefit to employees who can use the FareChecks for several mass transit options, including vanpools. Over the course of the year, employees save hundreds of dollars that they would have otherwise paid in taxes. The program is based on a federal tax law designed to encourage the use of public transit, reduce driving and congestion, and produce environmental benefits. An amendment enacted under the Transportation Equity Act for the 21st Century (TEA-21) expanded the definition of the Qualified Transportation Fringe provision of the Internal Revenue Code, Section 132(f). See plot 8: Tax Advantages of Transit Benefit (yearly calculation).	Multiple Passengers	Case Study
https://www.planning.dot.gov/documents/RidesharingOptions_Toolkit.pdf	Monetary benefits of ridesharing Comparing the cost savings of ridesharing using the following assumptions to simulate a representative average daily commute: 1. Round-trip commute is 30 miles. 2. Vehicle gas mileage is 25 miles-per-gallon. 3. Commuter works 20 days per month. 4. Gasoline costs $3.00 per gallon 5. Average cost of vehicle ownership, excluding gasoline, is 43.5 cents-per-mile. 6. Free parking at work. Average Cost of Single Occupancy Vehicle (SOV) Commuting in the U.S: Daily: $16.65 Weekly: $83.25 Monthly: $333 Yearly: $3,996 The annual cost to own a personal vehicle is nearly $4,000. The cost of ridesharing is significantly less, depending on a variety of factors, including program structure, incentives, number of riders, and length of trip. See Plot 9: A commuting cost calculator from the state of New Jersey estimates the following savings for carpools of various sizes Based on these results, a daily rideshare of four people can save well over $2000 annually for each participant, and even just a two-person rideshare saves over $1500 every year for both riders. -Rideshares almost always pay less than $100 per month to participate in a daily rideshare, and often the fee can be as low as $2, or even free.	Multiple Passengers	Benefits
https://www.planning.dot.gov/documents/RidesharingOptions_Toolkit.pdf	Northeastern Illinois and Northwestern Indiana: Pace RideShare and MetraThe Pace Rideshare program was launched in March 2008 to provide residents and employees in Northeastern Illinois and Northwestern Indiana the ability to identify carpool partners quickly and securely. Pace has received $1 million in Congestion Mitigation and Air Quality (CMAQ) Program funds to establish 277 vanpools in the metro Chicago area. Twelve of these vanpools take advantage of an informal partnership between Pace and the commuter rail operator, Metra. The "Metra Feeder" incentive program allows for a Pace van to be parked at a Metra station near the worksite, so that 5-13 participants can take the train and then use the van to complete the commute to the worksite. To qualify for the program, at least half of the participants must purchase a Metra monthly pass or 10-ride ticket. Each participant pays $58 per month, which covers all costs associated with the van including fuel, maintenance, insurance, and tolls. One of the participants volunteers to be the primary driver, and he or she does not pay a fare. Participants are eligible for reimbursement of up to $125 per year for alternative transportation taken due to personal emergency.	Multiple Passengers	Case Study

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https://www.planning.dot.gov/documents/RidesharingOptions_Toolkit.pdf	Palouse Rideshare, Idaho Palouse Rideshare is an online carpool matching program in the Palouse region of rural Idaho and Washington provided by the Palouse-Clearwater Environmental Institute (PCEI), a non-profit environmental advocacy organization. Interested participants simply sign up on the Palouse Rideshare website and are then provided access to a database where they can view existing rideshares or post a proposed rideshare of their own. PCEI also owns and operates its own vanpool system with financial support from the Idaho Transportation Department and matching funds from local supporters, including the University of Idaho. A popular vanpool from the town of Lewiston to the University of Idaho, some 32 miles apart, has a contingent of 12 daily riders. In one year, this volunteer-driven vanpool saved 4,000 gallons of fuel by reducing vehicle miles traveled. Idaho ranks 44th in the U.S. in population density. The success of this rideshare program demonstrates that ridesharing can thrive in even the most rural of places.	Multiple Passengers	Case Study
https://www.planning.dot.gov/documents/RidesharingOptions_Toolkit.pdf	Washington State Vanpool Grant Program In 2003, the Washington State Legislature created a vanpool grant program to increase the use of vanpooling by the state's commuters. The program was funded at $4 million for 2003-2005 biennium, at $8.9 million for 2005-2007, and at $8.6 million for 2007-2009. The funds are for public transit agencies and can be used only for the capital costs of putting new vans on the road and for incentives for employers to increase employee vanpool use. The program exceeded its goal of a 10% increase in vanpools operating by 2005. There was a 14% increase in the number of vanpool vehicles operating, and a 20% increase in the number of vanpool riders. The increase is evident both in the Puget Sound Region and statewide.	Multiple Passengers	Case Study
https://www.wsdot.wa.gov/transit/grants/vanpool-investment	Washington State Public Transportation - Grants - Vanpool Investment Program WSDOT provides state funds to support vanpool programs in transit agencies across Washington. Transit agencies use these funds to purchase vans to expand vanpool fleets, replace aging vans and provide incentives to employers to increase vanpool ridership. WSDOT awarded $10.3 million in Vanpool Investment Program grants to 16 transit agencies across the state for the 2019-2021 biennium. These grants support the purchase of 420 vehicles, of which 10 are low-emission plug-in hybrid vans. Washington has the largest public vanpool fleet in the nation. Each work day more than 18,000 commuters ride in more than 3,000 vanpools. These vanpools improve air quality, reduce greenhouse gas emissions and reduce the number of cars on the road. This partnership between the state and transit agencies, which started in 2001 with 12 transit agencies, now includes 22 transit agencies.	Multiple Passengers	Case Study
https://www.northeastern.edu/commutingservices/rideshare/mass-rides-car-pool-matching-and-emergency-ride-home-programs/	Massachusetts: Mass Rides, Car Pool Matching and Emergency Ride Home programs MassRIDES is a free program of the Massachusetts Department of Transportation (MassDOT) designed to help reduce traffic congestion and improve air quality and mobility. To accomplish these goals, MassRIDES works with both employers and commuters within the Commonwealth to promote the use of commute options. Using MassRides online tool Bay State Commute, users can find people who live and work near them interested in carpooling. Through the University's partnership with MassRIDES, employees who car/van pool, bike, walk or take public transit are eligible for the Emergency Ride Home (ERH) program. MassRIDES ERH program will reimburse up to $100 per emergency ride home (no more than 4 trips per calendar year).	Multiple Passengers	Case Study
https://mobility.tamu.edu/mip/strategies-pdfs/travel-options/technical-summary/Carpooling-4-Pg.pdf	Houston, Texas The Houston Downtown Management District works with Central Houston to provide carpooling and other trip reduction services to employers and employees in the downtown Houston, Texas, area. In addition to working with the city of Houston, METRO transit, and TxDOT to improve public transit, they partner with NuRide in an innovative ridesharing application. In 2009, 52 percent of workers use some other mode than driving alone.	Multiple Passengers	Case Study
https://mobility.tamu.edu/mip/strategies-pdfs/travel-options/technical-summary/Carpooling-4-Pg.pdf	Washington, D.C. The Pool Rewards project by Commuter Connections was developed to encourage drive alone commuters to try carpooling. Eligible participants could earn $2 per day ($1 each way) for each day they carpooled to work. The program began as a three-month pilot in 2010. The pilot resulted in a decrease in 298 daily auto trips based on logged passenger trips and a daily VMT reduction of over 9,000 miles per day. According to a follow-up survey, 93 percent of participants continued carpooling after the pilot project ended.	Multiple Passengers	Case Study
https://calvans.org/	CalVans2: Sponsored by California Vanpool Authority, a public transit agency, it supplies qualified drivers with late model vans to drive themselves and others to work or school. CalVans pays for the gas, maintenance, repairs and a $10 million insurance policy. 1. Saving Money Sharing the cost of your commute can save you around $1,500 a year. 2. Reliability 3. Cleaner Air Air pollution is directly related to the amount of vehicles on our roadways. 4. Reducing Stress Ease the pressure of your commute. CalVans is less stressful than driving alone 5. Making Friends Building relationships with coworkers and forge lasting friendships.	Multiple Passengers	Case Study
https://sonomacounty.ca.gov/HR/Benefits/Clean-Commute/	Clean Commute Program3: Sonoma County has implemented a program that allows County of Sonoma employees to set aside pre-tax income to pay for cleaner modes of transportation to and from work. The Clean Commute program aims to help employees travel to and from work with less stress from traffic and parking, lower costs, and reduce our climate impacts.	Multiple Passengers	Case Study
https://www.metro.net/riding/rideshare/grh/	The regional Guaranteed Ride Home Program (GRH)4 The regional Guaranteed Ride Home is sponsored by the Los Angeles County Metropolitan Transportation Authority (Metro), Orange County Transportation Authority (OCTA) and San Bernardino County Transportation Authority (SBCTA). Providing employees who rideshare to work with a reimbursed ride home in the event of a valid emergency. GRH is a free benefit offered to commuters who carpool, vanpool, and take transit, bicycle, or walk to work. In order to take advantage of this program, employees must work for companies enrolled in the regional GRH program. The employer worksite must be located in the County of Los Angeles, Orange or San Bernardino. ●The GRH Program allows ridesharing employees to choose the most efficient means to get where they need to go during a qualified emergency. ●The GRH Program will reimburse a one-way taxi ride, one-day car rental, or transit ticket (public bus, Metro Rail, or Metrolink) to get them to their destination. The cost of an Uber or Lyft ride is also reimbursable (up to $3.50 per mile).	Multiple Passengers	Case Study

