Statewide Planning

Tom Houck

TRB 97th Annual Meeting
Jan. 7-11, 2018

Focus Area:
Connected and Autonomous Vehicles

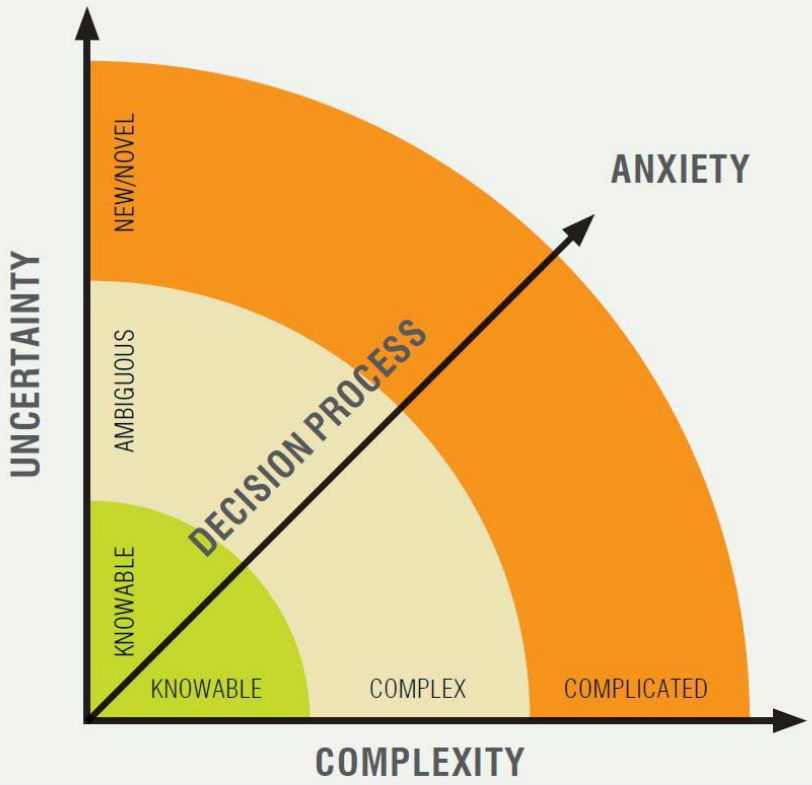
Lectern Sessions
(Monday, Jan. 8, 2018) 265, 271, 329, 406
(Tuesday, Jan. 9, 2018) 471 & 546

Participant: Tom Houck
NJDOT, Statewide Planning

PLEASE NOTE:

- The slides below represent what was shown by the presenter, Tom Houck, during the live TRB Roundtable event at NJDOT.
- They are then followed by detailed summaries (not shown during the live event) to enable you to obtain more information.

Accept Uncertainty



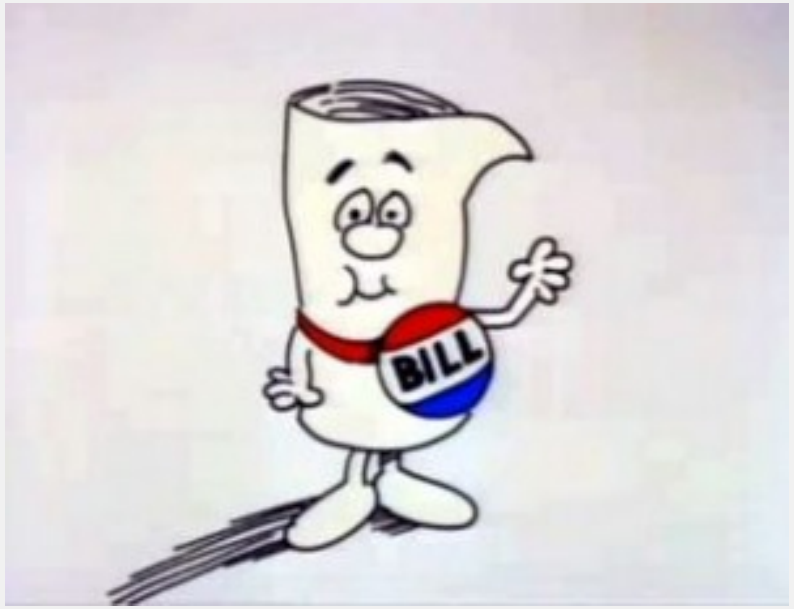
WHEN?

