

The National Academies of
SCIENCES • ENGINEERING • MEDICINE



TRANSPORTATION RESEARCH BOARD



-DIRECTORY OF INFORMATION RESOURCES-

This directory is assembled and maintained by TRB staff to help inform the work of this National Academies/TRB Forum. While far from exhaustive, the list includes resources that relate directly to the mission of this Forum. With a few exceptions, the list is limited to items that have been published or posted in 2017 or later.

TRB staff continues to keep this list updated, and the most current version is posted on the Forum's website (<https://trb.org/AVSMForum>). Forum participants and others are encouraged to bring similar resources to the attention of the TRB staff.

Contents

SCENARIOS FOR AUTOMATED VEHICLES AND SHARED MOBILITY	2
GUIDANCE FOR STATE, AND LOCAL AGENCIES.....	11
FEDERAL AGENCY NOTICES, GUIDANCE, AND INFORMATION	23
SAFETY & SECURITY	26
ROLE OF SHARED MOBILITY	32

SCENARIOS FOR AUTOMATED VEHICLES AND SHARED MOBILITY

- “Environmental and Equity Implications of Electric, Shared Autonomous Vehicles (SAVs) in Urban Transportation: A Case Study of San Francisco: SAFE Center for Automated Transportation Technology; November 2023; https://safe2020.wpenginepowered.com/wp-content/uploads/2023/11/CATT_Brief_3_v03.2.pdf
 - Case study predicts that modest deployment of electric, shared autonomous vehicles (SAVs) could result in noise and air pollution reductions, especially in disadvantaged communities.
- *Realistic Timing Estimates for Automated Vehicle Implementation*: Transportation Research Board, NCHRP Research Report 1049; July 2023; <https://www.trb.org/Publications/Blurbs/183062.aspx>
 - Identifies several opportunities in the current approach to forecasting the future of the automated vehicle marketplace. Delivers a framework of considerations for decision-making focused on vehicle automation and a set of assumptions and tools that agencies can use regardless of their size, geographic location, miles of roadway, number of transit vehicles, or funding sources.
- *Innovation Highway: Unlocking the Social and Economic Benefits of Autonomous Vehicles*: U.S. Chamber of Commerce, July 2023; https://www.uschamber.com/assets/documents/CTEC_InnovationHighwayReport_July23.pdf
 - Examines the potential safety and health benefits, mobility and access benefits, climate and environmental benefits, and economic competitiveness for three levels of vehicle automation
- *Toward Expandable, Robust, and Fair Artificial Intelligence in AVs – European Commission Report*: European Commission Joint Research Center; June 2023; https://op.europa.eu/en/publication-detail/-/publication/9f479334-de63-11ed-a05c-01aa75ed71a1/language-en?utm_source=TRB+Weekly&utm_campaign=0c40e65dc6-EMAIL_CAMPAIGN_2023_06_23_05_43&utm_medium=email&utm_term=0_c66acb9bce-0c40e65dc6-%5BLIST_EMAIL_ID%5D
 - Summarizes the talks presented during a March 2022 workshop and an analysis of the discussions that occurred during collaborative working sessions. Topics of interest included, among others, current regulations and standards regarding automated and autonomous road vehicles and analysis of their limitations; explainability of artificial intelligence; accuracy, robustness, security, and fairness of AI systems. Provides concluding remarks how the findings of the Workshop can help to promote further research within and outside of the JRC on this topic.
- *Toward a National Regulatory Framework for Automated Vehicles – Challenges and Opportunities*: Transportation Research Board; May 2023; <https://onlinepubs.trb.org/onlinepubs/TRBAVSM/AVForumInformationResourcesNov2022.pdf>.
 - Summarizes a series of panel discussions hosted by the National Academies-TRB Forum on Preparing for Automated Vehicles and Shared Mobility, and the ITS America Automated Vehicles Standing Committee during 2022. Addresses the challenges and opportunities for a national AV regulatory framework. Panelists included representatives from federal agencies, state agencies, localities, industry, and consumer safety groups.

- *Economic Impacts of Removing Transportation Barriers to Employment for Disabled Individuals Through Autonomous Vehicle Adoption*: National Disability Institute; December 2022; <https://www.nationaldisabilityinstitute.org/reports/autonomous-vehicle-adoption/>.
 - Examines how accessible, affordable, and sustainable AVs could increase employment for people with disabilities and strengthen the broader economy.
- *Mixed-Autonomy Era of Transportation: Resilience and Autonomous Fleet Management*: Carnegie Mellon University; September 2022; https://www.cmu.edu/traffic21/research-and-policy-papers/traffic21_policymaker_guide_summer_2021-22.pdf
 - Demonstrates the potential for autonomous vehicles to improve traffic flow for both autonomous and nonautonomous vehicles in mixed-autonomy settings within a transportation network system.
- *Regulations to Respond to the Potential Benefits and Perils of Self-Driving Cars*: Urban Institute; September 2022; <https://www.urban.org/research/publication/regulations-respond-potential-benefits-and-perils-self-driving-cars>
 - Examines key potential benefits that automobile-sized automated vehicles could generate, as well as the problems they could exacerbate. Recommends public policies to mitigate potential negative impacts on equity and other issues.
- *The Impacts of Vehicle Automation on the Public Transportation Workforce*: Transit Cooperative Research Program, Transportation Research Board; June 2022; <https://nap.nationalacademies.org/catalog/26613/the-impacts-of-vehicle-automation-on-the-public-transportation-workforce>
 - Provides an analysis of the possible impacts of automation on the public transportation workforce. Seeks to fill the gap in automation-related workforce impact research by (a) identifying likely transit automation use cases, (b) analyzing each use case's potential effects on the public transit workforce, and (c) identifying clusters of strategies to prepare the workforce for and mitigate negative effects of transit vehicle automation
- *How to Make Sense of Bus Transit Automation?*: Carnegie Mellon University; Spring 2022; <https://www.cmu.edu/traffic21/research-and-policy-papers/traffic21-policy-brief-22.1---apr-14-002.pdf>
 - Analyzes the potential impact of bus automation on bus operators' jobs, duties, and actions. Offers recommendations for policy makers to consider around automation in transit operations.
- *Leveraging Autonomous Shared Vehicles for Greater Community Health, Equity, Livability, and Prosperity*: Center of Transportation Studies, University of Minnesota; April 2022; <https://www.cts.umn.edu/news/2022/april/equity>.
 - Aims to help transportation practitioners understand the potential of one deployment option—shared autonomous vehicles (SAVs)—in mitigating existing transportation inequities. The final report identifies policies and strategies that could guide an equitable rollout.
- *Impact of Automation on Long Haul Trucking Operator-Hours in the United States*: Humanities and Social Sciences Communications, March 2022; <https://www.nature.com/articles/s41599-022-01103-w#Abs1>
 - Studies the possible net impacts on tractor-trailer operator-hours from the “transfer-hub” model of deployment for automated trucks. Finds that up to 94% of long haul trucking operator-hours may be impacted as the technology improves to operate in all

weather conditions. If the technology is however restricted to the southern states where the majority of companies are currently testing automated trucking, finds that only 10% of operator-hours are impacted.

- *Opportunities, Challenges, and Uncertainties in Urban Road Transport Automation: Sustainability*, February 2022; <https://www.mdpi.com/2071-1050/14/3/1853>
 - Explains the opportunities for Automated Driving System (ADS) technology to improve the urban transport of people and goods, together with the challenges that will limit the scope and timing of the deployment of urban ADS. The discussion emphasizes the diversity of ADS applications and services, each of which has its own opportunities, challenges, and uncertainties, leading to diverse deployment scopes and schedules.
- *ITS ePrimer Module 13: Connected Vehicles*: U.S. Department of Transportation ITS Professional Capacity Building Program; November 2021; <https://www.pcb.its.dot.gov/eprimer/module13.aspx>
 - Describes the development and eventual deployment of connected vehicles (CVs) within the surface transportation system with an emphasis on ITS. Describes the current and emerging connected ecosystem, technologies, demonstrations, and challenges of deploying infrastructure in support of connected vehicle applications. Provides a snapshot overview of rapidly-developing programs and technologies and provides links for more information where available.
- *Inclusive Design of Autonomous Vehicles: A Public Dialogue*: U.S. Access Board; July 2021; <https://www.access-board.gov/files/usab-av-forum-summary-report.pdf>
 - Summarizes a series of virtual events hosted by the U.S. Access Board in March and April 2021 for the purpose of exchanging facts and information about autonomous vehicle (AV) accessibility, and to hear thoughts from individuals on how to ensure that autonomous vehicles are accessible to and usable by persons with mobility, sensory, and/or cognitive disabilities.
- *Near-Term Impacts of Automated Vehicle Technologies on Fuel Economy*: American Council for an Energy-Efficient Economy (ACEEE); June 2021; https://www.aceee.org/sites/default/files/pdfs/impacts_of_av_technologies_final_6-23-21.pdf
 - Investigates the potential effects that automated vehicle (AV) technology may have on light-duty vehicle fuel economy in the coming decade. Also investigates how current fuel economy and emissions regulations may or may not encourage the development of AV technology to be as efficient as possible. Concludes by making recommendations on how current regulations may be amended to better encourage AV technology to be developed so as to improve fuel efficiency.
- *Choosing Canada's Automotive Future*: Council of Canadian Academies, March 2021; <https://www.cca-reports.ca/wp-content/uploads/2019/01/Report-Choosing-Canadas-Automotive-Future.pdf>
 - Identifies potential impacts for policy areas critical to connected and autonomous vehicle (C/AV) development and diffusion. Points out that connected, autonomous, shared and electric (CASE) vehicles have the potential to make transportation safer and more accessible - but there are downsides. Warns that, without proactive urban management, these vehicles could worsen air quality and traffic congestion and increase transportation inequities.

- *User Perceptions of the Risks of Electric, Shared, and Automated Vehicles*: University of California, Davis, February 2021, <https://ncst.ucdavis.edu/research-product/user-perceptions-risks-electric-shared-and-automated-vehicles-remain-largely>
 - Presents findings on potential users' perceptions of safety and security risks posed by intertwined social and technical systems of electric, shared, and automated vehicles (e-SAVs). Includes a proposed a framework to advance research, policy, and system design. Summarizes the findings of that work and provides policy implications.
- *Preparing for Automated Vehicles and Shared Mobility: Crosswalk Summary of the State-of-the-Research Topical Papers*: Transportation Research Board, Forum on Preparing for Automated Vehicles and Shared Mobility, February 2021: http://onlinepubs.trb.org/onlinepubs/AVSMForum/products/Crosswalk_Analysis_of_Research_Topics_in_Automated_Vehicles_and_Shared_Mobility.pdf
 - Summarizes the findings and additional research within the following themes that are most prevalent across nine topical state-of-the-research papers: safety; environmental and socio-economic impacts; data and data governance; equity, accessibility, and inclusion; and automated vehicle and shared mobility services.
- *Preparing for Automated Vehicles and Shared Mobility: State-of-the-Research Topical Papers*: Transportation Research Board, Forum on Preparing for Automated Vehicles and Shared Mobility, November 2020
 - A series of nine white papers summarizing the research that has been completed to date on each of nine priority topics. Provide a snapshot of all research completed to date for each topical area. Include a high-level overview of the existing research and recommendations for further research within each topical area. Establish a foundation to guide the use of resources for further development and support of more comprehensive research that tracks the identified research gaps noted in each topical paper. The papers are as follows:
 - [Models for Data Sharing and Governance](#)
 - [Safety Scenarios and Engagement during Transition to Highly Automated Vehicles](#)
 - [Infrastructure Enablers for Automated Vehicles and Shared Mobility](#)
 - [Maximizing Positive Social Impacts of Automated Vehicle Deployment and Shared Mobility](#)
 - [Prioritizing Equity, Accessibility and Inclusion Around the Deployment of Automated Vehicles](#)
 - [Potential Impacts of Highly Automated Vehicles and Shared Mobility on the Movement of Goods and People](#)
 - [Impacts of Automated Vehicles and Shared Mobility on Transit and Partnership Opportunities](#)
 - [Implications for Transportation Planning and Modeling](#)
 - [Impacts and Opportunities Around Land Use and Automated Vehicles and Shared Mobility](#)
- *Autonomous Vehicles, Mobility, and Employment Policy: The Roads Ahead*: MIT Research Brief; John J. Leonard, David A. Mindell, Erik L. Stayton; July 2020;

<https://workofthefuture.mit.edu/sites/default/files/2020-07/WotF-2020-Research-Brief-Leonard-Mindell-Stayton.pdf>

- Considers the current state of automated driving technologies, including driver assistance systems and highly automated vehicles (AVs), as well as their potential implications for mobility and employment. Broader impacts, including the interplay with transit and land-use and environmental consequences are also briefly considered.
- *Economic Implications of Automated Vehicles and Shared Mobility*: Transportation Research Circular E-C261, Transportation Research Board, February 2020: <http://onlinepubs.trb.org/onlinepubs/circulars/ec261.pdf>
 - Summarizes a workshop held by the National Academies–TRB Forum on Preparing for Automated Vehicles and Shared Mobility on July 14, 2019 in Orlando, Florida. Encapsulates presentations and discussions on economic impacts at the systems level, specific economic impact analysis areas, key takeaways, and needed research.
- *Autonomous Vehicle Implementation Predictions: Implications for Transport Planning*; Victoria Transport Policy Institute, February 2020: <https://www.vtpi.org/avip.pdf>
 - Explores the impacts of autonomous vehicles (AVs) and their implications on planning issues. Investigates how quickly AVs are likely to develop and be deployed; their likely benefits and costs; and how they are likely to affect travel demands and planning decisions.
- *Zero Emission Vehicles: Forecasting Fleet Scenarios and their Emissions Implications*, NCHRP Web-Only Document 274, Transportation Research Board, February 2020: <http://www.trb.org/main/blurbs/180232.aspx>
 - Analyzes a set of scenarios of infrastructure development, policy changes, and cost parameters, with a suite of 49 simulations across those scenarios conducted to assess their impact on nationwide zero emission vehicle (ZEV) adoption and the corresponding levels of exhaust emissions. The model used in the scenarios analysis is a consumer choice model that estimates future sales, populations, and fuel consumption of advanced technology vehicles (ATVs), including ZEVs. A PowerPoint presentation also accompanies the document.
- *The Effect of Automated Vehicles on Toll Roads*; Fitch Ratings, February 2020; <https://www.fitchratings.com/site/re/10107648>
 - Predicts the effects of automated vehicles on toll roads. Observations and predictions include: Full autonomy will be transformative, overall VMT expected to increase, however, other factors could combine to decrease VMT, monopolistic systems are best positioned, managed lanes are most vulnerable, and timing of AV use is still uncertain. Due to uncertainties, Fitch has not taken rating actions or changed outlooks on toll road issuers due to risks from AVs.
- *Understanding Surveys of Public Sentiment Regarding Automated Vehicles*; U.S. Department of Transportation, November 2019, <https://rosap.ntl.bts.gov/view/dot/43628>
 - Explores the public’s outlook on automated vehicles, focusing specifically on attitudes regarding safety, trust, and willingness to try, as well as the factors that influence those opinions. Compiles the results of numerous surveys and studies conducted over the past four years and tracks consumer attitudes over time, against the backdrop of newsworthy events in the development, testing, and early deployment of automated vehicles. Also presents an overview of research on the factors that affect consumer technology adoption, particularly in the context of innovative technologies,