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https://ezride.org/transportation/carpools/	New Jersey Rideshare Actions EZ to Connect: EZ Ride makes it easy to join an existing carpool. As a Transportation Management Association affiliated with New Jersey Department of Transportation (NJ DOT), EZ can match commuters to share a ride to a common destination. Emergency Ride Home: Gives peace of mind to qualified commuters, knowing that they will get home freely in the event of an emergency. EZ Ride's Emergency Ride Home Program guarantees Carpoolers a ride home from work when unexpected circumstances arise. Commuters will be able to get home in case of illness, family crisis or unscheduled overtime gives them just one more reason to consider carpooling to work. EZ Ride will arrange commuters' return trip home at no cost to you. When commuters register for EZ Ride's Emergency Ride Home program, they qualify for up to three rides home a year. They may use an Emergency Ride Home if: -Commuter or a family member suffers an illness or a severe crisis -Commuter unexpectedly must work past their normal work time at the request of their supervisor. -Commuter's normal carpool or vanpool driver has to leave early or they have to work late. Statewide Access: It is a resource for finding a better way to commute in New Jersey. The FREE ride matching service connects people to rides with New Jersey's largest commuter network.	Multiple Passengers	Case Study
https://www.vox.com/a/new-economy-future/cars-cities-technologies	San Francisco San Francisco planned to shift 10 percent of single-occupancy vehicle trips to transit and ride hailing. The city proposed partnering with the University of California Berkeley and various tech companies to work out ways to: 1) Provide incentives to shift people from their own cars into car sharing: Designating certain road lanes as only available for ride sharing, making them the faster option. It might also entail seamlessly integrating car sharing, bike sharing, and public transit by creating a single simple mobile app that combines routing, scheduling, and payment for all of those services. 2) Make these services more affordable: That might involve providing low-income residents with access to smartphones and banking services, as well as providing free public Wi-Fi so that all could use these services. It would also mean finding ways to lower the price of car sharing by deploying larger six-person passenger vans to cut costs below what an Uber or Lyft ride currently costs. 3) Eventually move to automated electric vehicles: If self-driving cars and buses eventually become a reality, they too could be connected into a centralized network, making sharing even easier. These vehicles could also reduce fatal collisions (assuming that self-driving technology proves safer) and would eliminate air pollution (assuming that the cars were all electrified rather than running on gasoline).	Multiple Passengers	Case Study
https://www.icf.com/blog/transportation/new-york-traffic-ridesharing	New York In 2000, the Federal Communications Commission assigned 511 as a nationwide telephone number for traveler information such as road condition, commute costs, public transportation, travel time, greenhouse gas (GHG) emissions and more. The greater New York's 511 service includes a web/phone-based initiative that works with the state and employers to provide ride matching, commuter and traveler services. 511NY, USDOT, and ICF focused on carpooling to reduce carbon emissions and improve the air quality — including ways to reduce the number of New York's single-driver cars on the road. 511NY's services are free, offering a sense of personal accountability that every individual practice of sustainability helps.	Multiple Passengers	Case Study
https://www.icf.com/clients/transportation/nysdot	New York State Department of Transportation officials wants to reduce the number of single-occupancy vehicles causing road congestion. They reached out to businesses and the millions of daily commuters statewide with visually compelling infographics and videos from 511NY Rideshare, a program that helps people find carpool partners, plan a trip using public transportation, and improve their commute. 511NY RideShare is a solution that makes sense economically, environmentally, and personally. Over 70,000 commuters signed up for carpools to save extra money, time, and precious air quality. Challenge: Generate mass awareness of alternative commuting options in New York City, one of the most congested traffic regions in the country Solution: Launched innovative media and outreach campaigns to help commuters visualize the environmental benefits, cost-effectiveness, and availability of rideshare/mobility services in their daily schedules. Results: -The ridesharing program consolidated nearly four million single-occupancy cars, 3.7 million single-occupancy vehicles off the road. -Reduced traffic by 20%, -Reduced CO2 emissions which is enough to cover 98% of New York state, 12,100 tons of CO2 emissions reduced -Provided a sustainable alternative to driving alone, 201,560 commuters connected.	Multiple Passengers	Case Study
https://www.planning.dot.gov/documents/RidesharingOptions_Toolkit.pdf	New York City's share cab pilot programs Cab-share Services A number of internet-based cab-share services aggregate users' travel plans and serve as matchmakers for strangers willing to split a cab and- a fare. Travelers enter a starting point, destination, and time/date of the trip, and the service lets them know if there are other users headed the same way at the same time.	Multiple Passengers	Case Study