HOW?

WHERE?

WHO?

Legislation



- 21 States have passed legislation relating to autonomous vehicles.
- In 2017, 33 states have introduced legislation. In 2016, 20 states introduced legislation.
- Sixteen states introduced legislation in 2015, up from 12 states in 2014, nine states and D.C. in 2013, and six states in 2012.
- Since 2012, at least 41 states and D.C. have considered legislation related to autonomous vehicles.
- Governors in Arizona, Delaware, Hawaii, Massachusetts, Washington and Wisconsin issued executive orders related to autonomous vehicles.

Infrastructure

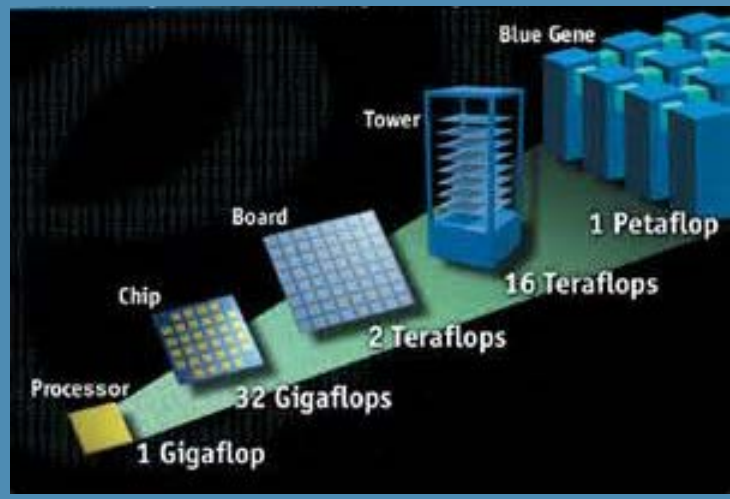
Vehicle to Vehicle (V2V)

Vehicle to Infrastructure (V2I)