- and identifies implications of this research for future assessments of the public's interest in automated vehicle.
- *Insights Into Future Mobility*; MIT Energy Initiative, November 2019; <http://energy.mit.edu/wp-content/uploads/2019/11/Insights-into-Future-Mobility.pdf>
 - Uses a scenario-based approach to explore some of the major factors that will affect the evolution of personal mobility leading up to 2050 and beyond. The five main areas of inquiry include: impact of climate change policies, outlook for vehicle ownership and travel, characteristics of alternative vehicle powertrains and fuels, infrastructure considerations for charging and fueling, and the future of personal mobility in urban areas - with a focus on the potentially disruptive role of autonomous vehicles and ride-hailing services.
 - *Impacts of Automated Vehicles and Shared Mobility on the Future Roles of the Public and Private Sectors*; Virginia Reeder, Scott Schmidt, and Katherine Kortum; November 2019: <http://onlinepubs.trb.org/onlinepubs/circulars/ec258.pdf>
 - Summarizes the July 15, 2019 workshop on the topic conducted by the National Academies/TRB Forum on Preparing for Automated Vehicles and Shared Mobility. Key takeaways included: Current roles will pave the way, but partnerships and relationships will need to change; One key is to acknowledge what we do not know; Everyone wants guidelines, frameworks; Consistency and standardization are critical, but it is unclear who should establish these; Vehicle manufacturers will continue to push agencies to improve existing traffic control devices.
 - *An Update on the Outlook for Automated Vehicle Systems*: Society of Actuaries, Richard R. Mudge and Alain Kornhauser; October 2019: <https://www.soa.org/globalassets/assets/files/resources/research-report/2019/automated-vehicle-update.pdf>
 - Summarizes major trends and trigger points, including those for policy, technology, and vehicles. The report also analyzes recent major events, including: slower deployment - with a few exceptions, Waymo moves forward, trucks, safety record - and the need for more data, implications of Tesla insurance package, company mergers, Uber and Lyft IPOs, regulations, local opposition to TNCs, AVs and the mobility impaired. Conclusions include, "Reality has caught up with the hype/romance of the popular press concerning the future of automated driving. Disappearing is the vision of connected swarms of driverless personal cars flowing effortlessly down our arterials and freeways. The buying public, however, is beginning to absorb the driver-assisted technologies that not only deliver safety, comfort and convenience, but also serve to embolden the traditional consumer-oriented business model. This, in turn, has helped accelerate private investment and technology partnerships that involve almost every automobile manufacturer."
 - *The Transition Toward Shared Automated Vehicles*, Transportation Research Board, September 2019: <http://onlinepubs.trb.org/onlinepubs/circulars/ec252.pdf>
 - Summarizes the February 2019 workshop on Transitioning Toward Shared-Automated Vehicles sponsored by the National Academies/TRB Forum on Preparing for Automated Vehicles and Shared Mobility. Key takeaways from the workshop include: Trends in transportation and digital transformation are upending our traditional notion of transportation and bringing unprecedented opportunities and challenges. This shift will not happen all at once. It is clear it will be a transition. This

- transition will have visibly different geospatial and temporal effects depending on the physical, political, and social situation of each region. The workshop identified what research is needed to transition to the vision (emphasizing the transition itself and need for immediate actions to facilitate the transition in the short term). Key research questions identified for regulation, equity, and land use and streets are listed.
- *Driving a Shared, Electric, Autonomous Mobility*: Rocky Mountain Institute, August 2019; <https://rmi.org/insight/driving-a-shared-electric-autonomous-mobility-future/>
 - Examines how policy, economics, infrastructure, and behavioral norms are shaping and spurring the “evolution” of “mobility ecosystems” in three nations – China, India, and the United States – and highlights the initiatives witnessing the greatest success. Concludes that ensuring that rides in autonomous vehicles are both electrified and pooled can “mitigate congestion and pollution issues” in those countries while providing “reliable, low-cost mobility for a rapidly urbanizing society.” However, the report found that if done in isolation of the needs of the electricity system, mass adoption of electric vehicles could result in “significant” added costs, which could easily be avoided with “intelligent and forward-looking planning processes.”
 - *Energy Implications of Current Travel and the Adoption of Automated Vehicles*: National Renewable Energy Laboratory, U.S. Department of Energy, May 2019: <http://www.trb.org/main/blurbs/179135.aspx>
 - Investigates how automated vehicle technology will affect driving and commuting habits. This report also identifies how different groups of people travel based on their residential area and their demographics. Survey findings show that vehicle miles traveled (VMT), in addition to energy consumption, will likely increase if AVs are not more efficient than conventional vehicles today, or if they are not used for ridesharing.
 - *Beyond Speculation 2.0 – Automated Vehicles and Public Policy*: Eno Center for Transportation, March 2019; <https://www.enotrans.org/etl-material/beyond-speculation-2-0-automated-vehicles-and-public-policy/>
 - Discusses the current and future state of automated vehicles, as well as the existing, proposed, and expected implications for federal, state, and local policy. The goal is to provide an overview of the current policy arena and posit concrete and substantive recommendations for policymakers to responsibly test and deploy AVs on public roads.
 - *Socioeconomic Impacts of Automated and Connected Vehicles*: TRB Conference Proceedings 56, January 2019: <http://www.trb.org/Main/Blurbs/178576.aspx>
 - Summarizes a symposium held in June 26–27, 2018, in Brussels, Belgium, hosted by the European Commission and TRB. The 2-day invitation-only symposium brought together high-level experts to share their views on the socioeconomic impacts of connected and automated vehicles and shared mobility (CAVSM). With the aim of fostering trans-Atlantic collaboration in research and deployment, symposium participants discussed challenges and opportunities arising from the diffusion of CAVSM and innovative approaches to mitigate any negative socioeconomic impacts.
 - *Preparing for Automated Vehicles and Shared Mobility*: TRB (prepared for National Academies Forum on Automated Vehicles and Shared Mobility); September 2018: <http://www.trb.org/main/blurbs/178223.aspx>

- Summarizes the deliberations of this TRB forum launched in early 2018 to facilitate evidence-based research needed to deploy automated vehicle technologies in a manner and timeframe that informs policy to meet long-term goals. Includes opportunities, challenges, impacts, research needs, and cross-cutting issues to be addressed.
- *Preparing the Workforce for Automated Vehicles - Truck Platooning State of the Industry 2018*: American Center for Mobility; August 2018: <https://ouravfuture.org/wp-content/uploads/2018/08/MSU-TTI-Preparing-Workforce-for-AVs-and-Truck-Platooning-Reports-.pdf>
 - Despite concerns that a rise in automated vehicles (AVs) will displace significant numbers of truck drivers in the United States, only a modest number of truck driver jobs, if any, will be affected, according to this new report commissioned by the American Center for Mobility (ACM), led by Michigan State University (MSU) and supported by Texas A&M Transportation Institute (TTI).
- *The Future of Autonomous Vehicles: Lessons from the Literature on Technology Adoption*: California Department of Transportation, July 2018: <http://www.trb.org/main/blurbs/177875.aspx>
 - Addresses the implications for how automated vehicles (AV) may affect the automobile industry and the transportation sector. Specifically, this report makes predictions about the future of AVs based on economic models.
- *Reshaping Urban Mobility with Autonomous Vehicles Lessons from the City of Boston*: World Economic Forum and The Boston Consulting Group, June 2018: <https://www.weforum.org/reports/reshaping-urban-mobility-with-autonomous-vehicles-lessons-from-the-city-of-boston>
 - Presents the findings from a three year collaboration that explored how autonomous vehicles could reshape the future of urban mobility. Includes steps that government leaders need to take to ensure the future of mobility remains safe, clean and accessible for all people.
- *America's Workforce and the Self-Driving Future-Realizing Productivity Gains and Spurring Economic Growth*; Securing America's Future Energy, June 2018: http://secureenergy.org/wp-content/uploads/2018/06/Americas-Workforce-and-the-Self-Driving-Future_Realizing-Productivity-Gains-and-Spurring-Economic-Growth.pdf
 - Experts address a set of key questions, including: 1) what precedents can we rely on in thinking about the impacts of AVs?, 2) what is the scale of concrete benefits AVs can offer to the broader population?, and 3) how can we inject rational, well-researched perspectives into the emotionally-charged yet critical conversation around the potential job impacts of AVs?
- *Travel Effects and Associated Greenhouse Gas Emissions of Automated Vehicles*: National Center for Sustainable Transportation at the University of California at Davis, April 2018: <http://www.trb.org/main/blurbs/177565.aspx>
 - Assesses the state-of-the-practice of automated vehicles (AVs) and their effects on travel and the environment. This paper identifies changes that AVs may have on increased roadway capacity, reduced travel time, monetary costs, parking, induced travel demand, new traveler groups, and energy.
- *Automation in the Long Haul: Challenges and Opportunities of Autonomous Heavy-Duty Trucking in the United States*: International Council on Clean Transportation, March 2018:

https://www.theicct.org/sites/default/files/publications/Automation_long-haul_WorkingPaper-06_20180328.pdf

- Explores the state of autonomous trucking technology from multiple stakeholder perspectives. This paper specifically focuses on how autonomous technology can affect fuel use and emissions in the freight sector.
- *Autonomous Vehicle Implementation Predictions: Implications for Transport Planning*: Todd Litman, Victoria Transport Policy Institute, January 2018: <http://www.vtpi.org/avip>
 - Explores autonomous vehicle benefits and costs, and impacts on transportation planning issues. It investigates how quickly self-driving vehicles are likely to be developed and deployed, and how they are likely to affect travel demands and planning decisions such as optimal road, parking and public transit supply.
- *Will Self-Driving Cars Usher in a Transportation Utopia or Dystopia?* Yale E360, January 2018: <http://e360.yale.edu/features/will-self-driving-cars-usher-in-a-transportation-utopia-or-dystopia>
 - Analysis by Jacques Leslie - Innovation visionaries say electric, self-driving, shared cars will soon revolutionize the way humans move about. But experts caution that unless this paradigm shift is guided by sound public policies, the future of transportation could lead to more pollution, more emissions, and more gridlock.
- *Future of Mobility White Paper*: Susan Shaneen, Hannah Totte. and Adam Stocker, California Department of Transportation, January 2018: <http://www.dot.ca.gov/hq/tpp/offices/osp/future-of-mobility.pdf>
 - This document is envisioned as a reference for modelers and decision makers. Aggregates current information and research on the state of key trends and emerging technologies/services, documented impacts on California's transportation ecosystem, and future growth projections (as appropriate).
- *Are We Going Too Fast on Driverless Cars?* Science, Jeffrey Marvis, December 2017: <http://www.sciencemag.org/news/2017/12/are-we-going-too-fast-driverless-cars>
 - Makes the case that predictions to date turn out to be based on surprisingly little research. While developers amass data on the sensors and algorithms that allow cars to drive themselves, research on the social, economic, and environmental effects of AVs is sparse. Truly autonomous driving is still decades away, according to most transportation experts. And because it's hard to study something that doesn't yet exist, the void has been filled by speculation—and starkly contrasting visions of the future.
- *All I Want for Christmas Is a New Transportation Planning Process*; Steven Polzin, Planetizen, November 2017: <https://www.planetizen.com/blogs/96036-all-i-want-christmas-new-transportation-planning-process>
 - The pace of change in transportation is creating a critical conundrum for transportation planners and policymakers. One of the planners' roles is to broker information that informs decision-making. But what in the world do we tell decision-makers? Who should one believe regarding the pace and impacts of transportation technology deployment?
- *Sharing Views on Automated Vehicles*; IFSTTAR, August 2017: <http://www.ifsttar.fr/en/online-resources/science-and-society/transport-and-mobility/science-topics/vehicule-autonome/>

- Presents views on operating safety, hybrid road infrastructure, automation and traffic management, driving activity, interactions with pedestrians, impacts on territories and lifestyles, freight and logistics, and legal challenges
- *Rethinking Transportation 2020-2030*; RethinkX, James Arbib and Tony Seba, May 2017: <https://www.rethinkx.com/transportation/>
 - We are on the cusp of one of the fastest, deepest, most consequential disruptions of transportation in history. The disruption will be driven by economics. By 2030, within 10 years of regulatory approval of autonomous vehicles (AVs), 95% of U.S. passenger miles traveled will be served by on-demand autonomous electric vehicles owned by fleets, not individuals, in a new business model we call “transport-as-a-service” (TaaS).
- *The Transforming Mobility Ecosystem: Enabling an Energy-Efficient Future*; U.S. Department of Energy, January 2017: <https://energy.gov/sites/prod/files/2017/01/f34/The%20Transforming%20Mobility%20Ecosystem%20Report.pdf>
 - Focuses on the range of possible impacts this transformation may have on energy, while acknowledging the economic, safety, and accessibility implications. In addition, this paper highlights the impacts that the mobility system of the future will have on our built environment, and how these interactions could change our cityscapes, as well as suburban and rural areas.
- *Identifying Autonomous Vehicle Technology Impacts on the Trucking Industry*; American Transportation Research Institute, November 2016: <http://atri-online.org/wp-content/uploads/2016/11/ATRI-Autonomous-Vehicle-Impacts-11-2016.pdf>
 - Outlines the impacts of automated truck (AT) deployment on the topics found within ATRI’s 2015 Top Industry Issues. To accomplish this, the report explores the role of each top industry issue across several levels of truck automation, offering a discussion of impacts to drivers, companies and operations in general. Additional issues related to AT impacts on the industry are also discussed.
- *Shared Mobility: Current Practices and Guiding Principles*; Susan Shaheen, Adam Cohen, and Ismail Zohdy, U.S. Department of Transportation, April 2016: <https://ops.fhwa.dot.gov/publications/fhwahop16022/fhwahop16022.pdf>
 - This primer provides an introduction and background to shared mobility; discusses the government’s role; reviews success stories; examines challenges, lessons learned, and proposed solutions; and concludes with guiding principles for public agencies. The primer provides an overview of current practices in this emerging field, and also looks toward the future in the evolution and development of shared mobility.