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https://waytogo.org/about/about-way-to-go	Colorado Way to Go program: Way to Go is a regional partnership between the Denver Regional Council of Governments (DRCOG) and a dedicated group of Transportation Management Associations (TMAs). DRCOG and TMAs work together to reduce traffic congestion, improve air quality, and make life better for the region's residents. Formerly known as Ride Arrangers, DRCOG and TMAs have been promoting better commuting options for employers and individuals for more than 30 years. They offer solutions helping commuters throughout the Denver metro area save money, experience less stress, and save time. There are some employer services including carpool, vanpool and Schoolpool programs and Guaranteed Ride Home. Carpool Carpooling saves employees money and frees up parking space at workplace. Way to Go's online ride-matching software is easy to use, secure and FREE. Vanpool Riding to work in a comfortable van and sharing the ride is ideal for groups of commuters who live near each other and travel more than 15 miles, one way, to work. The Way to Go vanpool program provides the vehicle, insurance and fuel. Denver-region vanpools are subsidized by RTD (Regional Transportation District) and can provide tools to assist with vanpool formation at workplaces. Schoolpool Way to Go help parents getting their kids to and from school with Schoolpool for FREE. Schoolpool is a secure system and connect parents with families in their neighborhood to share in the responsibilities of getting the kids to school and back via carpooling, walking, biking or riding either RTD or the school bus together. Thousands of other families from Denver-area schools are already connected. Guaranteed Ride Home Guaranteed Ride Home gives employees peace of mind by providing on-call taxi service at no additional charge. With the Guaranteed Ride Home commuters can help promote alternatives to solo driving and will arrive home safely in case of an emergency or unexpected schedule change.	Multiple Passengers	Case Study
https://kingcounty.gov/depts/transportation/metro/travel-options/rideshare.aspx#	King County, Washington Rideshare Choices: Vanpool The one-seat ride to work and back—monthly fare pays for the van, fuel, maintenance, insurance—everything commuters need for a smooth commute. Vanshare The first/last mile solution to getting to and from transit—and for getting the last mile or so to the worksite or school destination from transit stop. Carpool Sharing the ride to work or school also means sharing the expenses with other commuters. Carpooling saves money on gas, car care and parking—plus you can share the driving responsibilities. SchoolPool A program that serves King County commuters and students who travel to locations not well served by fixed route transit. TripPool A program where volunteer drivers use King County Metro commuter vans to share trips with other riders to the nearest Park & Ride. Community Van A pilot program being developed by Metro and participating cities to provide their community members with shared rides to local destinations. Real-Time Rideshare Share the ride on-the-fly! This concept makes use of a mobile application to match up drivers with passengers who want to rideshare.	Multiple Passengers	Case Study
https://commuteseattle.com/wp-content/uploads/2018/02/2017-Commuter-Mode-Split-Survey-Report.pdf	Seattle Founded in 2004, Commute Seattle is a not-for-profit Transportation Management Association (TMA) working to help commuters drive less by improving access and ability to and within downtown. Commute Seattle is led by a partnership between the Downtown Seattle Association, King County Metro, Sound Transit, and the Seattle Department of Transportation. How commuters travel to Downtown Seattle and how those behaviors have shifted over time. The 2017 mode-split survey data collected data from 1,784 employees at Non-affected worksites in Seattle's Center City neighborhoods. See Plot 10: Center City Mode Share Comparison (2010 and 2017)	Multiple Passengers	Case Study
https://www.citylab.com/transportation/2018/02/seattle-keeps-slashing-its-downtown-driving-rate/553280/	Seattle Just 25 percent of workers traveling into the center city drove themselves. While Seattle has gained about 60,000 jobs since 2010, there are approximately 4,500 fewer single-occupancy vehicles. SDOT and Commute Seattle work with 270 large companies around the region, including Microsoft, Expedia, and Amazon, to promote commuter incentive programs and strategic relocations. -The Gates Foundation has gone from an 88 percent "drive-alone" rate to 34 percent by distributing a suite of transit benefits to employees, including free Monorail punch cars and free monthly Zipcar hours. It also disincentivizes parking: The company lot charges a daily rate instead of a monthly rate -Weyerhauser, the real estate investment trust and timber company, decreased its employee drive-alone rates from 82 percent to 9 percent largely by relocating from the suburbs to downtown. The construction of new downtown housing options has helped, too. -Amazon has also made strides to reduce its traffic footprint, chiefly through its downtown location. It offers subsidized transit passes, and like Microsoft, it runs a private shuttle option to ferry workers from their suburban homes to its downtown campus. Both companies (alongside Expedia, Costco, and Vulcan) also donated hundreds of thousands of dollars to the Sound Transit 3 campaign.	Multiple Passengers	Case Study
https://www.washingtonpost.com/graphics/business/future-of-transportation/?hpid=hp_no-name_graphic-story-a%3Ahomepage%2Fstory	Denver The problem: The soaring population has led to crushing congestion, sapping the spirits of people with and without means and putting a sour asterisk on life in the Western boom town. By the numbers The population has jumped by nearly 25 percent in 15 years, to 683,000. The city swells by 200,000 a day, with most trips starting or ending outside the city. Roughly, a third of people live in poor neighborhoods with high unemployment. Building a single, mile-long lane along jammed Federal Boulevard cost $30 million. The idea Marry carpool services such as Lyft Line with light rail, commuter rail and bus lines, so people can more easily get to and from stations and drive less. In poorer areas in particular, the city plans to partner with Lyft and potentially others to promote "on-demand transit." How? Since residents in disadvantaged northern neighborhoods and elsewhere lack the bank accounts and resources needed to sign up for ride-hailing services, the city will try to play matchmaker. Officials would help poor residents pay for Lyft trips that start or stop along transit lines. The ride-hailing company could then guarantee rates to encourage drivers to make more pickups in underserved areas. Along the way, the city would gather data on where the holes in service are and test the economics of driverless cars. Officials also want to set up wireless connections with trucks moving through poorer communities such as Globeville and Elyria Swansea, with coordinated red lights cutting travel times and pollution	Multiple Passengers	Case Study