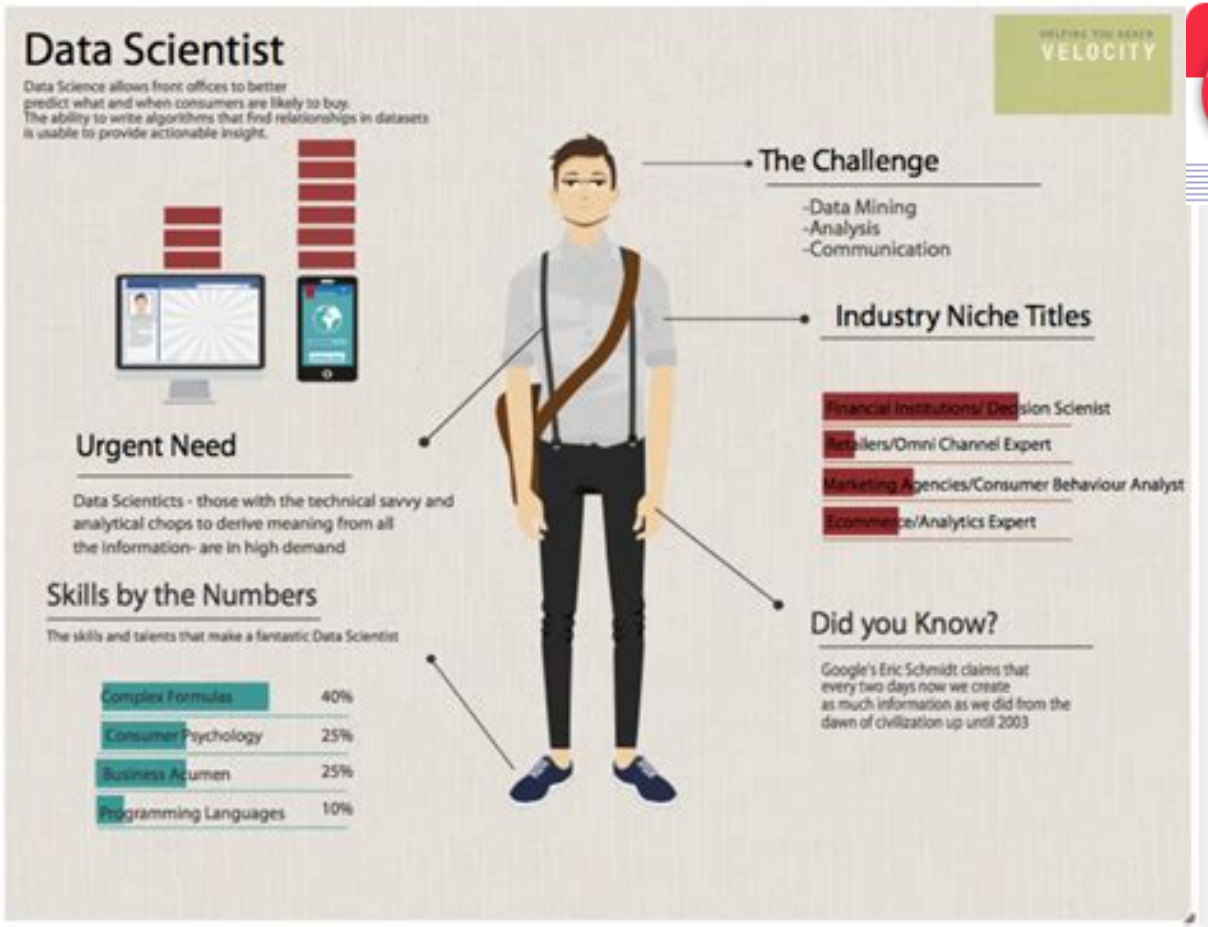
Vehicle to Everything (V2X)

BIG DATA & What's a Petaflop?

CDOT | ROADX
ACCELERATING TECHNOLOGY



Organization Structure



new jersey department of transportation

Employee Intranet

Human Resources
Career Advancement Overview

The following are entry level positions and their career paths. Click on the Career Path that you are interested in. Once the career "tree" opens, click on the particular title you would like to know about. You will then see a listing of relevant information provided for that title.

- Accident Record Reviewer
- Administrative Assistant 3
- Auditor Accountant Trainee
- Bridge Operator Trainee
- Civil Engineer Trainee
- Clerk Typist
- Construction & Maintenance Technician 5
- Electrical Mechanic Trainee
- Emergency Service Patrol Apprentice
- Engineering Technician 5
- Personnel Aide 2
- Purchasing Assistant
- Right of Way Negotiator Trainee
- Secretarial Assistant 3
- Technical Assistant, MIS

Data Scientist?