GUIDANCE FOR STATE, AND LOCAL AGENCIES

- *Preparing Transportation Agencies for Connected and Automated Vehicles in Work Zones*; National Cooperative Highway Research Program, Transportation Research Board; July 2023; https://nap.nationalacademies.org/catalog/27177/preparing-transportation-agencies-for-connected-and-automated-vehicles-in-work-zones?utm_source=TRB+Weekly&utm_campaign=d990a89018-EMAIL_CAMPAIGN_2023_07_28_03_12&utm_medium=email&utm_term=0_c66acb9bce-d990a89018-%5BLIST_EMAIL_ID%5D

- Presents guidelines to help state DOTs prepare for the impacts that CAV technologies will have on work zone environments. Identifies four CAV technologies that have the potential to improve work zone safety: lane keeping, queue warning systems for work zones, ATMAS, and work zone traveler information systems for CAVs. Supplemental to the report are a framework for assessing the benefits and challenges of CAVs in work zones; an overview of CAV technologies, both vehicle- and infrastructure-based, in work zones; a resource guide to expedite implementation of CAVs in work zones; and a plan that identifies mechanisms and channels for communicating and implementing this research.
- *State and Local Impacts of Automated Freight Transportation Systems*: NCHRP Research Report 1028, Transportation Research Board; June 2023;
https://nap.nationalacademies.org/catalog/27076/state-and-local-impacts-of-automated-freight-transportation-systems?utm_source=TRB+Weekly&utm_campaign=536f248fd6-EMAIL_CAMPAIGN_2023_06_12_07_16&utm_medium=email&utm_term=0_c66acb9bce-536f248fd6-%5BLIST_EMAIL_ID%5D
 - Details the impact of freight automated vehicles (FAVs) on state and local agencies and authorities, focuses on the modes of transportation that will be affected by FAVs, including trucks, drones, ships, and railways, as well as the possible interaction with terminal operations and other shipping and receiving systems.
- *Legal Issues and Emerging Technologies*: Transportation Research Board Transit Cooperative Research Program's TCRP Legal Research Digest 59; October 2022;
https://nap.nationalacademies.org/catalog/26786/legal-issues-and-emerging-technologies?utm_source=TRB+Weekly&utm_campaign=5fe6ec3ebf-EMAIL_CAMPAIGN_2022_10_31_07_58&utm_medium=email&utm_term=0_1a66ea3bb0-5fe6ec3ebf-510959085
 - Provides transportation attorneys with guidance and resources to assist with legal changes resulting from the implementation of technology, including regulatory challenges, risk management, cybersecurity, privacy, handling confidential and proprietary information, intellectual property rights, civil rights and environmental justice compliance, labor and employment law, and procurement issues.
- *High-Tech Workforce Preparation for Emerging Transportation Technologies*: Michigan Department of Transportation; December 2021;
https://www.michigan.gov/documents/mdot/SPR-1699-Report_743863_7.pdf
 - Provides an overall strategy to prepare a high-tech construction and operations-focused workforce within the next ten years by addressing the three primary objectives of the project: 1) Conduct research on new technologies and associated implementation strategies; 2) Develop a series of recommendations for MDOT units to aid decision-makers in identifying the expertise gap within MDOT's current construction and operation workforce, and 3) Provide a set of recruitment strategies for acquisition and (re)training the current and future workforce.
- *Initiating the Systems Engineering Process for Rural Connected Vehicle Corridors*: Transportation Research Board, National Cooperative Highway Research Program, October 2021
 - [Volume 1: Research Overview](#) identifies good starting points for these projects. [Volume 2](#) develops a model concept of operations. [Volume 3](#) provides a model

- system requirements specification. A [PowerPoint presentation](#) of context diagrams is also available.
- *AASHTO Connected and Automated Vehicle Policy Principles*: American Association of State Highway and Transportation Officials; October 2021; <https://mobility.transportation.org/wp-content/uploads/sites/65/2021/10/CAV-Policy-Principles-v4-press.pdf>
 - Articulates AASHTO’s policy position on connected-automated vehicle policy. Reflects AASHTO’s priorities and the current climate and policy needs for where we are in 2021 and is intended to be a living document, reviewed each year to reflect changes in technology and policy.
 - *Gaps and Opportunities in Accessibility Policy for Autonomous Vehicles*: Mineta Transportation Institute, San Jose State University; August 2021; <https://transweb.sjsu.edu/sites/default/files/2106-Riggs-Pande-Accessibility-Policy-Autonomous-Vehicles.pdf>
 - Evaluates numerous sources and develops a rigorous background of how the Americans with Disabilities Act and relevant research could inform trends of automated vehicles—particularly autonomous transit and paratransit. Develops a rating framework to evaluate how and to what extent vendors and technological frameworks (itemized as Case Studies) address accessibility requirements. Provides insights beyond an assessment of a specific project or technology and allows for a detailed exploration of the gaps and opportunities for these advancing technologies. Recommends specific policy and wording changes in relevant ADA regulations to accommodate and properly regulate automated transit services.
 - *Performance Measurement & Management Using Connected & Automated Vehicle Data*: Southeastern Transportation Research, Innovation, Development and Education Center (STRIDE); July 2021; <https://stride.ce.ufl.edu/wp-content/uploads/2021/07/STRIDE-Final-Report-Project-C-Hadi.pdf>
 - Includes a framework, methods, and algorithms for using CV data to estimate measures to support agency processes. Investigated the use of CV data to estimate metrics that can be currently estimated using existing data sources including those related to mobility, reliability, and environmental impacts. Investigated the estimation and utilization of additional mobility and safety metrics that cannot be estimated based on existing sources of data. The developed framework and methods to estimate performance measures can be used by a system operator, a planner, or an automated system to support decisions associated with the agency business processes. The methods can be also used in the real-time operations of traffic management centers (TMCs) to determine the traffic states. In addition, machine learning models were developed for use by the TMCs for short-term prediction of traffic conditions to support proactive activation of operational plans to mitigate potential deterioration in mobility and safety performance.
 - *Autonomous Vehicles Are Coming: Five Policy Actions Cities Can Take Now to Be Ready*: Taubman Center for State and Local Government at the Harvard Kennedy School; March 2021; https://www.hks.harvard.edu/sites/default/files/Taubman/Research/Autonomous%20Vehicles%20Are%20Coming_Five%20Policy%20Actions%20Cities%20Can%20Take%20Now%20to%20Be%20Ready.pdf

- Provides recommendations to help state and local government policymakers get ready for self-driving cars, shuttles, and delivery vehicles. Details five policy actions cities can take now to be ready for AVs in the coming years: 1: Foster Mobility as a Service (MaaS); 2: Rethink Curb Design and Street Space Allocation; 3: Manage and Reduce Congestion; 4: Establish Data-Sharing Guidelines and Agreements; 5: Reposition Revenues.
- *Older Adults, New Mobility, and Automated Vehicles*: AARP, February 2021: <https://www.aarp.org/content/dam/aarp/ppi/2021/02/older-adults-new-mobility-and-automated-vehicles.pdf>
 - Offers a framework that can serve as a tool for public- and private-sector actors in ensuring the equitable development of these new forms of transportation focusing on consumers and the local mobility ecosystem. Identifies factors that will affect how older adults engage with and experience AVs, and new mobility more generally, with a focus on the needs of the harder-to-serve older adult and the benefits of the “universal design” approach. Can be used as a checklist for city and state government officials planning new mobility pilots for older adults, or as an evaluation tool post-pilot. Private sector partners, such as vehicle producers or new mobility service companies, might use the framework to expand their research agenda, and explore adjustments to their products, services, communications and partnerships.
- *Policy Roadmap to Advance Automated Vehicle Innovation - A Plan to Revolutionize Transportation*: Alliance for Automotive Innovation, October 2020: <https://drive.google.com/file/d/1oa3YxkV9qzq377vOoHzX9ETLD7SGArf5/view>
 - Provides 14 specific recommendations for policymakers that fall within the following pillars: (1) Reform Regulations to Allow for AV Deployment at Scale; (2) Harmonize Federal, State, and International Policies; and (3) Lay the Foundation to Achieve Longer-Term Objectives.
- *Guidebook for Managing Data from Emerging Technologies for Transportation*: Transportation Research Board, National Cooperative Highway Research Program, October 2020: <https://www.nap.edu/download/25844>
 - Provides guidance, tools, and a big data management framework, and it lays out a roadmap for transportation agencies on how they can begin to shift – technically, institutionally, and culturally – toward effectively managing data from emerging technologies. Supplemental materials include an [Executive Summary](#), a PowerPoint [presentation on the Guidebook](#), and [NCHRP Web-Only Document 282: Framework for Managing Data from Emerging Transportation Technologies to Support Decision-Making](#).
- *Implications of Pavement Markings for Machine Vision*: AustRoads, September 2020: <https://austroads.com.au/publications/connected-and-automated-vehicles/ap-r633-20>
 - Examines how longitudinal pavement markings affect automated steering functions and whether changes to design and maintenance practices could improve the support that lane markings provide for current advanced drivers assistance systems and future automated vehicles. Documents the results of a literature review, stakeholder consultation, on-road and off-road evaluations and data analysis. Includes preliminary costings of key recommendations to allow agencies to understand the benefits and impacts of modifying line and lane marking practices.

- *Synthesis of State-Level Planning and Strategic Actions on Automated Vehicles: Lessons and Policy Guidance for California*: Institute of Transportation Studies, Berkeley; September 2020: <https://escholarship.org/uc/item/6mf030xb>
 - Provides a summary and comparative analysis of actions states across the United States are taking in response to automated vehicles (AVs). The research focuses on state-level stakeholder forums (e.g., task forces, committees) and state-level strategic actions (e.g., studies, initiatives, programs) initiated by a state legislature, a governor, or a state agency.
- *Business Models to Facilitate Deployment of Connected Vehicle Infrastructure to Support Automated Vehicle Operations*: TRB National Cooperative Highway Research Program's NCHRP Web-Only Document 289; September 2020: <https://www.nap.edu/download/25946>
 - Presents methods to identify the most plausible connected vehicle infrastructure investments, shows how to build effective business case arguments, and details specific business model options during project procurement and delivery.
- *Ten Best Practices for State Automated Vehicle Policy*: The Reason Foundation, September 2020: <https://reason.org/wp-content/uploads/10-best-practices-state-automated-vehicle-policy.pdf>
 - Provides definitions of key automated vehicle terms and concepts, continues with a survey of existing state automated vehicle policies, and follows with the ten policy recommendations for state policymakers to promote automated vehicle innovation.
- *Safe Testing and Deployment of Vehicles Equipped with Automated Driving Systems Guidelines*: American Association of Motor Vehicle Administrators; September 2020; https://aamva.org/getmedia/66190412-ce9d-4a3d-8b6e-28c1b80e3c10/Safe-Testing-and-Deployment-of-Vehicles-Equipped-with-ADS-Guidelines_Final.pdf.
 - Provides voluntary recommended guidelines for motor vehicle administrations, law enforcement, manufacturers, and other entities for the safe testing and deployment of ADS equipped vehicles and provides information and recommendations related to technology in vehicles today known as Advanced Driver Assistance System (ADAS).
- *Autonomous Vehicles – The Road to Economic Growth?*: Clifford Winston and Quentin Karpilow, Brookings Institution, June 2020; <https://www.brookings.edu/book/autonomous-vehicles/>
 - Presents the case for better public policies that can make the road smoother for self-driving vehicles and the society that soon will depend on them. Argues that policy analysts can play an important and constructive role in identifying and analyzing important policy issues and necessary steps to ease the advent of autonomous vehicles.
- *Guidebook for Managing Data from Emerging Technologies for Transportation*: Transportation Research Board TRB National Cooperative Highway Research Program's NCHRP Research Report 952, June 2020; <http://www.trb.org/main/blurbs/180826.aspx>
 - Provides guidance, tools, and a big data management framework, and lays out a roadmap for transportation agencies on how they can begin to shift – technically, institutionally, and culturally – toward effectively managing data from emerging technologies. These technologies include connectivity between vehicles, sensors, systems, shared-use transportation, and mobile devices.
- *Connected Vehicle System Design for Signalized Arterials*: National Institute for Transportation and Communities (NITC): Xianfeng Terry Yang, Mingyue Ji, and Qinzheng

Wang, University of Utah, April 2020: https://ppms.trec.pdx.edu/media/project_files/NITC-RR-1235_Connected_Vehicle_System_Design_for_Signalized_Arterials.pdf

- Aims to establish a real-time and adaptive system for supporting the operations of CV-based traffic signal control functions. The proposed system will best utilize the capacity of the communication channels with optimization functions. Addresses the urgent needs in CV system designs and offers control foundations to support the operations of urban signalized arterials in a CV environment.
- *Enhancing Active Transportation and Demand Management (ATDM) with Advanced and Emerging Technologies and Data Sources*; U.S. Federal Highway Administration, March 2020; <https://ops.fhwa.dot.gov/publications/fhwahop19010/index.htm>
 - Provides information for enhancing ATDM applications using emerging technologies (including connected and automated vehicles) and data sources. Introduces emerging technologies and data sources and how they can be used to enhance ATDM applications. Provides organizational information and operations and maintenance information for future deployments. Design and deployment elements and methods are discussed. Included are challenges that are encountered as well as case studies.
- *Infrastructure Owner Operators Guiding Principles for Connected Infrastructure Supporting Cooperative Automated Transportation*: AASHTO/ITE/ITSA Joint Task Force, February 2020: https://systemoperations.transportation.org/wp-content/uploads/sites/22/2020/02/GuidingPrinciples_Feb2020-1.pdf
 - Guidelines designed to support the deployment of Cooperative Automated Transportation or CAT systems. Guidelines envision all of the industry stakeholders and elements of the U.S. transportation system working through interdependent vehicle, infrastructure, and systems automation enabled by connectivity and information exchange.
- *Foreseeing the Impact of Transformational Technologies on Land Use and Transportation*; Transportation Research Board, National Cooperative Highway Research Program's NCHRP Research Report 924, February 2020; <http://www.trb.org/main/blurbs/179645.aspx>
 - Reviews the characteristics of new transportation-related technologies and their applications in the transportation sector and explores a wide variety of potential impacts on areas such as travel and land use and planning projects. Examples of transformational technologies include wireless telecommunications, shared vehicles, connected vehicles, fully autonomous vehicles, alternative-fuel vehicles, smart cities and communities, big data analytics, internet-of-things, as well as UAVs or drones, 3-D printing, and more. Concludes that public agencies face significant challenges continuing to perform their governmental functions in the face of the private sector's prodigious output of these new technologies. Agencies need to rethink how they develop their policies and plans—and they need to obtain new expertise.
- *Prioritizing Public Value in the Changing Mobility Landscape*: Harvard University Ash Center for Democratic Governance and Innovation, January 2020: https://ash.harvard.edu/files/ash/files/ash_mobility_goldsmith_gardner_final_.pdf
 - Looks at the values and goals cities affect with policies concerning connected mobility, and how to create a new framework that aligns with these objectives. First, the authors identify the transformative changes affecting cities and mobility. Second, they discuss in more detail the guiding values and goals that cities have around mobility with examples of these values in practice. Makes the case that cities must

- use specific public values lenses when planning and evaluating all the different facets of mobility. Transportation has entered a new phase, and the authors believe that cities should move forward with values- and community-driven policies that frame changing mobility as an opportunity to amend and improve previous transportation policies.
- *Considerations for Evaluating Automated Transit Bus Programs*: U.S. Federal Transit Administration, prepared by the John A. Volpe National Transportation Systems Center, December 2019: <https://www.transit.dot.gov/sites/fta.dot.gov/files/docs/research-innovation/146801/considerations-evaluating-automated-transit-bus-programs-fta-report-no0149.pdf>
 - Assists transit stakeholders with designing and implementing evaluations of automated transit-bus programs. In designing evaluations, transit agencies and other stakeholders should identify program goals and audiences affected by the technology; develop a logic model that maps project inputs, activities, and outcomes; choose an appropriate evaluation design; and collect and analyze data on key performance indicators related to their program goals.
 - *Transformational Technologies in Transportation: Impacts on Traditional Research Processes and Programs*: TRB Transportation Research E-Circular 253, Mark Norman (rapporteur), October 2019: <http://onlinepubs.trb.org/onlinepubs/circulars/ec253.pdf>
 - Addresses the basic question - In an era of rapidly evolving transformational technologies, can our research projects and processes provide needed answers in a timely manner while still protecting the credibility of the research, and if so, how? Includes a list of questions that can help researchers to determine a targeted time frame appropriate for the specific research in question. Lists options that exist to enable research projects and processes to provide needed answers in a timely manner while still protecting the credibility of the research.
 - *Smart Cities, Dumb Infrastructure - Policy-Induced Competition in Vehicle-to-Infrastructure Systems*: Korok Ray and Brent Skorup, George Mason University Mercatus Center, October 2019: <https://www.mercatus.org/system/files/ray-smart-cities-mercatus-working-paper-v1.pdf>
 - Describes and anticipates the tradeoffs that lawmakers, regulators, and state authorities will face as they budget for and fund V2I roadside networks. The authors find that public-private partnerships likely will have greater prominence in the construction of roadside V2I networks. Finally, the authors apply the “policy-induced competition model” to inform when public intervention into V2I funding and design is effective. They propose regulator adoption of an open access model for long-lasting roadside assets. According to the authors, this “dumb infrastructure” model promotes competition and innovation in V2I while minimizing use of regulator resources and public funding of networks.
 - *Foreseeing the Impact of Transformational Technologies on Land Use and Transportation*: Transportation Research Board, NCHRP Report 924 Pre-publication, September 2019; <http://www.trb.org/main/blurbs/179645.aspx>
 - Provides guidance on how state and local agencies can address transformational technologies in their policymaking and planning tools, products, and processes. Reviews the characteristics of new transportation-related technologies and their applications in the transportation sector, finding a wide variety of potential impacts