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http://www.uvm.edu/~transctr/research/trc_reports/UVM-TRC-13-010.pdf	Case Study: In the journey to work, about 84% of trips in the U.S. are in automobiles, and 74% of the trips are individuals driving alone. -The low and nonexistent cost of parking serves as an incentive to car use over other modes. -The low cost of parking disincentives the adoption of alternative modes. For example, an Australian study found that a 10% increase in parking cost resulted in a 2.91% increase in mass transit trips. There are 120 organizations promoting sustainable transportation in Vermont, New Hampshire and Maine to reduce single occupancy vehicles, SOV. Obstacles to reducing SOV use in Northern New England: -Household vehicle ownership, -Dispersed settlement patterns, -The lack of real alternatives, -Infrastructure that privileges the car all serve as major obstacles to reduce SOV use. -Limited access to public transportation outside metro areas. Single-occupancy vehicles have been the primary mode of transportation in the United States for decades despite increasing fuel prices and road congestion. Vermont: The spatial and temporal constraints of the bus routes leave many communities unserved or underserved. Rural Transportation Services (RTS) serves four counties in northeastern Vermont, but it only has two fixed-line routes, reaching four towns. Residents in the other 50 towns cannot rely on public transportation to meet their needs. New Hampshire: Only half of state residents had access to a reliable public transportation system, despite a majority of the population residing in urbanized areas. Survey findings: 35.7%: public transportation was available when they needed it, 34.1%: public transportation was not available where they wanted to go. Maine's public transportation network also faces challenges.	Multiple Passengers	Case Study
http://www.uvm.edu/~transctr/research/trc_reports/UVM-TRC-13-010.pdf	the most effective programs into three categories: ●Unlimited access; ●Employee incentives; ●Ridesharing -Unlimited access (UA) refers to an approach where transit rides are charged to participating employers. CATMA's Unlimited Access Program: Beginning in 2003, the Campus Area Transportation Management Association (CATMA) has coordinated with local universities to offer no-cost bus rides to students, faculty and staff on all fixed lines of the Chittenden County (Vermont) Transportation Authority (CCTA). CATMA Results: ●The number of participating institutions has expanded since implementation, and now includes the three largest in the area: the University of Vermont, Champlain College and Saint Michael's College. ●University transit ridership has grown significantly since the implementation of unlimited access. ●Program-wide ridership has increased 57% since FY 2008, from 263,634 to 458,427. ●The expanding ridership reflects the addition of new institutions as well as increased use among existing members. ●The University of Vermont (UVM) With over 14,000 students and faculty is the largest institution participating in the UA program. ●UVM's initial trial period in spring semester 2003 averaged 5,549 rides per month. ●Since then ridership has steadily increased at more than 10% annually over the subsequent decade. ●As of 2012, University of Vermont students and employees used the service nearly 40,000 times per month during the school year. ●The ease of riding public transportation without an up-front cost has reduced SOV commutes among students and employees. ●Among students living more than a half-mile from campus, driving alone decreased from 79.4% in 2003 to 49.2% in 2010. ●Transit ridership among off-campus students increased from 3.7% to 20.8% over the same period. Advance Transit: Advance Transit is the fixed-route and paratransit service for the Upper Valley, along the Connecticut River near the towns of Norwich, VT, and Hanover, NH. The service connects outlying areas to the amenities of the micropolitan core, including Dartmouth College, Dartmouth-Hitchcock Medical Center and other large area employers. The service is free to all riders thanks to public and private partnerships. Advance Transit Results: ●Ridership has increased along Advance Transit's New Hampshire routes since the implementation of fare-free service, providing over 800,000 rides in 2012. ●The surge in passengers has made Advance Transit one of the most productive transit providers in the state on a per-unit basis.	Multiple Passengers	Case Study
http://www.uvm.edu/~transctr/research/trc_reports/UVM-TRC-13-010.pdf	Employee Incentives: 1-AllEarth Renewables: A renewable-energy manufacturer based in Williston, Vermont, implemented an innovative program to incentivize smart energy consumption in 2012, titled "Renewables & Efficiency: The program provides each employee with an annual bonus of $6,000 to cover all energy needs including vehicle use, home heating and electricity. If an employee uses more than $6,000 worth of energy (40,000 kilowatt-hours), he or she does not receive a bonus. AllEarth Renewables Results: ●Many employees have turned to carpooling to share energy use on their daily commutes. ●Other employees have opted for public transportation to eliminate their transportation energy use altogether. ●By reducing SOV trips, employees not only spend less on fuel and parking but also earn a larger annual bonus. 2-Cx Associates Cx Associates, a building commissioning firm in Burlington, implemented a six-point Green Incentives program to get its employees out of their vehicles. These include company-paid bus passes, carpool and $200 gift certificates to purchase walking and biking accessories. Employees used to traveling by car are rewarded with gift certificates to local restaurants "for every 50 miles cycled or 25 miles walked as part of their commute. For employees who decide to drop their vehicles altogether, Cx Associates pays the annual fee of a CarShare Vermont membership. 3-Maine Medical Center In June 2008, Maine Medical Center implemented a multifaceted transportation management plan at the request of the City of Portland. The plan encourages its 4,500 employees to utilize alternative modes of transportation on their daily commute. Carpoolers and vanpoolers receive gated card access to convenient ground-level parking. New bike lockers and bicycle repair equipment were installed, and existing racks were rearranged to locations that are more convenient. Employees may purchase METRO Bus multi-ride tickets at half price from several locations throughout the hospital. Maine Medical Center Results: ●The program exceeded expectations in its first year of operation. ●15% of employees enrolled in the program. Carpooling was the most popular alternative mode, with around 400 users, which almost doubled initial projections. Walking and biking attracted more than 100 users each. ●1,200 subsidized multi-use tickets were sold during the first year. Ride sharing: Growth in car ownership, dispersed land settlement patterns, highway investments, travel behavior and socioeconomic changes have all contributed to a dramatic increase in automobile use in the U.S. over the last 80 years. Governments have turned to promoting ridesharing as a key strategy in reducing single-occupancy vehicle use. Average vehicle occupancy rates in the U.S. for work trips are about 1.1 per vehicle, down from 1.3 in 1977. Increasing occupants per vehicle would result in less SOV trips, reducing pollution and saving consumers money.	Multiple Passengers	Case Study

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Source	Notes	Theme	Subtheme
http://www.uvm.edu/~transctr/research/trc_reports/UVM-TRC-13-010.pdf	Organizational approaches to ridesharing and reducing SOV use: Vermont: Go! Vermont (http://www.connectingcommuters.org) The website was introduced after an extensive marketing campaign geared toward early innovators and schedule-consistent commuters. Go! Vermont Results: ●Its website saw 150 web hits per day after rolling out, with 7 to 12 calls and emails daily inquiring about the service. ●Six hundred individuals signed up for the ridematching service in the first month of operation. ●Over 1,000 people have registered with the rideshare service since it re-emerged under Zimride in October 2012, leading to 1,700 registered trips as of May 2013. ●The program's continuing success is facilitated by industry partnerships, such as the use of Efficiency Vermont's call center and Zimride's rideshare service. The service also coordinates vanpools where in groups of individuals are subsidized to purchase vans for regular commute routes. Maine: GO MAINE (http://www.gomaine.org) Like Go! Vermont, it has an "emergency ride home guarantee" Carpoolers do not need to worry about being stranded without their vehicles. GO MAINE provides information on insurance, licensing and taxation for enthusiastic commuters wishing to start their own tax-exempt vanpool nonprofit or LLC. New Hampshire: Green Commute NH (http://commutergreennh.org) The website aggregates transportation-related events from across the state onto a single platform, though the majority of its profile is devoted to specific "challenges" where individuals compete to replace SOV trips with alternative transportation methods—ridesharing included.	Multiple Passengers	Case Study
https://www.unomaha.edu/sustainability/center-for-urban-sustainability/_docs/UNO-transportation-study.pdf	Transportation (or Travel) Demand Management (TDM) is primarily aimed at decreasing the percentage of commuters who travel by single occupancy vehicles(SOVs)and/or vehicle miles traveled by commuters who use SOVs. Alternatives to SOV driving include biking, walking, public transit, carpooling, vanpooling, and telecommuting ●TDM can bring about economic development and fiscal sustainability by creating jobs, increasing local government tax revenues, increasing business income, and reducing road costs. Fiscal sustainability effects include reducing personal costs for the automobile and its incidental expenses ●TDM decreases fuel usage as it reduces driving, and in turn, improves air quality. The environment improves due to reduced energy consumption and carbon emissions ●TDM reduces traffic congestion by decreasing the number of automobiles and miles traveled, leading to time and cost savings. ●TDM has beneficial impacts on health. Positive healthcare effects include improved physical and mental health, and safety. Given the appropriate infrastructure for walking and biking, non-motorized commuting is safer and healthier than driving. ●better transportation systems, based on TDM, attract young talent to a community. Affordable transportation alternatives allow students to move to a community that does not require car ownership. ●TDM directly reduces demand and cost of providing parking. Economic benefits of active transportation: ●Reduction in road construction, repair and maintenance costs. ·Reduction in costs due to greenhouse gas emissions. ·Reduction in health care costs due to increased physical activity and reduced respiratory and cardiac disease. ·Reduction in fuel, repair and maintenance costs to user. ·Reduction of costs due to increased road safety. ·Reduction in external costs due to traffic congestion. ·Reduction in parking subsidies. ·Reduction of costs due to reduced air and water pollution. ·Increased productivity and a reduction of sick days and injuries at the workplace.	Multiple Passengers	Benefits
https://www.unomaha.edu/sustainability/center-for-urban-sustainability/_docs/UNO-transportation-study.pdf	Universities and TDM, Transportation (or Travel) Demand Management: A number of universities have successfully implemented TDM programs that include diverse strategies such as shuttle systems, transit programs, bicycle facilities, pre-tax commuter benefits, and preferential carpool parking to encourage students, faculty, and staff members to use sustainable modes of transportation. University TDM strategies: ●Enabling and promoting bicycle and walking; encouraging car sharing and ride sharing; expanding campus housing; and telecommuting ●Parking management mainly tries to decrease parking demand, and thus, saving costs to universities. ●Transit Incentives: Many universities offer incentives such as free or subsidized public transit access to students, faculty, and staff. Providing real-time information at transit stops and stations has the potential to increase ridership. ●Bicycling and Walking: Increased walking and biking can reduce parking demand and lead to cost savings for universities, as well as improve financial sustainability for individuals, health, safety, campus aesthetic appeal and students' engagement on campus. To promote walking and biking, it is necessary to provide access and infrastructure. Issues important for walking include: -Personal safety, whether the streetscape is attractive and interesting with diverse views; -The presence of destinations. To provide sustainable modes of non-motorized transportation, municipalities also need to improve infrastructure. ●Carpooling and Ride Sharing: Car sharing also called carpooling refers to sharing "vehicles owned by a separate organization and shared among a number of different users, who may use them at different times. Fewer trips by single occupants decreases parking demand and negative environmental impacts. Factors for successful car sharing and ride sharing: -Having positive community attitudes toward car/ride sharing, -Active partners, -Previous experiences. -Community attitudes toward environmental values are positively associated with successful implementation of car sharing. -One barrier of car sharing is "a lack of understanding about how and where it works. -Communications could be effective for influencing attitudes. -Support from partner organizations, engaged in car sharing helps promote its long-term success.	Multiple Passengers	Case Study