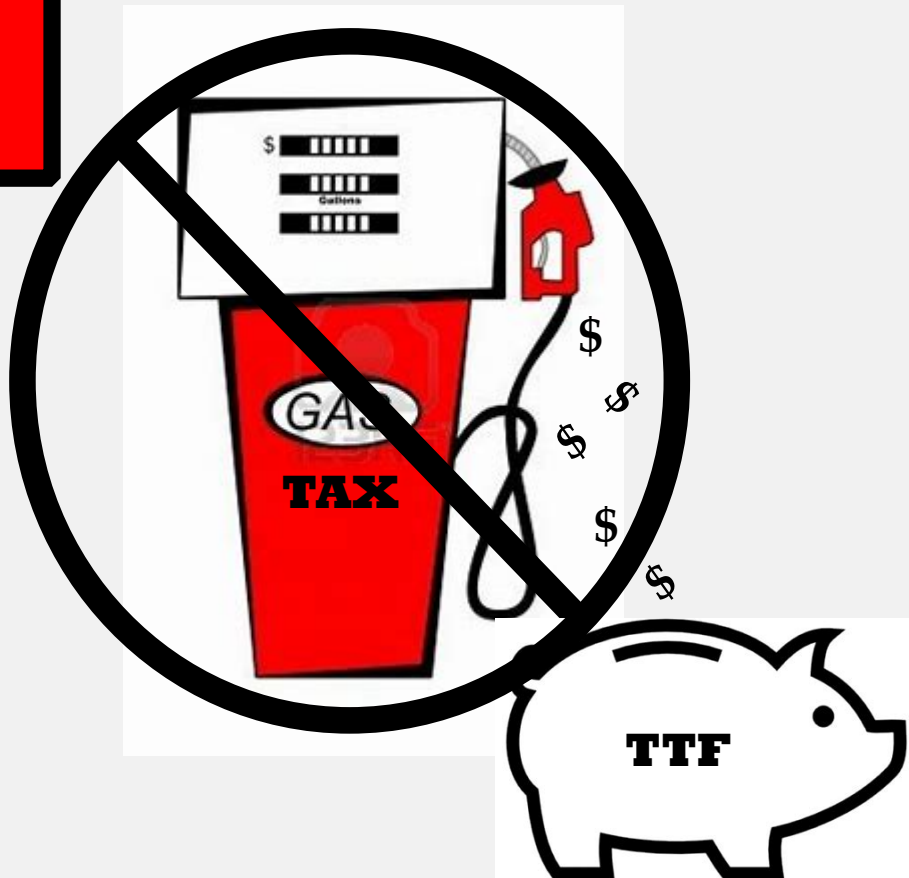
CDOT COLORADO Department of Transportation

LADOT

State of New Jersey Civil Service Commission

…Impact on FUNDING$$$$

How will transportation projects be funded in a future with CAVs?



FLORIDA AUTOMATED VEHICLES

Where are Transportation Agencies Going?

Level 1

Level 2

Level 3

Level 4

Level 5

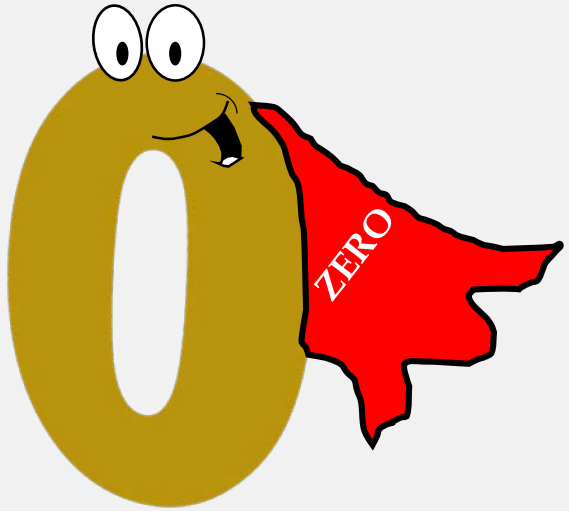
Level 6

SIP SIP-adus Innovation of Automated Driving for Universal Services

Develop A CAV Vision

- TRENDS
  INDICATORS
- VISIONS & GOALS
  SCERARIO PLANNING
- STRATEGIES
  DECISION MAKING TOOLS
- ACTION PLAN
  IMPLEMENTATION TOOLS