- on areas such as travel and land use and planning projects. These new technologies include wireless telecommunications, shared vehicles, connected vehicles, fully autonomous vehicles, alternative-fuel vehicles, smart cities and communities, big data analytics, internet-of-things, as well as UAVs or drones, 3-D printing, and more.
- *Blueprint for Autonomous Urbanism – Second Edition*; National Association of City Transportation Officials, September 2019: <https://nacto.org/publication/bau2/>
 - Focuses on policies that prioritize efficiency and equity in the advent of an autonomous future. Increasingly, policy makers are realizing that the autonomous future must be guided by thoughtful, bold, transformative public policy and street design practice that reduces driving and vehicle miles traveled (VMT) and offers mobility and opportunity to everyone, not just those in cars.
 - *How Locals Need To Prepare for the Future of V2V/V2I Connected Vehicles*: University of Minnesota Center for Transportation Studies, August 2019: <http://www.cts.umn.edu/Research/ProjectDetail.html?id=2018025>
 - Addresses this complex subject for the various owners, agencies and stakeholders involved in traffic operations. Discusses the connected vehicle ecosystem and its background, potential CAV applications, types of communication and hardware required for CAV systems, and recommendations to local road owners. The report also includes a survey sent to local road owners to assess the current readiness of the transportation system for CAVs. Although it is too early to give specific recommendations, general guidance is provided for road owners to begin preparing for the future of CAVs.
 - *Importance and Role of Connectivity: Report of a Workshop*; Transportation Research Board, Forum on Preparing for Automated Vehicles and Shared Mobility, June 2019; <http://www.trb.org/main/blurbs/179187.aspx>
 - Summarizes the February 2019 mini-workshop on the importance and role of connectivity within the automated vehicles and shared mobility environment. Key takeaways from the workshop suggest that more needs to be done to create consumer awareness of the differences between and the benefits of both connected and automated vehicles, two critically important reasons for connectivity include redundancy and the ability to see what sensors cannot, and connectivity may require a different legislative and regulatory framework than exists today. Other takeaways included that consistency and interoperability are critical to the successful deployment of connectivity, there is fear regarding liability of a failure in connectivity, exploring uses cases for connectivity is important, and the number of devices on the road should not be the sole measure of readiness.
 - *Driverless Cars and Accessibility: Designing the Future of Transportation for People with Disabilities*; ITS America, April 2019; https://static1.squarespace.com/static/596fb16003596e0fa70a232f/t/5c9bab319b747a61663ac9bc/1553705778370/ITSAmerica_Driverless+Cars+Accessibility+Mobility_April2019.pdf
 - Summarizes current challenges that people with disabilities face and speculates as to which requirements might be necessary for a “fully automated” and “fully accessible” vehicle to indeed be accessible. The report draws from the November 10, 2016 and January 11, 2017 charrettes on “The Future of Autonomous Vehicles and the Disability Community” and “Fully Accessible and Automated Vehicles,” hosted at

- ITS America and the Transportation Research Board respectively in Washington, D.C.
- *Smart Transport for Cities & Nations: The Rise of Self-Driving & Connected Vehicles*; University of Texas at Austin, February 2019: <http://www.trb.org/main/blurbs/178830.aspx>
 - The University of Texas at Austin has released a report that discusses impacts that connected and automated vehicles (CAVs) may have on the transportation community. This report includes legal and policy issues, current public opinions of CAVs, models for estimating safety and traffic operations benefits, discussions of current technology options, and case studies evaluating ridesharing and other technology scenarios. It also led to the creation of a website (<http://smarttransport.solutions>) summarizing CAVs' potential impacts.
 - *Dedicating Lanes for Priority or Exclusive Use by Connected and Automated Vehicles*: TRB National Cooperative Highway Research Program (NCHRP) Research Report 891, January 2019: <http://www.trb.org/Main/Blurbs/178633.aspx>
 - Identifies and evaluates opportunities, constraints, and guiding principles for implementing dedicated lanes for connected and automated vehicles. This report describes conditions amenable to dedicating lanes for users of these vehicles and develops the necessary guidance to deploy them in a safe and efficient manner. This analysis helps identify potential impacts associated with various conditions affecting lane dedication, market penetration, evolving technology, and changing demand.
 - *Updating Regional Transportation Planning and Modeling Tools to Address Impacts of Connected and Automated Vehicles*: National Cooperative Highway Research Program Report 896, November 2018, Volume 1 Executive Summary: <http://www.trb.org/main/blurbs/178392.aspx>; Volume 2 Guidance: <http://www.trb.org/main/blurbs/178393.aspx>
 - Provides guidelines to help agencies update their modeling and forecasting tools to address expected impacts of connected and automated vehicles (CAVs) on transportation supply, road capacity, and travel demand components. Under requirements for long-range transportation planning, state departments of transportation and regional metropolitan planning organizations are required to have a multimodal transportation plan with a minimum time horizon of 20 years. Because manufacturers and shared fleet operators suggest that CAVs will be present on the highway system in significant numbers well before 2038, the planning community will require procedures and methods to address the potential positive and negative direct and indirect outcomes from their deployment.
 - *Implications of Automation for Motor Vehicle Codes*: Transportation Research Board, National Cooperative Highway Research Program 20-102 (07), October 2018: <http://www.trb.org/Main/Blurbs/178298.aspx>
 - Provides state departments of transportation (DOTs) and motor vehicle departments with guidance and resources to assist with the legal changes that will result from the roll out of connected and automated vehicles. Coordinated with work being done by the American Association of Motor Vehicle Administrators (AAMVA). The six volumes include: 1) Legal Landscape, 2) State Legal and Regulatory Audit, 3) Legal Modification Prioritization and Harmonization Analysis, 4) Autonomous Vehicle Action Plan, 5) Developing the Autonomous Vehicle Action Plan, and 6) Implementation Plan.

- *Autonomous Vehicle Pilots Across America*: National League of Cities, October 2018: <https://www.nlc.org/resource/autonomous-vehicle-pilots-across-america>
 - Provides a municipal action guide that is meant to give cities the ability to better understand and approach the impending rollout of autonomous vehicles in their cities. Lays out the current typologies of how cities and other levels of government are working together with the private sector to begin to integrate self-driving cars onto the roadways. Provides the reader with: analysis of the current legal/ regulatory structure, the state of AV pilot programs, city approaches to AV pilots, best practices from cities throughout the country, action steps on city leadership to move forward.
- *Advice on Automated and Zero Emissions Vehicles Infrastructure*: Infrastructure Victoria, October 2018: <http://infrastructurevictoria.com.au/sites/default/files/files/AVZEV/Advice%20on%20automated%20and%20zero%20emissions%20vehicles%20-%20October%202018.PDF>
 - Provides advice on what infrastructure is required to pave the way for highly automated and zero emissions vehicles in Victoria, Australia. Includes 17 recommendations in total, tested against the context of seven possible scenarios for the future and key triggers for action.
- *Governors Staying Ahead of the Transportation Innovation Curve – A Policy Roadmap for States*: National Governors Association, July 2018: <https://www.nga.org/wp-content/uploads/2018/07/Transportation-Innovation-Roadmap-Final-Hi-Res-for-Posting-Online.pdf>
 - Reviews challenges that states face as they seek to address concerns and reap the benefits of new transportation technology. Presents seven strategies for governors to help prepare their states to embrace transportation innovation.
- *Guidelines for the Regulation and Management of Shared Active Transportation*: National Association of City Transportation Officials (NACTO), July 2018: <https://nacto.org/home/shared-active-transportation-guidelines/>
 - Provides standards for cities to manage companies (including dockless bike share and scooter share) that are not otherwise overseen or selected through competitive procurement processes or contracts, and sets minimum standards that all cities should require for managing this new industry on city streets.
- *Jurisdictional Guidelines for the Safe Testing and Deployment of Highly Automated Vehicles*: American Association of Motor Vehicle Administrators (AAMVA), May 2018: <https://www.aamva.org/GuidelinesTestingDeploymentHAVs-May2018/>
 - Assists motor vehicle and law enforcement agencies seeking to address the testing or use of Level 3, 4, and 5 automated vehicles in their jurisdiction.” It provides voluntary guidance and recommendations to assist agencies as they wrestle with this topic, in hopes of “creating a consistent regulatory approach across jurisdictions.”
- *Paving the Way for Autonomous and Connected Vehicle Technologies in the Motor Carrier Industry*: Institute for Transportation at Iowa State University, May 2018: <http://www.trb.org/main/blurbs/177727.aspx>
 - Illustrates potential safety considerations and infrastructure needs to support the mass adoption of autonomous and connected vehicles in the motor carrier industry. This report focuses on infrastructure requirements as a primary policy concern.
- *Understanding How Cities Can Link Smart Mobility Priorities Through Data*: University of California at Berkeley, April 2018: <http://www.trb.org/main/blurbs/177562.aspx>

- Presents an evaluation framework for assessing technological impacts within transportation-related city projects. This report focuses on how data can improve safety, equity, environment, energy, and congestion.
- *Autonomous Vehicles/Self-Driving Vehicles Enacted Legislation*: National Conference of State Legislatures: <http://www.ncsl.org/research/transportation/autonomous-vehicles-self-driving-vehicles-enacted-legislation.aspx>
 - Website tracks status of federal and state legislation and regulations on automated vehicles. Includes autonomous vehicles legislative database, providing up-to-date, real-time information about state autonomous vehicle legislation that has been introduced in the 50 states and the District of Columbia.
- *Preparing Communities for Autonomous Vehicles*: American Planning Association, March 2018: <https://planning-org-uploaded-media.s3.amazonaws.com/document/Autonomous-Vehicles-Symposium-Report.pdf>
 - Summarizes the findings of a symposium and research on the implications of autonomous vehicles for cities and regions. It is intended for planners and local government officials involved in land-use planning, urban design, and transportation. Readers will learn about the need to plan for the potential benefits and negative impacts of autonomous vehicles and what steps they can take now to prepare their communities.
- *Autonomous Vehicle Policy Framework Summit*: Transpogroup, February 2018: http://www.transpogroup.com/assets/autonomousvehiclepolicyframeworksummit_finalproductreport.pdf
 - Addresses a wide range of issues including, but not limited to, greater access, equity, reducing transportation-related greenhouse gases, vehicle safety, public health, land use planning issues, community livability, parking and managing the streets. The identified policies should be viewed as concepts for further discussion.
- *Advancing Automated and Connected Vehicles: Policy and Planning Strategies for State and Local Transportation Agencies*: TRB/NCHRP Report 845, 2017: <http://nap.edu/24872>
 - Assesses policy and planning strategies at the state, regional, and local levels that could influence private-sector automated vehicle (AV) and connected vehicle (CV) choices to positively affect societal goals. The report aims to assist agencies with exploring actions that might increase the likelihood that AV and CV technologies will have beneficial impacts on traffic crashes, congestion, pollution, land development, and mobility.
- *Strategies to Advance Automated and Connected Vehicles*: TRB/NCHRP Briefing Document, 2017: <http://nap.edu/24873>
 - Concisely conveys the key findings of NCHRP Research Report 845: *Advancing Automated and Connected Vehicles: Policy and Planning Strategies for State and Local Transportation Agencies*.
- *State CEO Leadership Forum on Connected & Autonomous Vehicles and Transportation Infrastructure Readiness*, TRB/NCHRP, CAVita, December 2017: [http://onlinepubs.trb.org/onlinepubs/nchrp/docs/NCHRP20-24\(111\)_FR.pdf](http://onlinepubs.trb.org/onlinepubs/nchrp/docs/NCHRP20-24(111)_FR.pdf)
 - Summary of discussion and background information for state CEO panel held in conjunction with 2017 ITS World Congress in Montreal. Includes CAV state-of-the-art, DSRC and 5G, progressing independent of federal action, cybersecurity,

workforce, coordination and collaboration, messaging, and CAV preparation by state DOTs.

- *The Future of Equity in Cities*; National League of Cities, November 2017: <http://www.nlc.org/resource/the-future-of-equity-in-cities>
 - It is clear that our nation's cities cannot only be defined by the growth of the tech and the creative sectors. Instead, cities must act deliberately for growth of any kind to be truly sustainable. As the tide of innovation in cities rises, local leaders must work assiduously to lift all boats by planning for inclusive economic development. Includes chapter on infrastructure - autonomous vehicles, road pricing and more.
- *Ten Rules for Cities About Automated Vehicles*; Congress for New Urbanism, October 2017: <https://www.cnu.org/publicsquare/2017/10/16/ten-rules-cities-about-automated-vehicles>
 - Traditional urbanism evolved over millennia to meet human needs. The adoption of AVs should not be allowed to replace time-tested places with something that would probably make our lives worse.
- *New Mobility – Autonomous Vehicles and the Region*; Regional Plan Association, October 2017: <http://library.rpa.org/pdf/RPA-New-Mobility-Autonomous-Vehicles-and-the-Region.pdf>
 - Highlights key recommendations from RPA's Fourth Regional Plan for the New York-New Jersey-Connecticut metropolitan area. Included are policy recommendations regarding autonomous vehicles, goods movement and autonomy, the shared economy and social equity, and impacts on the built environment.
- *Future Cities: Navigating the New Era of Mobility*; Michigan Economic Development Corporation, PlanetM, Center for Automotive Research, October , 2017: <http://www.cargroup.org/publication/future-cities-navigating-new-era-mobility/>
 - Assesses the potential impacts of CAVs and innovative mobility services on local communities in the state of Michigan. These technologies and services promise many benefits for local Michigan communities, but in many cases, new infrastructure or policies are required to maximize their societal benefits and overall effectiveness. This policy development and infrastructure deployment will often require an innovative and collaborative approach between local units of government, state agencies, in partnership with private organizations.
- *Autonomous Vehicles: A Policy Preparation Guide*; National League of Cities, April, 2017: <http://www.nlc.org/AVPolicy>
 - An overview of AV technology and answers frequently asked questions for city leaders around AV manufacturers, public policy considerations, municipal coordination, and infrastructure investment.
- *Iowa Automated Vehicle Technologies Project*: Iowa DOT, Iowa State University, University of Iowa, HERE, April 2017: https://www.iowadot.gov/pdf_files/IowaVisionDocument.pdf
 - The State of Iowa is taking a proactive approach to preparing for increasing levels of vehicle automation. This document sets out a comprehensive vision for the Iowa Department of Transportation's (DOT) role in the future transportation environment, and a plan for accelerating progress towards that future.
- *Travel Modeling in an Era of Connected and Automated Transportation Systems: An Investigation in the Dallas-Fort Worth Area*: Center for Transportation Research – The University of Texas at Austin, February 2017: <http://ctr.utexas.edu/wp-content/uploads/122.pdf>

- Examines the state of technology for both autonomous vehicles (AVs) and connected vehicles (CVs). Discusses adoption predictions. Propose multiple potential planning scenarios to reflect the wide range of potential connected and autonomous vehicles impacts.