Literature Review in Support of SB19-239: MULTIPLE PASSENGER

Source	Notes	Theme	Subtheme
https://www.move-forward.com/carpooling-benefits-to-society-employers-and-individuals/	Results from Carpooling Studies: -Each year, the average passenger vehicle consumes approximately 550 gallons of fuel. -If one additional passenger were added to every 10 vehicles, the U.S. could reduce fuel consumption by 7.54 to 7.74 billion gallons annually. -If one passenger were added to every 10 vehicles, 68.0 million tons of GHG emissions will reduced annually in the U.S -Employees participating in carpooling and (TDM) programs report between 4% and 6% lower vehicle miles traveled than employees at the same worksite who did not participate. -Carpooling can reduce regional vehicle miles traveled (VMT) by an estimated 1% to 2%, based on carpooling's congestion mitigation impacts on the rest of traffic. -Employers can reduce parking demand saving an estimated USD$15,000 to $45,000 per parking space in capital expenditures and USD$360 to $2,000 in operations and maintenance per a space. -In Washington State, employers and property managers who provide financial incentives to their employees for carpooling (along with other TDM measures) are allowed a credit up to USD$60 per employee (up to USD$100,000 annually). Maryland and Georgia have similar tax credit programs. -Using the HOV lanes of the San Francisco-Oakland Bay Bridge, carpoolers can take advantage of a toll discount and shorter waits at the toll plaza. -According to a 1998 survey by the Metropolitan Transportation Commission, approximately 9,000 Bay Area commuters (6,000 riders and 3,000 drivers) used casual carpooling each morning. -Casual carpooling in Washington D.C. and Northern Virginia found that the top reason for choosing to be a carpool rider was the desire to save on the cost of gasoline, followed by a preference to do other things during the drive.	Multiple Passengers	Case Study
https://www.sciencedirect.com/science/article/abs/pii/S0967070X16300038	Casual carpooling is an informal form of commuter ridesharing operating in Washington, D.C.; Houston, Texas; and San Francisco, California. The results indicate that the motivations for casual carpooling participation include: -Convenience, -Time savings, and -Monetary savings, -Environmental and community-based motivations Findings from several surveys: -Casual carpoolers tended to be high-income earners, employed full-time, between the ages of 25 and d55. -Casual carpooling average wait times were more efficient in contrast to alternative travel modes (bus/BART) with median wait times less than 2.5 min for riders and 2 min for drivers during peak commute times. -The majority of participants learn about casual carpooling by word-of-mouth and value the advantages of time and cost savings and the comfort it provides over their alternative commute modes of BART and bus. -Three-fourths of participants were formerly public transit riders. -Over 60% travel after 8:00am, suggesting participants find the system reliable to transport them to their destination on time, without needing to factor in a time buffer. -Environmental benefits are a positive by product of the system, but they are not as highly regarded among participants.	Multiple Passengers	Case Study
http://innovativemobility.org/wp-content/uploads/2015/01/Ridesharing_in_North_America_Past__Present__and_Future.pdf	Ridesharing's modal share has declined since the 1970s in the USA. In1970, 20.4% of American workers commuted to work by carpool. This has declined to 10.7% in 2008. The largest drop occurred between 1980 and 1990, when carpooling declined from 19.7% to 13.4%. Ridesharing has increased slightly in recent years. From a low of 10.1% in 2004, carpooling has risen slightly and settled around 10.7% since 2005. Similarly, ridesharing has increased somewhat since 2001 in Canada. Approximately 7% of Canadian workers commuted as a passenger in 2001; this increased to 7.7% in 2006. There are seven times as many US passenger-miles for commute trips by carpool and vanpool as there are for public transit).	Multiple Passengers	Current State
http://innovativemobility.org/wp-content/uploads/2015/01/Ridesharing_in_North_America_Past__Present__and_Future.pdf	North American ridesharing's evolution can be categorized into five key phases: 1-World War II car-sharing clubs (1942 – 45); 2-majorresponses to energy crises (late 1960s to 1980); 3-early organized ridesharing schemes (1980 – 97); 4-reliable ridesharing systems (1999 – 2004); 5-technology-enabled ridematching (2004 to present).	Multiple Passengers	Current State
http://innovativemobility.org/wp-content/uploads/2015/01/Ridesharing_in_North_America_Past__Present__and_Future.pdf	North American ridesharing Ridematching platform partnerships: From 2004 to the 2011, a new generation of ridematching platforms has been developed for regions and employers to use. There has been significant growth and overall success with this strategy. Partnerships between ridematching software companies and its large-scale clients take advantage of existing common destinations and large numbers of potential members. "Green trip"-sponsored incentives: Many public agencies and companies promote ridesharing by providing its members with incentives. NuRide: An online ridesharing club with over 63 000 members in seven US metropolitan areas. NuRide rewards points when members carpool, vanpool, take public transit, bike, walk, or telecommute for both work and personal trips. These points can be used for restaurant coupons, shopping discounts, and attraction tickets. NuRide collaborates with public agencies, employers, and businesses to sponsor the incentives. RideSpring: Works with employer commute programs and participating employees can enter monthly drawings for prizes from over 100 retailers. Social networking platforms: The rise of social networking platforms, such as Facebook, has enabled ridesharing companies to use this interface to match potential rides between friends or acquaintances more easily. Social networking will build trust among participants, addressing safety considerations. Zimride: Which has partnered with 86 US and Canadian colleges, universities, and companies that each has their own "network" of members. Zimride also uses the Facebook platform to attract public users. Ridematching programmes statistics: As of July 2011, it was estimated that there were 638 ridematching services in North America, based on an extensive Internet search. This tally includes both online (most have an Internet-based component) and offline carpooling and vanpooling programmes. Those located in sparsely populated rural areas, which appeared to have very low use, were excluded. Of the total, 401 are located in the USA, and 261 are in Canada (24 programmes span both countries). Carpooling attracts the largest focus, with 612 programmes offering ridematching, and 153 providing vanpool ridematching; 127 offer both.	Multiple Passengers	Case Study