Plan for Attainable CAV Benefits



FATALITIES

PERSONS LEFT OUT

EMISSION

STRESS

INSTITUT VEDECOM

DU VÉHICULE DÉCARBONÉ ET COMMUNICANT ET DE SA MOBILITÉ

Social Acceptance

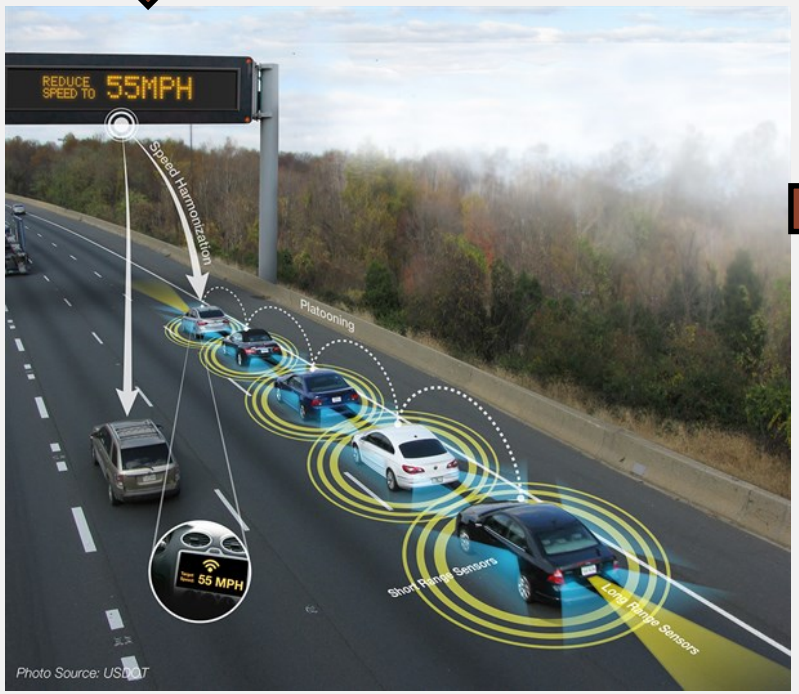
CURRENT DRIVING ENVIRONMENT

to

MIXED VEHICLE ENVIRONMENT

to

FULLY AUTONOMOUS ENVIRONMENT



Collaborate

I-95 CORRIDOR COALITION
Beyond Boundaries

NHTSA
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION

Transportation.gov
U.S. Department of Transportation

European Commission

NDAVC

TRB
TRANSPORTATION RESEARCH BOARD

FLORIDA AUTOMATED VEHICLES

SMART BELT COALITION

CALIFORNIA
CONTRA COSTA
County

pennsylvania
DEPARTMENT OF TRANSPORTATION

What Now?

YOU CAN'T CROSS THE SEA BY STANDING AND STARING AT THE WATER

– RABINDRANATH TAGORE

Sessions Attended: Monday, January 8, 2018

- Session 265 – Metropolitan Policy Considerations for Connected and Autonomous Vehicles (Part 1)
- Session 271 – Impacts of Connected and Autonomous Vehicles on Transportation forecasting and Planning
- Session 329 – The Future of Transportation Infrastructure: What? Where? How?
- Session 406 – Planning for a Future with Autonomous and Connected Vehicles

Monday, January 8, 2018

Session 265 – Metropolitan Policy Considerations for Connected and Autonomous Vehicles (Part 1)

Topic Area\Presenter

- **Perspective from Contra Costa, CA**
  Randell Iwasaki, Contra Costa Transportation Authority
- **Perspective from North Texas Council of Governments**
  Thomas Bamonte, North Central Texas Council of Governments
- **AASHTO SCOP Survey and Perspectives**
  Matthew Hardy, AASHTO
- **Automation Readiness for Metros**
  Siegfried Rupprecht, Rupprecht Consult

Metropolitan Policy Considerations for Connected and Autonomous Vehicles (Part 1)

Session 265

Session Summary

Planning for connected and autonomous vehicles is evolving as metropolitan areas consider policies in there planning processes to address these emerging technologies. Session 265 presented the latest research and thinking. Presenters discussed their findings and recommendations for informing decision makers in establishing metropolitan area policies that will shape the planning process for connected and autonomous vehicles.