FEDERAL AGENCY NOTICES, GUIDANCE, AND INFORMATION

- *Advancing Interoperable Connectivity Deployment: Connected Vehicle Pilot Deployment Results and Findings*: Federal Highway Administration Joint Program Office; May 2023; https://rosap.ntl.bts.gov/view/dot/68128?utm_source=TRB+Weekly&utm_campaign=ac58d7df21-EMAIL_CAMPAIGN_2023_08_14_08_39&utm_medium=email&utm_term=0_c66acb9bce-ac58d7df21-%5BLIST_EMAIL_ID%5D
 - Assesses the impacts of the deployment of connected vehicle technologies at three sites as part of the Connected Vehicle (CV) Pilot Deployment Program. Safety, mobility, environmental, and public agency efficiency impacts of CV applications were assessed by both the sites themselves and independent evaluators. Serves as an entry point for readers seeking to understand the objectives, successes, and insights gained from the CV Pilot Deployment Program.
 - *Federal Policy Framework for Our AV Future*: Autonomous Vehicle Industry Association, March 2023; <https://theavindustry.org/resources/AVIA-Federal-Policy-Framework-for-Our-AV-Future.pdf>
 - Proposes a series of policy recommendations focused on deployment and commercialization of autonomous vehicles
- Connected Vehicle Pilot Deployment Program Independent Evaluation: National-Level Synthesis Report*; Texas A&M Transportation Institute; September 2022; The report is available at https://rosap.ntl.bts.gov/view/dot/64245?utm_source=TRB+Weekly&utm_campaign=b69dfae442-EMAIL_CAMPAIGN_2022_10_17_07_19&utm_medium=email&utm_term=0_1a66ea3bb0-b69dfae442-510959085
- Provides a national-level synthesis of the Connected Vehicle Pilot Deployment sites. Summarizes the challenges, findings, critical lessons learned, and impacts from the three connected vehicle (CV) deployments and discusses the implications of these impacts on future CV deployment across the nation.
- *Evaluation and Synthesis of Connected Vehicle Communications Technologies NCHRP Web-Only Document 310*: Transportation Research Board, National Cooperative Highway Research Program; June 2021; <https://www.trb.org/Publications/Blurbs/182571.aspx>
 - Presents a compilation of material on the intelligent transportation system (ITS) band, also known as the “5.9 GHz band.” Focuses on the actions taken by the Federal Communications Commission (FCC) from 2019 through early 2021 to reallocate portions of this band away from dedicated use for traffic flow, traffic safety, and other ITS applications. Provides contemporaneous documentation of stakeholder concerns about and perspectives on a landmark change in the regulation of critical infrastructure for ITS and CAVs.
 - *Automated Vehicles Comprehensive Plan*; U.S. Department of Transportation, January 2021, https://www.transportation.gov/sites/dot.gov/files/2021-01/USDOT_AVCP.pdf

- Advances the DOT's work to prioritize safety while preparing for the future of transportation. Building upon the principles stated in Ensuring American Leadership in Automated Vehicle Technologies: Automated Vehicles 4.0 (AV 4.0), the plan defines three goals to achieve this vision for Automated Driving Systems (ADS): 1. Promote Collaboration; 2. Modernize the Regulatory, and 3. Prepare the Transportation System.
- *Smart Mobility Capstone Reports*; U.S. Department of Energy, Energy Efficiency & Renewable Energy (EERE) Vehicle Technologies Office Smart Mobility Lab Consortium, August 2020: <https://www.energy.gov/eere/articles/understanding-next-revolution-transportation-doe-publishes-results-3-year-smart>
 - A series of six Capstone reports describing the results of three years of research through DOE's SMART Mobility National Lab Consortium. Based on the principle that transportation is a "system of systems," the six reports are: Connected and Automated Vehicles, Mobility Decision Science, Multi-Modal Freight, Urban Science, Advance Fueling Infrastructure, and Smart Mobility Modeling Workflow.
- *Intelligent Transportation Systems Deployment: Findings from the 2019 Connected Vehicle and Automated Vehicle Survey*; U.S. DOT Federal Highway Administration, June 2020: https://www.itskrs.its.dot.gov/sites/default/files/doc/2019_connected_vehicle_automated_vehicle_survey.pdf
 - Presents summary findings from the 2019 ITS JPO Connected Vehicle (CV) and Automated Vehicle (AV) Survey. The survey was administered online to freeway, arterial and transit agencies from 78 large metropolitan areas and 30 medium size cities. The survey addressed a range of topics, including deployment levels for CV and AV, the types of CV applications and AV tests being deployed/tested, communication technologies being used to support CV, CV and AV readiness, challenges faced in deploying CV and AV, and resources needed to support CV and AV deployment, among other topics.
- *Issues in Autonomous Vehicle Testing and Deployment*; Congressional Research Service (CRS), February 2020: <https://crsreports.congress.gov/product/pdf/R/R45985>
 - Summarizes the following issues regarding the testing and deployment of AVs: advances in vehicle technology, cybersecurity and data privacy, pathways to automated vehicle deployment abroad, issues in federal safety regulation, Obama administration policy direction, Trump administration policy guidelines and proposed safety rules, National Transportation Safety Board investigation and recommendations, connected vehicles and spectrum allocation, Congressional action, State concerns, and implications for highway infrastructure
- *Ensuring American Leadership in Automated Vehicle Technologies: Automated Vehicles 4.0*; U.S. Department of Transportation, January 2020, <https://www.transportation.gov/sites/dot.gov/files/docs/policy-initiatives/automated-vehicles/360956/ensuringamericanleadershipav4.pdf>
 - Establishes U.S. Government principles that consist of three core interests, each of which is comprised of several sub-areas. Unifies efforts in automated vehicles across 38 Federal departments, independent agencies, commissions, and Executive Offices of The President, providing high-level guidance to federal agencies, innovators, and all stakeholders on the U.S.

- *Automated Vehicles and Adverse Weather*; U.S. Department of Transportation, June 2019: <https://rosap.ntl.bts.gov/view/dot/43772>
 - Explores how adverse weather and road weather conditions affects automated vehicles through three primary tasks: 1) a literature review, 2) two experiments to observe the performance of AVs and their sensor systems under controlled conditions, and 3) three listening sessions with stakeholders. Following background information presented in Chapter 1, a summary of the research and findings of each primary task is presented in Chapter 2, Chapter 3, and Chapter 4, respectively. The document finishes with conclusions in Chapter 5 and identifies outstanding research needs in Chapter 6.
- *Preparing for the Future of Transportation: Automated Vehicles 3.0*; U.S. Department of Transportation, October 2018: <https://www.transportation.gov/briefing-room/automated-vehicles>
 - Latest federal guidance for automated vehicles, supporting the safe integration of automation into the broad multimodal surface transportation system. Builds upon-but does not replace-voluntary guidance provided in 'Automated Driving Systems 2.0: A Vision for Safety.
- *Infrastructure Initiatives to Apply Connected- and Automated-Vehicle Technology to Roadway Departures*; Federal Highway Administration, September 2018: <http://www.trb.org/main/blurbs/178156.aspx>.
 - Investigates how emerging connected-vehicle (CV) and automated-vehicle (AV) technologies can address roadway-departure (RwD) crashes. The objective of this report is to develop a framework for the FHWA regarding how the infrastructure components may need to change to accommodate CV and AV technologies to help reduce the frequency and severity of RwD crashes.
- *Automated Driving Systems Request for Information*; Federal Highway Administration, January 2018: <https://www.transportation.gov/sites/dot.gov/files/docs/policy-initiatives/automated-vehicles/303131/fhwa-2017-0049.pdf>
 - The FHWA seeks information directly from the public and stakeholders to better understand FHWA's role in automation and inform future agency research and activities. In addition, FWHA seeks comments more broadly on planning, development, maintenance, and operations of the roadway infrastructure necessary for supporting ADS, including any information detailing the costs associated with implementation. Comments are requested in response to ten questions.
- *Automated Transit Buses Research Program*; Federal Transit Administration, January, 2018: <https://www.transportation.gov/av/FTA-RFC-automated-buses>
 - Requests transit industry comment regarding the current and near-future status of automated transit buses and related technologies. Comments received will assist FTA in developing future Notices of Funding Opportunity's (NOFO) for transit bus automation demonstrations with respect to the industry's ability and interest.
- *Strategic Transit Automation Research Plan Roadmap*; Federal Transit Administration, December 2017: <https://www.transit.dot.gov/sites/fta.dot.gov/files/strategic-transit-automation-research-roadmap.PDF>
 - The Strategic Transit Automation Research (STAR) Plan builds on extensive stakeholder consultation and use case analysis to define a five-year research agenda which will move the transit industry forward. "Bus" is defined broadly to consider a

- range of sizes and passenger capacities, and could include both traditional and novel vehicle designs (e.g. full-size city buses, articulated buses, and small shuttles).
- *Automated Vehicles – Comprehensive Plan Could Help DOT Address Challenges*; U.S. Government Accountability Office, November 2017: <https://www.gao.gov/products/GAO-18-132>
 - GAO concluded that policymakers will need to decide if the current approach to vehicle testing and standards is sufficient to ensure adequate vehicle safety, according to many stakeholders GAO interviewed. Further, policymakers may want to address how automated vehicles interact with other road. Likewise, automated vehicles may require infrastructure changes, and policymakers will need to decide what changes to pursue, while also providing for conventional vehicles since many stakeholders expect conventional vehicles to remain on the roads for decades.
 - *Future Environment Net Assessment – Autonomous Vehicles*; U.S. Department of Homeland Security, June 2017: <http://www.trb.org/Main/Blurbs/176291.aspx>
 - Autonomous vehicles are an emerging risk that will affect critical infrastructure. This study identifies and examines risks and issues likely to develop as autonomous vehicles become more common throughout the United States, and is intended to help decision makers mitigate potential consequences before they become significant problems.
 - *The U.S. Department of Transportation’s Smart City Challenge and the Federal Transit Administration’s Mobility on Demand Sandbox*; TRB Transportation Research Circular E-C219, March 2017: <http://www.trb.org/Publications/Blurbs/175826.aspx>
 - Features presentations and dialogue from a January 8, 2017 workshop at the TRB Annual Meeting. The workshop explored the role of public transit, shared mobility, and advanced technology (including connected and automated vehicle technology, sensing, cameras, etc.) in the recent competitions, along with next steps and plans for researching the pilot projects and documenting best practices. Sessions featured the U.S. DOT Smart City Challenge winner: Columbus, Ohio, and highlighted pilot projects from the FTA Mobility on Demand (MOD) Sandbox, along with selected public-private partnerships and research initiatives on the future of mobility.

SAFETY & SECURITY

- *Measuring and Predicting Drivers’ Takeover Readiness and Supporting Takeover Transitions in Automated Driving*: AAA Foundation for Traffic Safety; September 2023; <https://aaafoundation.org/wp-content/uploads/2023/09/202309-AAAFTS-Predicting-Readiness-and-Supporting-Takeover-Transitions.pdf>.
 - Summarizes a series of studies and data exercises aimed at examining driver’s readiness at taking over control of the vehicle following periods of automated driving as well as support systems that can help guide driver’s attention during the takeover.
- *Examining the Safety Benefits of Partial Vehicle Automation Technologies in an Uncertain Future*: AAA Foundation for Traffic Safety; August 2023; <https://aaafoundation.org/wp-content/uploads/2023/07/AAAFTS-Safety-Benefits-of-ADAS.pdf>.
 - Presents a methodology to estimate safety benefits of Advanced Driver Assist Systems (ADAS) and describes potential reductions in motor vehicle crashes, injuries, and deaths that ADAS and partial vehicle automation technologies may

- prevent in the future. Examines many factors that will influence how large those benefits will be and how quickly they will materialize, as well as the continued need to invest in a comprehensive array of traffic safety measures.
- *Framework for Assessing Potential Safety Impacts of Automated Driving Systems*: Transportation Research Board, National Cooperative Highway Research Program and the Behavioral Transportation Safety Cooperative Research Program; November 2022; https://nap.nationalacademies.org/catalog/26791/framework-for-assessing-potential-safety-impacts-of-automated-driving-systems?utm_source=TRB+Weekly&utm_campaign=cbeebd4ef8-EMAIL_CAMPAIGN_2022_11_14_05_14&utm_medium=email&utm_term=0_1a66ea3bb0-cbeebd4ef8-510959085
 - Describes a framework to help state and local agencies assess the safety impact of automated driving systems (ADS) and is designed to guide them on how to adapt the framework for a variety of scenarios. Supplemental to the report are a [Video](#) describing the project’s assessment framework, a [Proof of Concept Results Document](#), an [Implementation Plan](#), and a [Future Research Needs Document](#).
 - *Automated Last Mile Connectivity for Vulnerable Road Users – Participant Survey Study*: Center for Advanced Transportation Mobility, August, 2022; <https://www.ncat.edu/cobe/transportation-institute/files/tcatm-lastmilefinalreportaada.pdf>.
 - Summarizes surveys conducted to gain a better understanding of how senior adults view low-speed automated vehicles (LSAV) and what preconceived attitudes and/or obstacles might prevent their use of this relatively new mobility technology.
 - *Autonomous Ground Vehicle Security Guide: Cybersecurity and Infrastructure Security Agency (CISA)*; September 2021; https://www.cisa.gov/sites/default/files/publications/CISA_AV_SecurityGuide_508.pdf
 - Provides transportation systems sector partners with a framework to better understand cyber-physical threats related to automated vehicles and recommended strategies to mitigate both enterprise- and asset-level security risks. Provides a framework for identifying AV risks based on the attack vectors, targets, consequences, and outcomes associated with a specific cyber-physical attack.
 - *Law Enforcement, First Responder and Crash Investigation Preparation for Automated Vehicle Technology*: Governors Highway Safety Association, August 2021: <https://www.ghsa.org/resources/Preparation-for-Automated-Vehicle-Technology21>
 - Addresses the current and projected state of automated vehicle technologies. Incorporates discussions with government administrators, first responders, law enforcement organizations, automakers, crash reconstruction experts and insurance and safety advocates to identify where training is most needed. Researchers used this information to design a curriculum development strategy for training law enforcement and other first responders and crash investigators tasked with responding to these motor vehicle crashes and incidents.
 - *Automated Vehicle Systems Outlook, 2021 Update*: Society of Actuaries, Richard R. Mudge and Alain Kornhauser; July 2021: <https://www.soa.org/globalassets/assets/files/resources/research-report/2021/automated-vehicle-systems-outlook.pdf>
 - The third in a series of such reports. Observes that, despite the advent of COVID-19, autonomous vehicle (AV) market leaders continued to invest in technology and to

establish partnerships with vehicle original equipment manufacturers (OEMs). Points out that, as automated driving systems take over the driving function, one can see a shift in the balance of liability to the product side, back to the manufacturer. Moreover, to gain customer acceptance, manufacturers may find they need to guarantee their performance by absorbing their liability implications, thus relieving the purchaser of personal liability.