Literature Review in Support of SB19-239: MULTIPLE PASSENGER

Source	Notes	Theme	Subtheme
https://www.icf.com/blog/transportation/new-york-traffic-ridesharing	In the U.S., companies like Widex have taken the initiative in racing to the top of energy efficient operations. Since Widex began supporting rideshare arrangements like car and vanpooling in February 2013, around 156 employees were using 18 vans to move from west to eastern Long Island. They have now taken about 10 million miles off accumulated road travel, which equals 400 trips around the earth. More than 70,000 people have signed up for the service so far. Time Saving Using HOV Facilities: San-Francisco: 30-37 Minutes (SR-85, I-880, US-101) Washington, D.C. : 35 Minutes (I-95) Los Angeles: 28 Minutes (I-10) This equates to about 9 days saved for mega-commuters in these areas.	Multiple Passengers	Case Study
https://www.energy.gov/eere/vehicles/articles/fotw-1040-july-30-2018-average-vehicle-occupancy-remains-unchanged-2009-2017	Average Vehicle Occupancy Remains Unchanged From 2009 to 2017 According to the newly released 2017 National Household Travel Survey, the average light vehicle occupancy in 2017 was 1.67, unchanged from 2009. By vehicle type, cars and pickups remained nearly the same, while vans and motorcycles had higher occupancy in 2017 than in 2009. The occupancy rate for vans has increased from 2.07 in 1995 to 2.44 in 2017. Vans were the only category with an occupancy rate higher than two. The only category that had a lower occupancy rate in 2017 was sport utility vehicles.	Multiple Passengers	Occupancy
https://nacto.org/wp-content/uploads/2016/04/3_ORNL-Transportation-Energy-Data-Book-edition-34_2015.pdf	See Plot 11: **Average Vehicle Occupancy by Vehicle Type, From 1995 to 2009**	Multiple Passengers	Occupancy
https://www.planning.dot.gov/documents/RidesharingOptions_Toolkit.pdf	Zimride and Zipcar There are nearly 13 million faculty, staff, and students on more than 2,500 college campuses, many of whom do not have convenient access to transportation. There are millions more who have the option to bring a personal vehicle to campus, despite the fact that they may rarely require use of that vehicle. Zimride is an online platform for setting up rideshares that has explicitly focused on college, university, and corporate communities. In a partnership with Zipcar, Zimride allows people to share their rides even if they do not own a car themselves. Zimride was initially launched at Stanford University. When reserving a car on Zipcar, members are given an option to automatically post the date, time, and destination of their trip onto the Zimride Stanford University website. Zimride then finds and notifies users looking for a ride that may be compatible with the ride already planned by a fellow user in a Zipcar. Because of this partnership, Zimride ridesharers no longer have to own their own vehicle. Instead, they not only remove their own car from the road, but by sharing the excess capacity in their Zipcar they can reduce additional trips. Zimride's ridesharing community is based on simple and intuitive software that combines Google Maps, social networking and a proprietary ride-matching algorithm. People looking for rides are connected with people offering rides along a similar route. "Zimriders" utilize an online platform to denote whether they are a driver or a passenger, as well as their starting and ending addresses. They also identify the frequency with which the trip is to be taken -- the trip may be one-way, round-trip, or may be offered with frequency on a daily or weekly basis. In 2007, two entrepreneurs at Cornell University launched a free Facebook application to help college students share rides. Zimride was the first online carpooling service to integrate a Facebook application to arrange ridesharing within specific communities like universities or companies. Zimride could then use the social networking site to show potential riders and drivers the people who might be riding with them. In 2008, Zimride won a $250,000 grant from Facebook, as part of Facebook's effort to support innovative applications. The Results: Since launching in 2007, Zimride's rideshare solutions have served more than 300,000 users across the country and around the world. Zimride is now active at over 30 universities, as well as Fortune 500 companies, including Wal-Mart and Jetblue Airways. The U.S. DOT is promoting the use of innovative technologies such as social networking sites.	Multiple Passengers	Case Study
https://www.planning.dot.gov/documents/RidesharingOptions_Toolkit.pdf	Loss of time: •HOV Lanes provide access for ridesharers to bypass more crowded general purpose lanes. •Preferred parking at transit stations, for example, can reduce the time required to seek parking as well as the time to walk to trains •Ridesharing often provides opportunities for "trip chaining" at meet-up spots, which can reduce one's overall number of trips and the time requirements for those trips.	Multiple Passengers	Methods
https://www.london.ca/residents/Roads-Transportation/Transportation-Choices/Pages/Carpooling.aspx	LONDON Regional Rideshare (formerly London Carpools) is a free service that matches potential carpoolers. It is available to all Londoners and anyone who regularly commutes to and from London from surrounding communities. Benefits of Regional Rideshare: -saving money on gas, parking, repairs, and other car-related costs -socializing, read, or even sleep -contributing to air emission and other pollution reductions -having driving choices: those who prefer to drive can and those who prefer not to drive can be passengers -spending less time commuting and contributing to traffic congestion (as fewer cars are on the road) -catching up with friends as you go to and from work Carpooling even one day a week means a 20% reduction in weekly wear and tear on your vehicle.	Multiple Passengers	Case Study
https://www.gopili.co.uk/ride-sharing/	Ridesharing in UK More and more people are sharing their cars to travel in the United Kingdom. For regular or occasional trips, leisure travel or business, this new mode of transport appeals to many people every day. It is a great way to save money, meet new people, make new friends, help the environment and ease traffic congestions. List of ridesharing sites in UK BlaBlaCar With 10 million members and 2 million people transported each month, BlaBlaCar is the reference of ride sharing in Europe. The site offers many services: a price journey calculator, calendar events, e-mail alerts and mobile applications. Liftshare Liftshare is the largest ride-share scheme in the UK. A carpooling website for journeys in the United Kingdom, it allows commuters to book ride sharing seats online. Simple and easy to use, Liftshare will help people to find a ride-share route for your weekends or holidays. GoCarShare The GoCarShare.com site offers lift-shares for regular and occasional rides for drivers and passengers throughout the United Kingdom. This large ride sharing service simply reduces travel expenses whether you're driving or catching a lift.	Multiple Passengers	Case Study