Metropolitan Policy Considerations for Connected and Autonomous Vehicles (Part 1)

Session 265

Session Summary

- **Perspective from Contra Costa, CA**
  Randell Iwasaki, Contra Costa Transportation Authority

Contra Costa County Transportation Authority has been highly visible in sharing their efforts in the Connected and Autonomous Vehicle arena of late. The Authority indicated several elements that have enabled the progress that has been made; enabling legislation, provision of testing grounds, and partnership with tech and auto manufacturers/developers. These elements are facilitating movement toward City 5.0. Current projected capacity gains are anticipated based upon the way lane capacity is calculated (i.e. reduced from 2 second headway to 1 second). Randy concluded to suggest that the way we engage in the Planning process, and the Planning process itself, must change as we consider the future of transportation.

Metropolitan Policy Considerations for Connected and Autonomous Vehicles (Part 1)

Session 265

Session Summary

- **Perspective from North Texas Council of Governments (NTCoG)**
  Thomas Bamonte, NTCoG

The NTCoG presented data in the context that transportation agencies will deliver a future transportation product that is worse than today despite what in NTCoG's case is significant programming ($120B). A combination of robotaxis, micro transit, AV shuttles, buses, AV freight, personal AV, and people movers will need to be pursued as possible solutions to the anticipated degradation of the transportation system. As part of the presentation, NTCoG introduced their current efforts in preparing their long range plan and policies that consider connectivity, AV and data. These efforts have prioritized data sharing, cost/benefit analysis, considerations, 3P funding opportunities, and increasing vehicle occupancy. Above all, the infrastructure must be maintained at a level that supports the utilization of these considerations as well as the testing and deployment of AV to achieve solutions in delivering the future transportation product that is effective in addressing the users' mobility needs.

Session Summary

- **AASHTO SCOP Survey and Perspectives**
  Matthew Hardy, AASHTO

Matt Hardy presented the planning snapshots from AASHTO SCOP survey (NCHRP 8-36, Task 120 http://www.planningsnapshots.camsys.com/). As we plan for a future with CAV we must have the expectation that the autonomous network will produce a mean distance between failures (MDBF) greater than is currently occurring. In this endeavor, we must be cognizant of what can be done right now (considerations of performance measures in light of the limited funds) as well as acknowledge and leverage disruptive forces (MOD, MaaS). There is a need for planners to not simply engage in LRPs to satisfy federal requirement, but to view this work as dynamic and consistently presenting opportunities to innovate. The goals of LRPs will need to continue to evolve addressing emerging issues such as system connectivity, intermodal connectivity and data connectivity. The survey suggests that full CAV implementation is likely beyond a 10 year horizon.

Session Summary

- **Automation Readiness for Metros**
  Siegfried Rupprecht, Rupprecht Consult

Siegfried Rupprecht offered a European perspective on the emerging arena of MOD and MaaS. The process by which technology and disruptive services are accepted should not be viewed as a linear progression. Projections for automation (SAE Levels 4 or 5) should be cautiously viewed with the knowledge that all projections will inevitably be wrong and therefore must be adjusted as technology evolves. It should be expected that very controlled and very invested communities will likely be the leaders. German cities are considering an automation roadmap that includes transportation modeling, road (infrastructure) development, and the governance structure/service models. This roadmap promotes sustainable automation, leverages automation benefits, and accounts for system disruptions (institutional adjustments, infrastructure adjustments, and collective mobility adjustments or MOD/MaaS).

Monday, January 8, 2018

Session 271 – Impacts of Connected and Autonomous Vehicles on Transportation forecasting and Planning

Impact of Connected and Automated Vehicles on Transportation Forecasting And Planning

Session 271

Topic Area\Presenter

- **Starting Points for CVAV Planning: What is unknown**
  Tony Seba, RethinkX
- **Modifying the Planning Process for Colorado DOT and Connected and Automated Vehicles**
  Debra Perkins-Smith and Peter Kozinski Colorado DOT
- **Investigation Efforts to Address the Impacts of CAV on Transportation Forecasting and Planning in Florida**
  Thomas Byron, Florida DOT
- **Connected Vehicles Vs. Automated Vehicles: Changes That Need to Occur in the Planning Process to Help Manage the Changes Ahead**
  Jeremy Raw, FHWA
- **City Level Efforts to Prepare for Connected and Automated Vehicles**
  Jennifer Cohen, City of Los Angeles DOT
- **Austin to China to India: Illustrating the Spectrum of Mobility Paths Off Oil and Carbon**
  Amory Lovins & Greg Rucks, Rocky Mountain Inst., Inc.