- *Safe Enough: Approaches to Assessing Acceptable Safety for Automated Vehicles*: The Rand Corporation, November 2020; https://www.rand.org/pubs/research_reports/RRA569-1.html?utm_source=WhatCountsEmail&utm_medium=NPA:2593:6454:Oct%2029,%202020%206:09:18%20AM%20PDT&utm_campaign=NPA:2593:6454:Oct%2029,%202020%206:09:18%20AM%20PDT
 - Points out that establishing whether automated vehicles (AVs) are acceptably safe is not straightforward. Analyzes three categories of approach—measurements, processes, and thresholds—and notes the different kinds of evidence associated with each, the ways in which different approaches can be used together, and the degree to which stakeholder groups agree on the merits of these approaches. Complements discussion of measurement and analytical issues with a discussion of challenges in communicating about AV safety, especially to the general public.
- *Is the Transit Industry Prepared for the Cyber Revolution? Policy Recommendations to Enhance Surface Transit Cyber Preparedness*: Mineta Transportation Institute, September 2020; <https://transweb.sjsu.edu/sites/default/files/1939-Belcher-Transit-Industry-Cyber-Preparedness.pdf>
 - Assesses the readiness, resourcing, and structure of public transit agencies to identify, protect from, detect, respond to, and recover from cybersecurity vulnerabilities and threats. Reviews the state of best cybersecurity practices in public surface transit; outlines U.S. public surface transit operators' cybersecurity operations; assesses U.S. policy on cybersecurity in public surface transportation; and provides policy recommendations that address gaps or identify issues for Congress, the Executive Branch, and the public surface transit agencies.
- *Impact of Information on Consumer Understanding of a Partially Automated Driving System*: AAA Foundation for Traffic Safety, September 2020; <https://aaafoundation.org/wp-content/uploads/2020/09/ImpactOfInfoOnUnderstandingPartiallyAutomatedDrivingSystemFinalReport.pdf>
 - Explores how the information given to drivers about an active driving assistance system influences their initial beliefs about and expectations of the system, and by extension, how they interact with it.
- *Evaluation of Active Driving Assistance Systems*: AAA, August 2020; <file:///C:/Users/mnorman/Downloads/E.1.-Research-Report-Evaluating-ADA-FINAL-7-13-20.pdf>
 - Evaluates vehicles equipped with active driving systems (ADA) – considered to be SAE level 2 systems. Considers how vehicles equipped with ADA systems perform during scenarios reasonably encountered (via closed-course testing), and how vehicles equipped with ADA systems perform during naturalistic highway driving in highway driving situations (on public highways and interstates).

- *Sharing the Road with Autonomous Vehicles: Perceived Safety and Regulatory Principles*: G.S. Nair and C.R. Bhat, University of Texas at Austin, June 2020: <https://www.caee.utexas.edu/prof/bhat/TechAV.html>
 - Looks at public perceptions about safety and their support for regulation in terms of their willingness to drive alongside automated vehicles. Addresses the question of how people feel about sharing the road with AVs in their human-driven vehicles.
- *Safety First - Car Crashes, Innovation, and Why Federal Policy Should Prioritize Adoption of Existing Technologies to Save Lives*: Consumer Reports, June 2020; <https://advocacy.consumerreports.org/wp-content/uploads/2020/06/CR-Safety-First-White-Paper-June-2020.pdf>
 - Provides a guide for policymakers and the auto industry on how best to substantially and expeditiously reduce road crashes, deaths, and injuries. Analyzed the safety benefits of currently available crash avoidance systems and other existing motor vehicle safety technologies, including a review of the safety research that has been conducted on the topic. Predicted that existing motor vehicle safety technology would save 16,800-20,500 lives per year if equipped across the full U.S. light vehicle fleet.
- *Considerations for Deploying Automated Driving Systems Around Schools*: Pedestrian and Bicycle Information Center, May 2020; http://www.pedbikeinfo.org/cms/downloads/PBIC_WhitePaper_ADS%20Near%20Schools.pdf
 - Summarizes key issues and research needs related to deploying automated driving systems (ADS) near school zones, with an emphasis on pedestrian safety. The material was informed through interviews with school transportation experts at multiple venues with the goal of identifying themes at the intersection of ADS deployment and transportation issues in and around school zones. The paper also summarizes the challenges of ADS deployment from technical, policy, infrastructure, and educational perspectives.
- *What Humanlike Errors Do Autonomous Vehicles Need to Avoid to Maximize Safety?*: Insurance Institute for Highway Safety, May 2020; <https://www.iihs.org/api/datastore/document/bibliography/2205>
 - Highlights the types of crashes that may still occur in an all-AV fleet if AVs are not designed to avoid poor choices that currently lead to crashes. Finds that autonomous vehicles might prevent only around a third of all crashes if automated systems drive too much like people.
- *Understanding the Impact of Technology: Do Advanced Driver Assistance and Semi-Automated Vehicle Systems Lead to Improper Driving Behavior?*; AAA Foundation for Traffic Safety, December 2019: https://aaafoundation.org/wp-content/uploads/2019/12/19-0460_AAFTS_VTTI-ADAS-Driver-Behavior-Report_Final-Report.pdf
 - Investigates advanced driver assistance systems (ADAS) effects on driver behavior. The objectives of this study were to 1) Investigate driver behavior and the associated risks of ADAS use; 2) Fill a critical knowledge gap by providing information regarding the potential for changes in driver error, drowsiness, secondary task engagement (STE), and eye-glance behavior (e.g., surrogates for distracted driving behaviors) relative to ADAS use; and 3) Investigate changes in safety-critical event (SCE; i.e., crash or nearcrash) risk related to the use of ADAS.

- *Measuring Automated Vehicle Safety: Forging a Framework*; Laura Fraade-Blanar, Marjory S. Blumenthal, James M. Anderson, Nidhi Kalra; Rand Corporation, October 2018: <http://www.trb.org/main/blurbs/178293.aspx>
 - Presents a framework for measuring safety in automated vehicles (AVs) that could be used broadly by companies, policymakers, and the public. In it, the authors considered how to define safety for AVs, how to measure safety for AVs, and how to communicate what is learned or understood about AVs. Presents a structured way of thinking about how to measure safety at different stages of an AV's evolution, and proposes a new kind of measurement. Highlights the kinds of information that could be presented in consistent ways in support of public understanding of AV safety.
- *Vehicle Owners' Experiences with and Reactions to Advanced Driver Assistance Systems*; AAA Traffic Safety Foundation, September 2018: <https://aaafoundation.org/vehicle-owners-experiences-reactions-advanced-driver-assistance-systems/>
 - Presents the results of a survey of over 1,200 owners of vehicles equipped with advanced driver assistance systems (ADAS). The data reflects owners' opinions about, understanding of, and experiences with the ADAS technologies. Although the majority of drivers generally have favorable impressions of the technologies on their vehicles, many respondents demonstrated lack of awareness of the key limitations of the technologies.
- *Preparing for Automated Vehicles: Traffic Safety Issues for States*: Governors Highway Safety Association, August 2018: https://www.ghsa.org/sites/default/files/2018-08/Final_AVs2018.pdf
 - Outlines new and perhaps unanticipated state traffic safety issues that automated vehicles may bring to states, and discusses how law enforcement and State Highway Safety Offices (SHSOs) should prepare for them. Includes recommendations to states on automated vehicle testing and deployment, management, and traffic laws.
- *Evaluating Autonomy*: Insurance Institute for Highway Safety Highway Loss Data Institute, August 2018: <http://www.iihs.org/iihs/news/desktopnews/evaluating-autonomy-iihs-examines-driver-assistance-features-in-road-track-tests>
 - Reports on early results from testing level 2 driver assistance systems, including whether the systems handle driving tasks as humans would. The early results underscore the fact that today's systems aren't robust substitutes for human drivers.
- *Safer Roads with Automated Vehicles?*: International Transport Forum, May 2018: <http://www.trb.org/main/blurbs/177729.aspx>
 - Examines how increasing automation of cars and trucks could affect road safety. This report focuses on which security vulnerabilities may be affected by the rise of self-driving vehicles and how vehicle automation could impact the principles of the "Safe System" approach, which aspires to a long-term policy goal that no one should be killed or seriously injured in a highway crash.
- *Connected Vehicle Problems, Challenges, and Major Technologies*: Center for Transportation Research and the Wireless Networking and Communications Group at The University of Texas at Austin, February 2018. Full report: <https://ctr.utexas.edu/wp-content/uploads/135.pdf>; Workshop material: <https://library.ctr.utexas.edu/ctr-publications/0-6845-p1.pdf>; Summary: <https://library.ctr.utexas.edu/ctr-publications/psr/0-6845-s.pdf>
 - Investigates the quality and security of information flow in the connected vehicle (CV) environment. Conducts a comparative analysis of two major enabling

- technologies for V2V (vehicle-to-vehicle) and V2I (vehicle-to-infrastructure) communication, namely LTE (Long-Term Evolution) and DSRC (dedicated short-range communication). Their technology standards, performance, and cost are analyzed. Provides a critical review of potential attacks on CVs and limitations of existing DSRC standards to address these threats. Identifies open issues that remain unsolved by existing technologies and security protocols.
- *Cybersecurity Challenges and Pathways in the Context of Connected Vehicle Systems*: Center for Transportation Research and the Wireless Networking and Communications Group at The University of Texas at Austin, February 2018: <https://ctr.utexas.edu/wp-content/uploads/134.pdf>
 - Provides an overview and comparison of the inherent security flaws in automotive radar and DSRC technologies. Discusses the motivation for combining radar and DSRC into a joint system and provides an overview of the potential consequences of an insecure vehicular system.
 - *Why Waiting for Perfect Autonomous Vehicles May Cost Lives*; RAND Corporation, November 2017: <https://www.rand.org/blog/articles/2017/11/why-waiting-for-perfect-autonomous-vehicles-may-cost-lives.html>
 - Some people think autonomous vehicles must be nearly flawless before humans take their hands off the wheel. But RAND research shows that putting AVs on the road before they're perfect improves the technology more quickly—and could save hundreds of thousands of lives over time
 - *Automated Driving Systems (ADS) – A Vision for Safety 2.0*; National Highway Traffic Safety Administration; September 2017: https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/documents/13069a-ads2.0_090617_v9a_tag.pdf
 - Replaces the Federal Automated Vehicle Policy released in 2016. This updated policy framework offers a path forward for the safe deployment of automated vehicles by: encouraging new entrants and ideas that deliver safer vehicles; making Department regulatory processes more nimble to help match the pace of private sector innovation; and supporting industry innovation and encouraging open communication with the public and with stakeholders.
 - *Autonomous Vehicles Meet Human Drivers: Traffic Safety Issues for States*; Governors Highway Safety Association, February 2017: <https://www.ghsa.org/sites/default/files/2017-01/AV%202017%20-%20FINAL.pdf>
 - This report is written for state DOTs, DMVs, and State Highway Safety Offices (SHSOs). It describes the key topics that states must address to manage traffic safety in a world with both driver-operated and autonomous vehicles. The report then summarizes what some states already have done to address autonomous vehicles. Finally, the report suggests what all states can and should do to prepare for autonomous vehicles and to assure that traffic safety is at the forefront of all autonomous vehicle discussions.

ROLE OF SHARED MOBILITY

- *Mobility as a Service: Code of Practice*: United Kingdom Department for Transport; August 2023; <https://www.gov.uk/government/publications/mobility-as-a-service-maaS-code-of-practice/mobility-as-a-service-code-of-practice>
 - Provides a code of practice will enable the Department to support MaaS as it grows without introducing regulations at a time that could stifle innovation in this emerging industry. Also provides an opportunity to gather further evidence in a structured manner to understand if and where regulation might need to be brought forward in the future.
- *Shared Micromobility State of the Industry Report 2022*: North American Bikeshare & Scootershare Association; August 2023; <https://www.dropbox.com/scl/fi/g8bs0ivbntntfpod6hxy/2022-State-of-the-Industry-Report.pdf?dl=0&rlkey=n4k2t53u0itcowqv6dauctxmt&submissionGuid=996fa6a0-0d21-424d-b5b8-02cfd7fdc25b>
 - Fourth annual report tracks the progress and presents new research demonstrating the impact of the industry across North America.
- *Equity Effects of Rare Events on Transportation Network Company and Transit Riders*: Mobility 21 University Transportation Center, August 2023; https://ppms.cit.cmu.edu/media/project_files/Final_Report_-_396.pdf?utm_source=TRB+Weekly&utm_campaign=66e9e93193-EMAIL_CAMPAIGN_2023_08_21_05_11&utm_medium=email&utm_term=0_c66acb9bce-66e9e93193-%5BLIST_EMAIL_ID%5D
 - Identifies opportunities for public policies that may enhance transportation benefits, while mitigating private costs, social costs, and inequities for TNC and transit riders in disadvantaged neighborhoods. Discusses the simulation of racial discrimination in TNCs and the impact this could have on wait times in various communities. and the implications of rare weather events on TNC usage in different communities.
- *Data for Environmentally Sustainable and Inclusive Urban Mobility*: Heinrich Boell Foundation, the Eno Center for Transportation and the Wuppertal Institute; June 2023; https://www.boell.de/sites/default/files/2023-06/e-paper-data-for-environmentally-sustainable-and-inclusive-urban-mobility-endfassung_1.pdf
 - Provides recommendations to improve ridesharing data sharing and usage in U.S. cities for moving toward an urban mobility system that is sustainable, accessible, and equitable.
- *Identifying and Prioritizing Behavioral Interventions to Improve Child Passenger Safety in For-Hire Vehicles*: Transportation Research Board, Behavioral Traffic Safety Cooperative Research Program; May 2023; https://nap.nationalacademies.org/catalog/27067/identifying-and-prioritizing-behavioral-interventions-to-improve-child-passenger-safety-in-for-hire-vehicles?utm_source=TRB+Weekly&utm_campaign=360c81b4ed-EMAIL_CAMPAIGN_2023_06_05_05_19&utm_medium=email&utm_term=0_c66acb9bce-360c81b4ed-%5BLIST_EMAIL_ID%5D
 - Provides guidelines to identify and prioritize the types of behavioral interventions needed to improve child passenger (defined as people under 13 years of age) safety in the for-hire rideshare environment, including taxis. Describes steps that can be taken to help ensure that the requirements for child restraint systems (CRS) use in for-hire vehicles provide complete and consistent coverage; describes steps that can be taken

- to communicate with for-hire companies to request that they work to help address challenges associated with CRS use in rideshare and taxi vehicles; and discusses legislative provisions that require for-hire companies to provide CRS in their vehicles or facilitate CRS use.
- *All Possible Commutes: How Micromobility and Realistic Car Travel Times Impact Accessibility Analyses*: The New Urban Mobility Alliance and Transport for Cairo; May 2023; <https://www.numo.global/sites/default/files/2023-05/2023-All-Possible-Commutes.pdf>
 - Evaluates the effects of shared micromobility and transit on job access in San Francisco Bay Area, Minneapolis-St. Paul, Cairo and Mexico City. Presents an open-source, replicable method for accessibility analysis that incorporates the effects of micromobility and more realistic conditions for car travel, including traffic congestion and parking time.
 - *Exploring the Impact of Autonomous Taxis on People with Disabilities*: Warwick University, January 2023; https://www.researchgate.net/publication/373898455_Exploring_the_Impact_of_Autonomous_Taxis_on_People_with_Disabilities
 - Focuses on the impact of autonomous taxis on people with disabilities. Aims to answer two research questions: 1) How do traditional taxi experiences shape expectations of autonomous taxis in terms of disability accessibility? 2) To what extent does the autonomy of self-driving taxis contribute to a perceived increase in travel freedom?
 - *Shared Automated Vehicle Toolkit: Policies and Planning Considerations for Implementation*: Transportation Research Board, National Cooperative Highway Research Program Report 1009, 2022; <https://nap.nationalacademies.org/download/26821>
 - Establishes a framework that provides public agencies and other transportation stakeholders with tools and potential strategies that can be used to assess programs; plan infrastructure and services; and implement policies to address converging trends in mobility on demand (MOD), automated vehicles (AVs), and emerging modes of transportation.
 - *Micromobility Policies, Permits, and Practices – NCHRP Synthesis 597*: National Cooperative Highway Research Program, Transportation Research Board; December 2022; https://nap.nationalacademies.org/catalog/26815/micromobility-policies-permits-and-practices?utm_source=TRB+Weekly&utm_campaign=b796f7cfee-EMAIL_CAMPAIGN_2022_12_05_08_24&utm_medium=email&utm_term=0_c66acb9bce-b796f7cfee-%5BLIST_EMAIL_ID%5D
 - Documents policies, permits, and practices that state DOTs are engaged with regarding micromobility
 - *Shared Micromobility Permitting, Process, and Participation*: National Association of City Transportation Officials; December 2022; https://nacto.org/shared-micromobility-working-paper/?utm_source=NACTO+Newsletter&utm_campaign=0a4218a6a7-EMAIL_CAMPAIGN_2019_04_22_04_58_COPY_01&utm_medium=email&utm_term=0_8f3492144e-0a4218a6a7-345022653&mc_cid=0a4218a6a7&mc_eid=ad562e74b1
 - Outlines emerging trends in how cities manage micromobility networks, including the growth of electrified devices, the selection of operators based on strategic goals, and regulations to better organize devices. Offers cities tactics for making systems more equitable and effective.