Literature Review in Support of SB19-239: MULTIPLE PASSENGER

Source	Notes	Theme	Subtheme
https://katrinaherzog.atavist.com/blablacar-italy	BlaBlaCar: An online platform designed to connect drivers with potential passengers traveling on similar journeys. Drivers set a price for passengers to help with the costs of tolls and petrol, allowing passengers to pay what amounts to a fraction of corresponding train prices. The idea was conceived of by Frédéric Mazzella in 2003 in France and then BlaBlaCar was founded officially in 2006. As of spring 2015, it is a company valued at more than 100 million euros and functions in seventeen countries total, ranging from the United Kingdom to the Netherlands, and including Russia, Turkey, Ukraine, and, most recently, India and Mexico. Italy had its own version of a rideshare scheme, originated in 2010, but in 2012 it joined the international network that is BlaBlaCar.	Multiple Passengers	Case Study
https://www.taxisingapore.com/carpooling-in-singapore/	Car-sharing, ride-sharing, lift-sharing in Singapore: Lompang App: Lompang is a carpooling app that pairs a commuter with other nearby commuters. Sharetransport.sg: Sharetransport.sg started in March 2012, takes the problem of Singapore transport situation into its own hands. The website and iOS app aggregate people who live in the same estate and work in the same place into shared transport by car-pooling, taxi-pooling or bus-pooling. Currently, the platform is the latest and most prominent with 15,000 users and expects to exceed 20,000 next year. Carpool King: Carpoolking.com started in 2007 by 32-year-old New Zealand-based Taiwanese who runs a software business in China, hosts Carpool King. This car pool platform helps to match carpool and goo in Singapore. Carpool King has more than 15,000 users registered in the region, of which 5,000 are in Singapore.	Multiple Passengers	Case Study
http://www.urbangateway.org/news/rise-car-sharing-china	The rise of car sharing in China. In 2012, there were only two car-sharing operators (CSOs), with a total of 39 vehicles in Chinese cities. Today, China's car-sharing network has grown to 1,000 vehicles with five active operators in Beijing, Hangzhou, Wuhan, Shenzhen and Changsha. ●Eduo Auto ●Evnet ●Weigongjiao Weigongjiao, which means "mini-bus," creatively uses vending-machine-like parking garages with electric vehicle charging infrastructure. ●E-car Car2Go: The first car-sharing program supported by a foreign original equipment manufacturer (OEM) in China. Launched in Shenzhen in February 2014 and is operated by the international CSO Car2Share. Peer-to-peer car-sharing: Peer-to-peer (P2P) companies provide a platform for members to rent vehicles owned by other members in the network. PPZuche and ATzuche are two of the most notable P2P companies in China: -PPZuche has been growing by 50% per month since its launch in Beijing last November. It now operates in Shanghai, Shenzhen, and Guangzhou with over 20,000 members. -ATzuche has received attention due to its comprehensive service package, innovative vehicle tracking, and remote keyless entry device that can plug directly into cars without any vehicle modification.	Multiple Passengers	Case Study
http://innovativemobility.org/wp-content/uploads/2015/01/Ridesharing_in_North_America_Past__Present__and_Future.pdf	A ridesharing classification scheme is based on how ridesharing appears today and the relationship among its participants. Acquaintance-based carpool: Typically formed among families and friends, often called "fampools", as well as among co-workers. Organization-based carpool: Refers to carpools and vanpools that require participants to join the service whether through formal membership or simply visiting the organization's website. The term does not necessarily refer to consistent participation in the same carpool or vanpool every day, as some schemes allow for varying carpool participants. Vanpools are categorized into four types, depending on how the vanpool is owned and operated. Ad hoc: Ridesharing requires little relationship between participants and does not include membership. Ad hoc ridesharing is realized through casual carpooling. The last division is based upon the mechanism that organizes the shared rides. This includes self-organization, incentives, notice boards, and various computerized ridematching products.	Multiple Passengers	Case Study
http://innovativemobility.org/wp-content/uploads/2015/01/Ridesharing_in_North_America_Past__Present__and_Future.pdf	See Plot 12: Ridesharing Classification Scheme	Multiple Passengers	Methods
First and Last Mile Plan - RTD Colorado Springs 2019	Transit is only efective when riders can ac- cess it. First and Last Mile (FLM) is the prob- lem of getting to transit (frst mile) and getting to your fnal destination (last mile). Revamp and renaming of RTD's Call-n- Ride service to FlexRide, which introduced a mobile app to provide convenience and reduce the time taken to book trips Partnerships with Transportation Network Companies (TNCs) to improve access to RTD services The deployment of the region's frst autonomous transit shuttle The execution of license agreements with e-scooter/e-bike share companies to deploy on RTD property	Multiple Passengers	First Last Mile
https://www.bestworkplaces.org/pdf/vanpoolbenefits_07.pdf	A vanpool is a group of people who are coming to the same workplace from the same community, riding together in a van. Vanpools typically carry from seven to fifteen passengers, and operate weekdays, traveling between one or two common pick-up locations (typically a park-and-ride lot where a rider may leave his/her car, or a transit station) and the workplace. Employers can help employees form vanpools through rideshare matching. Rideshare matching helps potential vanpoolers locate others nearby with similar schedules. Regional rideshare services in most areas allow interested employees to register for matching services directly at no cost. Employers can direct their employees to these free services. Rideshare agencies can also help organize vanpools directly with employees. Employees realize a variety of benefits from vanpooling including cost savings, decreased vehicle wear and tear, time savings in regions with HOV lanes, and the ability to talk, eat, sleep, or read while commuting. Vanpool participants report saving up to $3,000 or more a year on gas, car maintenance, and wear and tear as well as reduced stress and commuting time. The primary employer advantage is the need for fewer parking spaces; other advantages include less employee stress and improved productivity. Providing vanpool benefits is one of the primary benefits employers participating in Best Workplaces for CommutersSM can offer employees. Employers must offer at least one of three primary benefits to their employees to be recognized as one of the Best Workplaces for CommutersSM (the other two are parking cash out and telework). Under this option, the employer agrees to provide at least $30 per month in transit or vanpool benefits for any employee (or the full monthly commuting expense if it is less than $30 per month). (This does not refer to pre-tax. Pre-tax is considered a supporting benefit.)	Multiple Passengers	Methods

Transportation Provider Data Request

To obtain the most accurate data available for number of trips, number of trips, vehicle miles traveled (VMT), and industry growth projections by the six transportation provider types, the consultant team and CDOT conducted provider data requests. The team formulated questions that were unique to each transportation provider type, and in some cases, unique to each provider. CDOT made requests to the transportation providers who were also members of the SWG and the Freight Advisory Panel. The consultant team handled the other requests, and in total over 30 entities were contacted. Several transportation providers responded to these requests, while others were unresponsive. The Colorado Department of Regulatory Agencies Public Utilities Commission provided data on the taxi companies VMT and the Denver International Airport provided information on rental car companies and TNC trips. Several companies who were members of CDOT committees provided useful data, including SWG members ShareNow and Freight Advisory Council members FedEx, UPS and Amazon Flex. Several providers responded to express concerns about confidentiality, and requested that a non-disclosure agreement be signed. CDOT is currently developing a non-disclosure agreement which will be distributed to these companies who agreed to participate with this caveat.