Impact of Connected and Automated Vehicles on Transportation Forecasting And Planning

Session 271

Session Summary

Transportation agencies must be planning for the changes required to support the potentially paradigm-shifting technologies of connected and automated vehicles (CAV). These changes will most probably impact how multimodal transportation is planned, designed, modeled, and operated. The session explored and discussed the implications of CAV on the long range planning of multimodal transportation infrastructure and services included in planning processes, forecasting, and organizational structures.

Impact of Connected and Automated Vehicles on Transportation Forecasting And Planning

Session 271

Session Summary

- **Starting Points for CVAV Planning: What is unknown**

  Tony Seba, RethinkX

Tony Seba of RethinkX presented an optimistic perspective of transportation outcomes as a result of system disruption. As technology advances the hardware that will enable system disruption reduces in cost and size. We are approaching a convergence where the cost of technology (development of lidar, batteries, etc.) and demand are aligning allowing a real birth of autonomous and electric vehicles. It is being projected that by 2021, the cost to provide autonomous vehicle services will be cheaper than owning a car and by 2030 95% of all VMT will be by TaaS or MaaS. 2018 promises to be the cusp of the fastest and deepest cutting transportation disruption in history.

Impact of Connected and Automated Vehicles on Transportation Forecasting And Planning

Session 271

Session Summary

- **Modifying the Planning Process for Colorado DOT and Connected and Automated Vehicles**

  Debra Perkins-Smith & Peter Kozinski, Colorado DOT

The Colorado DOT (CoDOT) is seeking to transform the way people travel across Colorado by utilizing technology and ingenuity to solve current and increasing future infrastructure challenges. CoDOT is currently employing the RoadX program to improve localized driving, safety and navigating apps using real time data; provide connected infrastructure and drivers with capacity to "talk to" each other, help prevent accidents and facilitate the speed and flow of traffic; foster smarter trucking that moves goods and services more efficiently for better communities and industry; improve smarter systems in infrastructure to help the flow of traffic and decrease the need for additional capacity; and facilitate the development of infrastructure, like virtual guiderails, that "talk to" cars to prevent and eliminate crashes. CoDOT has also incorporated these strategies in the development of the LRP in considering 'big data', technology, extreme weather, funding, and workforce adaptation as well as the project delivery process assessing the use of technology as a part of all projects. This is not a vision of CoDOT developing technology, but rather leveraging technology to provide transportation solutions.
https://www.codot.gov/programs/roadx

Impact of Connected and Automated Vehicles on Transportation Forecasting And Planning

Session 271

Session Summary

- **Investigation Efforts to Address the Impacts of CAV on Transportation Forecasting and Planning in Florida**
  Thomas Byron, Florida DOT

The Florida DOT is anticipating a huge disruption in their ability to fund the management of the transportation system considering the current source of funding; Gas Tax. Currently, 75% of all funding is from state and federal gas taxes (50% state, 25% federal). FDOT's ability to manage the transportation system in the state will be significantly diminished due to improvements in vehicle gas efficiency and the anticipated role of electric vehicles and shared mobility. By employing forecast maps of hurricane Irma, FDOT illustrated the uncertainty of future transportation decisions and the need for continuous monitoring. It has been detected that the next 25 years will likely present system disruptions for the way Floridians utilize the transportation network and consequently how the network is funded – how can they prepare?