- *Advancing Social Equity and Congestion Relief: Understanding the Travel Needs of Underserved Populations That Rely on Transportation Network Companies in the San Francisco Bay Area*: National Institute of Congestion Reduction; November 2022; https://digitalcommons.usf.edu/cgi/viewcontent.cgi?article=1012&context=cutr_nicr&utm_source=TRB+Weekly&utm_campaign=7b184b0dd1-EMAIL_CAMPAIGN_2023_02_13_07_05&utm_medium=email&utm_term=0_c66acb9bce-7b184b0dd1-%5BLIST_EMAIL_ID%5D
 - Explores the needs of underserved populations (e.g., lower-income, people of color) who use TNCs at least once per week. Looks at the factors impacting the willingness and propensity to use pooled TNCs and identifies strategies/policies that could be employed to reduce TNC congestion.
- *How Urban Mobility Will Change by 2030*: Oliver Wyman Forum and the Institute of Transportation Studies at the University of California, Berkeley; 2022; https://www.oliverwymanforum.com/content/dam/oliver-wyman/ow-forum/mobility/2022/Value%20Pool%20Report_7_2022.pdf.
 - Analyzes 13 services in three regions: North America, Europe, and Asia. In addition to mobility services, the study covers complementary services such as electric-vehicle (EV) charging stations and smart parking solutions.
- *Mobility for the People: Evaluating Equity Requirements in Shared Micromobility Programs*: National Institute for Transportation and Communities; July 2022; https://pdxscholar.library.pdx.edu/cgi/viewcontent.cgi?article=1242&context=trec_reports.
 - Addresses four questions: 1) What equity requirements do shared micromobility programs include? 2) What strategies are employed by cities/agencies seeking to operationalize equity in shared micromobility programs? 3) To what extent are programs monitored and evaluated to determine if program requirements translate to more equitable outcomes in practice? and 4) How do current frameworks approach equity in shared micromobility?
- *Research and Innovation in Car Sharing in Europe*: European Commission; 2022; <https://publications.jrc.ec.europa.eu/repository/handle/JRC127774>.
 - Provides a comprehensive analysis of R&I related to car sharing in Europe. Critically assesses research by six key thematic areas, highlighting recent technological and other developments and future needs. Themes include: Better understanding of impacts (economy, environmental); User behaviour and acceptance of car sharing schemes; Information technology development (apps, websites, connected cars); Vehicle technology (electric vehicles, hybrid vehicles, ergonomics, automated vehicles); Development and implementation; and Others (stakeholder engagement, regulations, and policies).
- *Shared Mobility and Automated Vehicles*: Institute of Engineering Technology; 2021; <https://shop.theiet.org/shared-mobility-and-automated-vehicles>
 - Serves as a source of information on how best to shape shared vehicle systems of the future. Contributes knowledge on key facets of shared mobility. Includes shared vehicle systems as well as shared automated vehicle systems. Themes covered include policy and regulatory frameworks, planning, design, technology, demand and supply models, algorithms, operations, management, economic factors, business models, social equity, environmental impacts, and pandemic effects.

- *Research on Micromobility Blog*: Transportation Research Board, November 2021: <https://www.nationalacademies.org/trb/blog/research-can-help-micromobility-have-a-supersized-effect-on-future-transportation>
 - Contains resources on research on micromobility and its potential impact on the future of transportation. Provides links to a plethora of resources, events, committees and forums, projects and articles available from TRB and the National Academies.
- *Transit and Micromobility*: Transportation Research Board, Transit Cooperative Research Program Report 230, October 2021: <https://www.nap.edu/catalog/26386/transit-and-micromobility>
 - Provides an analysis of the full benefits and impacts of micromobility on public transportation systems in transit-rich markets as well as in medium-sized and smaller urban areas. Includes case studies and lessons learned from different collaborations among cities, transit agencies, and micromobility companies.
- *Micromobility, Equity, and Sustainability – Summary and Conclusions*: International Transport Forum, September 2021: <https://www.itf-oecd.org/sites/default/files/docs/micromobility-equity-sustainability.pdf>
 - Examines micromobility trends and reviews its benefits and social costs, with the aim to help develop governance frameworks and regulations that maximize the contribution of e-scooters, electric bikes and pedal bikes to more sustainable mobility and minimize any negative effects, particularly for pedestrians.
- *An Evaluation of the Valley Metro-Waymo Automated Vehicle RideChoice Mobility on Demand Demonstration*: Federal Transit Administration Report No. 0198, August 2021: <https://www.transit.dot.gov/sites/fta.dot.gov/files/2021-08/FTA-Report-No-0198.pdf>
 - Evaluates the Valley Metro Regional Public Transportation Authority (Valley Metro) of the Greater Phoenix metropolitan area, which was awarded a grant as part of the FTA Mobility on Demand (MOD) Sandbox program. Through the grant, Valley Metro and Waymo partnered to pilot the use of Waymo autonomous vehicles (AVs) as certified vehicles for Valley Metro’s RideChoice program, a subsidized curb-to-curb individual mobility service (via taxi or ride-hailing services) for paratransit-certified people under the Americans with Disabilities Act (ADA) and for older adults age 65 and over living in Greater Phoenix.
- *The Innovative Mobility Landscape – The Case of Mobility-as-a-Service*: International Transport Forum, July 2021: <https://www.itf-oecd.org/sites/default/files/docs/innovative-mobility-landscape-maaS.pdf>
 - Addresses the current and future context for urban mobility including the sustainability challenges ahead. Reviews how the urban mobility landscape is changing with respect to mobility operators and services. Addresses the development and characterization of MaaS as a means to improve urban mobility outcomes. Reviews a number of essential governance and regulatory challenges that must be addressed to create a healthy mobility as a service ecosystem that delivers clear benefits to people and is aligned with societal objectives.
- *Micromobility Facility Design Guide*: Institute of Transportation Engineers (ITE), May 2021: https://ecommerce.ite.org/IMIS/ItemDetail?iProductCode=IR-149-E&_zs=DITdl&_zl=w1ru1
 - Identifies potential design challenges that micromobility users experience as they travel on a typical roadway as well as the challenges other users of the roadway may

face caused by micromobility users. Solutions with real-world examples are identified that accommodate micromobility and improve the roadway for all users. (This document does not provide best practices pertaining to policy.)

- *The Impact of Ride Hail Services on the Accessibility of Nonprofit Services*: National Institute for Transportation and Communities, May 2021: <https://nitc.trec.pdx.edu/research/project/1357>
 - Looks at how nonprofit organizations might address the mobility needs of their clients through ride hailing (also known as Transportation Network Companies, or TNCs).
- *Impacts of Transportation Network Companies on Urban Mobility*: Nature Sustainability, February 2021: <https://www.nature.com/articles/s41893-020-00678-z>
 - Assesses three aspects of how ride-sharing impacts urban mobility in the United States — road congestion, public transport ridership, and private vehicle ownership — and how they have evolved over time.
- *Redesigning Transit Networks for the New Mobility Future*: TRB, Transit Cooperative Research Program, January 2021: <http://www.trb.org/Main/Blurbs/181561.aspx>
 - Contains two sections. Section 1 consists of the research report on bus network redesigns and new mobility. Section 2 contains the following resources: case studies of bus network redesigns at four transit agencies; and toolkits to help transit agencies and stakeholders plan and implement a bus network redesign, supporting bus as a mode of choice as part of a bus network redesign, and working with the private sector for the new mobility components of a bus network redesign.
- *Low-Speed Automated Vehicles (LSAVs) in Public Transportation*: TRB Transit Cooperative Research Program, January 2021: <https://www.nap.edu/catalog/26056/low-speed-automated-vehicles-lsavs-in-public-transportation>
 - Presents current use cases for LSAVs and provides a Practitioner Guide for planning and implementing LSAV services as a new public transportation service.
- *The Role of Transit, Shared Modes, and Public Policy in the New Mobility Landscape*: Transportation Research Board, January 2021: <https://www.nap.edu/catalog/26053/the-role-of-transit-shared-modes-and-public-policy-in-the-new-mobility-landscape>
 - Considers the role of new shared mobility providers in regional transportation and their relationships to, and impacts on, existing public transit. Looks at how shared mobility can further societal goals, the role that public transportation and other agencies, levels of government, and private companies can play in this regard, and ways that transit agencies have coordinated with shared mobility providers in the United States and abroad. Recommends steps to help bring about this transformation, starting in urban cores with historically robust transit service but with the aim of increasing the value and viability of transit and shared mobility services more broadly across regions.
- *Understanding and Tackling Micromobility: Transportation's New Disrupter*: Governors Highway Safety Association, August 2020; https://www.ghsa.org/sites/default/files/2020-08/GHSA_MicromobilityReport_Final_1.pdf
 - Includes an overview of micromobility, and explores six micromobility challenges—oversight, funding, data collection, enforcement, infrastructure and education—and the role that State Highway Safety Offices (SHSOs) and partners can play to help address them.

- *Shared Mobility and the Transformation of Public Transit*: Transportation Research Board, Transit Cooperative Research Program's TCRP Report 188, August 2020; <http://www.trb.org/main/blurbs/174653.aspx>
 - Examines the relationship of public transportation (including paratransit and demand-responsive services) to shared modes, including bikesharing, carsharing, microtransit, and ridesourcing services provided by companies such as Uber and Lyft. A supplemental infographic summarizes the aspects of the sharing economy and its intersection with transit.
- *What Makes Cents? How Uber Shapes Municipal On-Street Parking Revenue*: National Institute for Transportation and Communities at the University of Oregon, August 2020; https://ppms.trec.pdx.edu/media/project_files/NITC-RR-1215_What_Makes_Cents_How_Uber_Shapes_Municipal_On-Street_Parking_Revenue.pdf
 - Begins to quantify the potential financial impacts of AVs by analyzing current associations between transportation network company (TNC) trips—often viewed as a precursor of AVs—and parking revenue. Uses TNCs as a proxy for future AV travel to examine the connections between trip-making and on-street parking occupancy and revenue. Specifically, the researchers use Uber trip data along with built environment and parking revenue data from the City of Seattle to ask: what is the association between TNC trips and parking occupancy and revenue?
- *Towards the Promise of Mobility as a Service (MaaS) in the U.S.*: The Shared Use Mobility Center, July 2020; <https://learn.sharedusemobilitycenter.org/overview/towards-the-promise-of-mobility-as-a-service-maas-in-the-u-s-2020/>.
 - Provides a guidepost to meet MaaS challenges, with MaaS topology, principles, and case examples. The challenges to MaaS that must be addressed before MaaS can be realized include fare payment integration, data-sharing agreements, and workable business models in a financially-strapped COVID-19 environment.
- *Emissions Benefits of Electric Vehicles in Uber and Lyft Ride-Hailing Services*: Alan Jenn, Institute of Transportation Studies, University of California, Davis, CA; July 2020; <https://escholarship.org/uc/item/14f893rv#main%3Chttps://escholarship.org/uc/item/14f893rv>
 - Compares the potential environmental and emission reduction benefits for electric vehicles being used in ride-hailing compared with those of regular vehicle usage in California.
- *Mobility on Demand in the United States*: Susan Shaheen and Adam Cohen, Berkeley Transportation Sustainability Research Center, June 2020;
 - This chapter in the publication "Analytics for the Sharing Economy: Mathematics, Engineering and Business Perspectives" reviews terms and definitions related to Mobility on Demand (MOD) and Mobility as a Service (MaaS), the mobility marketplace, stakeholders, and enablers. Also reviews the U.S. Department of Transportation's MOD Sandbox Program, including common opportunities and challenges, partnerships, and case studies for employing on-demand mobility pilots and programs. Concludes with a discussion of vehicle automation and on-demand mobility including pilot projects and the potential transformative impacts of shared automated vehicles on parking, land use, and the built environment.
- *21 Key Takeaways from Partnerships Between Public Transit Providers and Transportation Network Companies in the United States*: DePaul University and the Shared Use Mobility

- Center, April 2020: <https://las.depaul.edu/centers-and-institutes/chaddick-institute-for-metropolitan-development/research-and-publications/Documents/21Takeaways-Final.pdf>
- Helps fill gaps in the understanding of these partnerships by exploring questions and reviewing the experiences of notable on-demand partnerships around the United States. The results are distilled into 21 takeaways in seven broad categories that are important to program planners.
 - *Transportation Network Companies (TNCs): Impacts to Airport Revenues and Operations—Reference Guide*: Transportation Research Board, Airport Cooperative Research Program ACRP Research Report 215: March 2020; <http://www.trb.org/main/blurbs/180473.aspx>
 - Identifies strategies and practical tools for adapting airport landside access programs to reflect the evolution of ground transportation modes such as TNCs and autonomous vehicles. A searchable statistical database of the airport survey and the Airport Mode Choice and Ground Simulator Template (an Excel-based simulation template), which shows how the mode-choice model is applied to estimate revenue impact, supplement the report.
 - *Shared Mobility Policy Playbook*: UC Berkeley, December 2019; <http://www.its.berkeley.edu/node/13734>
 - Provides an introduction and definitions of shared mobility services, mode-specific resources for agencies looking to develop policies in their community, and policy-focused tools demonstrating case studies and best practices for shared mobility
 - *Transportation Network Companies (TNCs): Impacts to Airport Revenues and Operations*: Airport Cooperative Research Program, Transportation Research Board, December 2019; <http://www.trb.org/main/blurbs/180077.aspx>
 - ACRP Research Report 215 is designed to help airport operators develop and implement practical approaches to managing TNCs within the context of commercial ground transportation policies and programs. The report presents best practices that have proven to be effective tools that airport operators can use to manage TNC operations and develop sustainable revenue models. It particularly is designed to help airport operators evaluate the tradeoffs among customer service, revenue generation, current operations, and long-term facility planning.
 - *Taxonomy & Classification of Powered Micromobility Vehicles*: SAE International, November 2019; <https://www.sae.org/news/press-room/2019/11/sae-international-publishes-industry%E2%80%99s-first-standard-for-classification-and-definition-of-powered-micromobility-vehicles>
 - Provides clarity and organization around the nomenclature of these vehicles. The standard provides a criteria for “powered micromobility vehicles” and a classification system that defines six types of powered micromobility vehicles by physical attributes—including powered bicycles, standing and seated scooters, self-balancing and non-self-balancing boards, and skates—with descriptors for curb weight, vehicle width, top speed and power source.
 - *E-Hail Regulation in Global Cities*: Rudin Center for Transportation, New York University, November, 2019; https://wagner.nyu.edu/files/faculty/publications/RUDIN_EHAIL_REPORT.pdf
 - Describes current and future regulatory strategies for e-hail services in 13 international cities. Helps cities learn from each other's regulatory approaches to