The questions asked in the data requests were as follows:

TNCs—Uber, Lyft, Hop Skip Drive

1. How many vehicle trips (with passengers) are made during an average weekday? What is the average trip length? If Sunday and Saturday are different, please specify? What is the average trip length?
2. Can you provide any information on pooled versus single passenger trips? What percentage of TNC trips are pooled (or shared-ride)?
3. What is the average trip length of vehicle trips without passengers?
4. Average fares per trip, by trip length, by time of day
5. Area of coverage
6. Pickups and drops off by time of day and by geographic area – we can provide a shapefile of zones/areas that point data could be aggregated to for anonymity
7. Fleet size and availability (make/model of car, any EVs?)
8. Number of drivers

Taxis—PUC

1. How many taxi vehicle trips (with passengers) are made during an average weekday? What is the average trip length? If Sunday and Saturday are different, please specify? What is the average trip length?
2. Can you provide any information on pooled versus single passenger taxi trips? What percentage of taxi trips are pooled (or shared-ride)?
3. What is the average trip length of vehicle trips without passengers?

Transportation Provider Data Request

4. Average fares per trip, by time of day
5. Area of coverage
6. Pickups and drops by geographic area – we can provide a shapefile of zones/areas that point data could be aggregated to for anonymity
7. Fleet size and availability (make/model of car, any EVs?)

Taxi

1. Data provided are for a full year, correct?
2. Assuming yes to Q1, is there an annualization factor that we can use to convert annual to average weekday or daily (365)?
    a. If PUC doesn't know the answer, then we can follow up with Taxi companies. Taxi companies may not have an average weekday. Their days may coincide with busy times at the airport or hotels.
3. It seems they provided data only includes paid miles. Do we have any information on the deadhead miles? Can we assume symmetry with "number of paid miles"?
4. Is there any information of paid miles for (flat meter DIA trips)?

Peer Car Share—Maven (may not be in Colorado), Getaround, Turo, ReachNow/ShareNow (acquired by Car2Go), JustShareIt (may not be in Colorado, acquired by FoxRental)

1. How many vehicle trips are made during an average weekday? What is the average trip length? If Sunday and Saturday are different, please specify? What is the average trip length?
2. Average fares per trip, by trip length, by time of day
3. Odometer reading at pick up and drop off by trip, by time of day
4. Any user/customer survey data (anonymized)
5. Area of coverage
6. Pickups and drops off by time of day and by geographic area – we can provide a shapefile of zones/areas that point data could be aggregated to for anonymity
7. Fleet size and availability (make/model of car, any EVs?)

Transportation Provider Data Request

Non-peer Car Share/Car Clubs/Business-to-Peer—Car2Go, ZipCar, Enterprise Car Share, ZimRide

1. How many vehicle trips are made during an average weekday? What is the average trip length? If Sunday and Saturday are different, please specify? What is the average trip length?
2. Average fares per trip, by trip length, by time of day
3. Odometer reading at pick up and drop off by trip, by time of day
4. Any user/customer survey data (anonymized)
5. Area of coverage
6. Pickups and drops off by time of day and by geographic area – we can provide a shapefile of zones/areas that point data could be aggregated to for anonymity
7. Fleet size and availability (make/model of car, any EVs?)

Car Rental

1. During a typical day (average weekday), how many cars are rented by customers, by pickup and drop off location? If there is no typical weekday or weekend day condition, please provide low and high values?
2. On average, how many vehicle miles do customers drive during each rental period?
3. Can you provide any information on "driver-only" versus "driver with passenger rentals"? Or during an average weekday, how many customers ask for the allowance of additional drivers when picking up their rental vehicles?
4. If car share service option is available, please provide the number of customers that select this option and the average number of vehicle miles driven during the rental period for an average weekday (and weekend day).
5. Odometer reading at pick up and drop off by trip, by time of day
6. Please provide information by geography if possible (Statewide, County, Front-range/non-front range)?
7. Provide the frequency of rental period (e.g. single day rental, two-way, three-day, etc.).
8. Trips by type of car (make/model of car, any EVs?)

Residential Delivery

Amazon (Amazon Service Partners and Amazon Flex)

1. How many vehicle miles do your employees drive delivering packages (from fulfillment centers to customer's homes) during an average weekday? Average weekend day?
2. If pooled, please provide the number of routes and the average number of miles driven on each route.

Transportation Provider Data Request

3. If there is no typical weekday or weekend day condition, please provide low and high values?
4. Area coverage

Uber Eats

1. During an average weekday (and weekend day), how many customer deliveries are made?
2. What is the average trip length of the deliveries?
3. If there are no typical conditions, provide low and high values?
4. Area coverage

Door Dash

1. During an average weekday (and weekend day), how many customer deliveries are made?
2. What is the average trip length of the deliveries?
3. If there are no typical conditions, provide low and high values?
4. How many deliveries on an average weekday by mode (vehicle or bike or other)?
5. Area coverage

GrubHub

1. During an average weekday (and weekend day), how many customer deliveries are made?
2. What is the average trip length of the deliveries?
3. If there are no typical conditions, provide low and high values?
4. How many deliveries on an average weekday by mode (vehicle or bike or other)?
5. Area coverage

Postmates

1. During an average weekday (and weekend day), how many customer deliveries are made?
2. What is the average trip length of the deliveries?
3. If there are no typical conditions, provide low and high values?
4. How many deliveries on an average weekday by mode (vehicle or bike or other)?
5. Area coverage

UPS

1. During an average weekday, how many vehicle miles do your operators (employees) drive delivering packages (using vehicles less than 14,000 lbs.)?
2. Please provide information by geography if possible (statewide, county, Front-range/non-front range)?
3. If there is no typical weekend or weekend day condition, please provide low and high values.

Transportation Provider Data Request

4. Please provide warehouse locations.

Fed Ex

1. During an average weekday, how many vehicle miles do your operators (employees) drive delivering packages (using vehicles less than 14,000 lbs)?
2. Please provide information by geography if possible (statewide, county, front-range/non-front range)?
3. If there is no typical weekend or weekend day condition, please provide low and high values?
4. Please provide warehouse locations.

Domino's Pizza

1. How many pizza deliveries are made during an average weekday?
2. What is the average trip length of the deliveries?
3. Can you provide data by geography--state, county, region (Front-range vs. non-front range)

Jimmy Johns

1. How many customer deliveries are made during an average weekday?
2. What is the average trip length of the deliveries?
3. Can you provide data by geography--state, county, region (Front-range vs. non-front range)

King Soopers Residential

1. How many customer deliveries are made during an average weekday?
2. What is the average trip length of each customer trip/delivery? What is the average trip length after the delivery has been made?
3. Can this data be provided geographically—state, county, front-range vs. non-front range?

Costco Grocery

1. How many customer deliveries are made during an average weekday?
2. What is the average trip length of each customer trip/delivery? What is the average trip length after the delivery has been made?
3. Can this data be provided geographically—state, county, front-range vs. non-front range?

Walmart Grocery

1. How many customer deliveries are made during an average weekday?
2. What is the average trip length of each customer trip/delivery? What is the average trip length after the delivery has been made?
3. Can this data be provided geographically—state, county, front-range vs. non-front range?

Transportation Provider Data Request

Instacart (King Soopers, Safeway, Sprouts, Costco, Natural Grocers, Sam's Club, Petco, Low's Mercado, Marzyk, Bonnie Brae Liquor)

1. How many customer deliveries are made during an average weekday?
2. What is the average trip length of each customer trip/delivery? What is the average trip length after the delivery has been made?
3. Can this data be provided geographically—state, county, front-range vs. non-front range?

Shipt (Target)

1. How many customer deliveries are made during an average weekday?
2. What is the average trip length of each customer trip/delivery? What is the average trip length after the delivery has been made?
3. Can this data be provided geographically—state, county, front-range vs. non-front range?