- leverage the power of shared information. Also seeks to offer ways for e-hail services to adapt their business models to meet increasing government regulation.
- *Guidelines for Regulating Shared Micromobility*; National Association of City Transportation Officials, September 2019; https://nacto.org/wpcontent/uploads/2019/09/NACTO_Shared_Micromobility_Guidelines_Web.pdf
 - Reflects the wide variety of experiences that North American cities have had in regulating and managing shared micromobility. The recommendations presented in this document are the result of city experience, and have been endorsed by NACTO's shared micromobility working groups. The first version of these guidelines was published in July 2018, and subsequent updates are expected due to the fast-changing nature of the shared micromobility industry. The publication is divided into two broad sections: Best Practice Recommendations and Current State of the Practice.
 - *Partnerships Between Transit Agencies and Transportation Network Companies*: Transportation Research Board, Transit Cooperative Research Program Report 204, September, 2019; <http://www.trb.org/main/blurbs/179624.aspx>
 - Draws on a thorough investigation of active and inactive partnerships between transit agencies and TNCs. Transit agencies have a wide range of motivations for engaging in partnerships with TNCs. The motivations, however, are often not tied to specific performance indicators, an area in which transit agencies can be more proactive in setting the approach. The report presents findings pertaining to data and information requirements of both transit agencies and TNCs; the various benefits and outcomes that transit agencies, communities, and customers have pursued through partnerships; and the challenges faced by transit agencies in developing partnerships with TNCs. An additional resource is part of the project: the [Partnership Playbook](#) offers a brief, 5-step plan designed to help the transit industry be more deliberate in its approach to working with TNCs.
 - *MaaS Movement? Issues and Options on Mobility as a Service for City Region Transport Authorities*: Urban Transport Group, September 2019; <http://www.urbantransportgroup.org/resources/types/reports/maas-movement-issues-and-options-mobility-service-city-region-transport>
 - Examines the concept of Mobility as a Service (MaaS) - identifying the three key factors that will determine the future of MaaS. The report also sets out the issues and options for city regions on the role they might play in shaping MaaS in their areas.
 - *Emissions Benefits of Electric Vehicles in Uber and Lyft Services*: UC Davis National Center for Sustainable Transportation, August 2019; <https://escholarship.org/uc/item/15s1h1kn>
 - Examines EV use in TNC fleets from 2016 through 2018. Quantifies the emissions benefits of EV use within TNC fleets, assesses the capability of EVs to perform TNC services, and analyzes the effects of EV use within TNC fleets on the charging behavior of non-TNC EVs. Concludes that the emission benefits of electrifying a vehicle in a TNC fleet are nearly three times greater than the benefits for electrifying a privately-owned vehicle.
 - *Estimated TNC Share of VMT in Six US Metropolitan Regions*: Fehrs & Peers, August 2019; <https://drive.google.com/file/d/1FIUskVkj9IsAnWJQ6kLhAhNoVLjFdx3/view>
 - Estimates the combined Vehicle Miles Traveled (VMT) of transportation network companies (TNCs) ride-hailing services in six metropolitan regions and compares that

value to approximate total VMT in each area for the same period. According to the study, it is estimated that TNCs account for between one percent and three percent of total regional VMT in the six major regions studied. However, TNC shares in the core and central areas of these regions are higher, ranging from around 2 percent of total VMT to over 13 percent of total VMT.

- *Integrating Shared Mobility into Multimodal Transportation Planning: Metropolitan Area Case Studies*; U.S. Federal Highway Administration, May 2019: <http://www.trb.org/main/blurbs/179252.aspx>
 - Describes case studies of how metropolitan planning organizations are integrating shared mobility into regional multimodal transportation planning. This report also identifies how transportation agencies are working with shared mobility companies to integrate these options into regional multimodal transportation networks in ways that improve system performance and support regional goals.
- *Assessing the Experience of Providers and Users of Transportation Network Company Ridesharing Services*: Center for Connected Multimodal Mobility (C2M2), Clemson University, May 2019: <https://documentcloud.adobe.com/link/track?uri=urn%3Aaaid%3Ascds%3AUS%3Ac4bd16c4-cff8-43de-aa2f-875e210b8897>
 - Studies driver and traveler attitudes towards UberPool and Lyft Shared, Uber and Lyft's services that take advantage of data connectivity and analytics to match travelers on the fly so they can share rides.
- *Mobility on Demand: A Smart, Sustainable, and Equitable Future*: Transportation Research Board, Transportation Research Circular E-C244, May 2019: <http://www.trb.org/Main/Blurbs/179157.aspx>
 - A synopsis of a January 13, 2019, workshop that explored the current state of mobility on demand (MOD), examined next steps for preparing for transition to autonomy, and discussed ways to optimize sustainability and ensure equitability. The workshop emphasized the role of public transit, share mobility, and automation shaping the future of mobility.
- *Micromobility in Cities: A History and Policy Overview*: National League of Cities, May 2019: https://www.nlc.org/sites/default/files/2019-04/CSAR_MicromobilityReport_FINAL.pdf
 - Explores the rapidly changing and disruptive nature of micromobility, and provides city officials useful information to deploy micromobility options in a safe, profitable and equitable way. Begins by defining micromobility and exploring the recent history of docked and dockless bikes and e-scooters. Then explores the challenges and opportunities facing cities, and illustrates a few examples of cities that are addressing these issues head-on. Concludes with a set of recommendations cities can consider as they work to regulate these new mobility technologies.
- *Is Uber a Substitute or Complement to Public Transit*: Jonathan D. Hall, Craig Palsson, and Joseph Price; Journal of Urban Economics, November 2018: <https://www.citylab.com/transportation/2018/10/uber-enemy-or-ally-public-transit/573196/>
 - Estimates the effect of Uber on public transit ridership using a difference-in-differences design that exploits variation across U.S. metropolitan areas in both the intensity of Uber penetration and the timing of Uber entry. Finds that Uber is a complement for the average transit agency, increasing ridership by five percent after

- two years. This average effect masks considerable heterogeneity, with Uber increasing ridership more in larger cities and for smaller transit agencies.
- *Taxonomy and Definitions for Terms Related to Shared Mobility and Enabling Technologies*: SAE, September 2018: <https://www.sae.org/shared-mobility>
 - Addresses discrepancies in the use and definition of terms, which often create ambiguity and confusion. Developed as an SAE Recommended Practice J3163, the standard covers six categories of terms related to shared mobility: travel modes, mobility applications, service models, operational models, business models, and deprecated terms.
 - *Partners in Transit – A Review of Partnerships Between Transportation Network Companies and Public Agencies in the United States*: Joseph P. Schwieterman, Mallory Livingston, & Stijn Van Der Slot; Chaddick Institute for Metropolitan Development at DePaul University, August 2018: https://las.depaul.edu/centers-and-institutes/chaddick-institute-for-metropolitan-development/research-and-publications/Documents/Partners%20in%20Transit_Live1.pdf
 - Summarizes the status of twenty-nine partnerships between TNCs and public bodies around the United States designed to improve mobility, twenty-two of which are currently active. For each partnership observed, the research team evaluated: when the programs were active; whether they have been modified since their inception; how the programs were financially structured; and audits of program performance made publicly available.
 - *The New Automobility: Lyft, Uber and the Future of American Cities*: Bruce Schaller, July 2018: <http://www.schallerconsult.com/rideservices/automobility.htm>
 - Combines recently published research and newly available data from a national travel survey and other sources to create a detailed profile of TNC ridership, users and usage. Discusses how TNC and microtransit services can benefit urban transportation, how policy makers can respond to traffic and transit impacts, and the implications of current experience for planning and implementation of shared autonomous vehicles in major American cities.
 - *Taxing New Mobility Services: What's Right? What's Next?:* Eno Center for Transportation, July 2018: <https://www.enotrans.org/etl-material/eno-brief-taxing-new-mobility-services-whats-right-whats-next/>
 - Summarizes the current state and general purposes of TNC taxes and fees to date in the United States, and provides guidance on the main questions cities and states are trying to answer when they levy taxes and fees on TNCs.
 - *Broadening Understanding of the Interplay Between Public Transit, Shared Mobility, and Personal Automobiles*: TRB Transit Cooperative Research Program Research Report 195, July 2018: <http://www.trb.org/main/blurbs/177112.aspx>
 - Explores the effect of app-based transportation network companies on the city where they operate, including on public transit ridership, single-occupancy vehicles trips, and traffic congestion. Built upon the findings of [TCRP Research Report 188](#), this report explores how shared modes—and ridesourcing companies in particular—interact with the use of public transit and personal automobiles.
 - *The Shared-Use City: Managing the Curb*: International Transport Forum, May 2018: <http://www.trb.org/main/blurbs/177730.aspx>

- Discusses how to manage growing competition for curb access in cities. This report explores the potential for a shift away from curb use focused on street parking to more flexible allocation that includes pick-up and drop-off zones for passengers and freight.
- *Why TNCs Will Be Regulated Like Taxis—Historically Speaking*; Institute for Transportation at Iowa State University, May 2018: <http://www.trb.org/main/blurbs/177752.aspx>
 - Forecasts how transportation network companies (TNCs) will be regulated in the near future. The authors hypothesize that when TNCs are regulated like taxis, customers will experience a high level of service at reasonable rates.
- *Legal Considerations in Relationships Between Transit Agencies and Ridesourcing Service Providers*; Transportation Research Board, Transit Cooperative Research Program (TCRP) Legal Research Digest 53, April 2018: <http://www.trb.org/main/blurbs/177575.aspx>
 - The report explores the efforts made by public transit agencies to provide on-demand services to the public. It also provides transit agencies with legal guidance for considering whether to enter into relationships with ridesourcing service providers (RSPs). The report includes a description of ridesourcing services in the United States, state and municipal legislative and regulatory schemes, procurement and procurement processes, contractual and partnership provisions in agreements between RSPs and a public transit agency, issues of compliance with federal legislation and civil rights requirements and those under the Americans with Disabilities Act, legal claims and litigation, and risk management issues stemming from relationships between RSPs and transit agencies.
- *The Effects of Ride Hailing Services on Travel and Associated Greenhouse Gas Emissions*; National Center for Sustainable Transportation at the University of California at Davis, April 2018: https://ncst.ucdavis.edu/wp-content/uploads/2016/07/NCST-TO-028-Rodier_Shared-Use-Mobility-White-Paper_APRIL-2018.pdf
 - Analyzes the effects of ride-hailing services on elements of the transportation system, including congestion, vehicle miles traveled, and greenhouse gas emissions. This report also determines the effects of ride hailing on individual vehicle ownership choices, use of ride-hailing services by those who would otherwise not travel independently by car, destination choice, mode choice, operation of ride-hailing vehicles without a traveler, and land use
- *Peer-to-Peer (P2P) Carsharing: Understanding Early Markets, Social Dynamics, and Behavioral Impacts*; Susan Shaheen, Elliot Martin, and Apaar Bansal, University of California Transportation Center, March 2018: <https://escholarship.org/uc/item/7s8207tb>
 - Studies the effect of peer-to-peer carsharing on behavior and its operational challenges and opportunities, as well as market characteristics.
- *Broadening Understanding of the Interplay Between Public Transit, Shared Mobility, and Personal Automobiles*; TRB/Transit Cooperative Research Program Report 195: <http://www.trb.org/Publications/Blurbs/177112.aspx>
 - The study broadens the understanding of the interplay among emerging and established modes of transportation. Built upon the findings of TCRP Research Report 188, this report explores how shared modes—and ridesourcing companies in particular—interact with the use of public transit and personal automobiles.
- *Shared Mobility Principles for Livable Cities*: 2017: <https://www.sharedmobilityprinciples.org/>

- These principles, produced by Robin Chase (ZipCar co-founder) and a working group of international NGOs, are designed to guide urban decision-makers and stakeholders toward the best outcomes.
- *“Look Ma, No Hands!” The Impact of Autonomous Vehicles on the Taxicab & For-Hire Ground Transportation Industry*; Black Car News, November 2017 (Also published in the April 2018 edition of the *Transportation Lawyer*, a journal with the Transportation Lawyers’ Association): <https://www.blackcarnews.com/article/look-ma-no-hands-the-impact-of-autonomous-vehicles-on-the-taxicab-for-hire-ground-transportation-industry>
 - A review of the many issues that need to be addressed regarding autonomous vehicles and their potential impacts on traditional taxi services, TNCs, and the for-hire ground transportation industry in general
- *Disruptive Transportation: The Adoption, Utilization, and Impacts of Ride-Hailing in the United States*; Regina R. Clewlow and Gouri Shankar Mishra, University of California Davis, October 2017: <http://www.trb.org/Main/Blurbs/176762.aspx>
 - Presents findings from a comprehensive travel and residential survey deployed in seven major U.S. cities, in two phases from 2014 to 2016, with a targeted, representative sample of their urban and suburban populations. The purpose of this report is to provide early insight on the adoption of, use, and travel behavior impacts of ride-hailing. The report is structured around three primary topics: adoption of ride-hailing, vehicle ownership and driving, ride hailing and public transit use.
- *Mobility on Demand Operational Concept Report*: Susan Shaheen, Adam Cohen, Balaji Yelchuru, and Sara Sarkhili, U.S. Department of Transportation, September 2017: <https://rosap.ntl.bts.gov/view/dot/34258>
 - Provides an overview of the Mobility on Demand (MOD) concept and its evolution, description of the MOD ecosystem in a supply and demand framework, and its stakeholders and enablers. Leveraging the MOD ecosystem framework, this report reviews the key enablers of the system including business models and partnerships, land use and different urbanization scenarios, social equity and environmental justice, policies and standards, and enabling technologies. This review is mostly focused on the more recent forms of MOD (e.g., shared mobility).
- *Travel Behavior: Shared Mobility and Transportation Equity*: Susan Shaheen, Corwin Bell, Adam Cohen, and Balaji Yelchuru, U.S. Department of Transportation, August 2017: https://www.fhwa.dot.gov/policy/otps/shared_use_mobility_equity_final.pdf
 - Shared mobility—the shared use of a motor vehicle, bicycle, or other low-speed transportation mode that allows users to obtain short-term access to transportation on an as-needed basis—has the potential to help address some transportation equity challenges. In an effort to categorize the myriad of transportation equity barriers facing transportation system users, this primer proposes a ‘STEPS to Transportation Equity’ framework including: Spatial, Temporal, Economic, Physiological, and Social barriers. For each barrier category, shared mobility opportunities and challenges are explored along with policy recommendations.
- *Shared Automated Vehicles: Review of Business Models*: Adam Stocker and Susan Shaheen, July 2017: <http://www.itf-oecd.org/co-operative-mobility-systems-automated-driving-roundtable>
 - Provides an introduction to the current state of vehicle automation and shared mobility. The paper discusses current shared mobility business models to foster a

- better understanding of these systems at present and to set the stage for possible future shared automated vehicle (SAV) business models. The discussion covers current SAV pilot projects around the world and then explores potential SAV business and service models considering high or full automation (Level 4 and higher).
- *Impacts of Car2go on Vehicle Ownership, Modal Shift, Vehicle Miles Traveled, and Greenhouse Gas Emissions,*” Working Paper: Elliot Martinand Susan Shaheen., UC Berkeley, July 2016: http://innovativemobility.org/wp-content/uploads/2016/07/Impactsofcar2go_FiveCities_2016.pdf?platform=hootsuite
 - An analysis of five North American Cities
 - *Shared Mobility and the Transformation of Public Transit;* TRB Transit Cooperative Research Report 188, Shared Use Mobility Center, June 2016: <http://www.trb.org/Main/Blurbs/174653.aspx>
 - Examines the relationship of public transportation (including paratransit and demand-responsive services) to shared modes, including bikesharing, carsharing, microtransit, and ridesourcing services provided by companies such as Uber and Lyft. The report also explores issues and opportunities and challenges as they relate to technology-enabled mobility services, including suggesting ways that transit can learn from, build upon, and interface with these new modes. A supplemental infographic summarizes the aspects of the sharing economy and its intersection with transit.