Impact of Connected and Automated Vehicles on Transportation Forecasting And Planning

Session 271

Session Summary

- **Connected Vehicles Vs. Automated Vehicles: Changes That Need to Occur in the Planning Process to Help Manage the Changes Ahead**
  Jeremy Raw, FHWA

The theme of Jeremy Raw's presentation was how FHWA is planning for uncertainty. Four (4) principles (Yogi Berra quotes) were utilized to reduce the anxiety of uncertainty. First, "you can observe a lot just by watching". By monitoring what people are doing with MOD, MaaS, app based mobility, drones, and crowd sourcing, transportation agencies can advance their agendas with more certainty. Second, "the future ain't what it used to be". Predictions are based on past actions. In a time of system disruptions, transportation agencies must manage risk. Third, "if you don't know where you're going, you might not get there". The vision must be defined with high specificity. The vision must include scenario planning outcomes, turning points, and indicators for technology development, the transportation agency and the users. Lastly, "it ain't over till it's over". In the era of Performance Based Planning and Programming (PBPP), the cycle is shorter and tighter.

http://apps.trb.org/cmsfeed/TRBNetProjectDisplay.asp?ProjectID=4008

Impact of Connected and Automated Vehicles on Transportation Forecasting And Planning

Session 271

Session Summary

- **City Level Efforts to Prepare for Connected and Automated Vehicles**

  Jennifer Cohen, City of Los Angeles DOT

Jennifer Cohen continued the theme of future uncertainty in the arenas of policy and regulation, data, and the workforce. As transportation agencies develop a transportation technology strategy toolbox, they must consider how to leverage the benefits of autonomy and technology. We are witnessing the traditional governance structure in flux, funding resources are changing and in this dynamic time it is our duty to ensure mobility equity for all is not only considered, but achieved. We are also experiencing the development of a transportation currency in the form of DATA. With the testing and deployment of CAVs, data collection and sharing agreements are paramount to having the proper information to make decisions. And lastly, this technology disruption is reaching our offices. Our duties require the services of a data scientist. However, this title is not considered in the CSC.

Impact of Connected and Automated Vehicles on Transportation Forecasting And Planning

Session 271

Session Summary

- **Austin to China to India: Illustrating the Spectrum of Mobility Paths Off Oil and Carbon**

  Amory Lovins & Greg Rucks, Rocky Mountain Inst., Inc.

Moving from PIGs (Personal Internal Combustion Gas) to SEALs (Sharable Electric Autonomous Lightweight). The Rocky Mountain Institute Inc. presented examples from three (3) varied nations in their efforts in this movement. The commonality for the nations was the consideration to employ strategies to think, do, and scale efforts facilitating this movement. All of the three noted environments are experiencing dynamic change in the way users are interacting with the traditional infrastructure. Increases in MaaS, Bike/Ped, smart infrastructure are palpable. Utilizing an example of Tokyo's rail system's resemblance to a slime mold, it is anticipated we will witness growth in the CAV organism being fed by the smaller cities outside the central city similar to the way the slime mold feeds on the food source adjacent to itself.

Monday, January 8, 2018

Session 329 – The Future of Transportation Infrastructure: What? Where? How?

Topic Area\Presenter

- **Trends for Nation's Transportation Infrastructure: Extent, Condition, Performance, and Investment**
  Patricia Hu, OST-R/Bureau of Transportation Statistics
- **Perspective from a State DOT Director**
  Patrick McKenna, Missouri DOT
- **Perspective from Private-Sector Finance**
  Jeffrey Holt, Bank of Montreal Capital Markets
- **Perspective from a Transit Director**
  Gary Thomas Dallas Area Rapid Transit (DART)
- **A Marine Perspective**
  Mary Brooks, Dalhousie University

The Future of Transportation Infrastructure:
What? Where? How?

Session 329

Session Summary

The U.S. transportation system is the largest in the world, providing mobility and goods movement to 321 million U.S. residents, 75 million foreign visitors and 7.5 million business establishments. The Bureau of Transportation Statistics (BTS) presented trends on the extent, condition, performance of, and investments in the system, including transportation's contribution to the economy. The TRB Executive Committee members comprised the panel and shared their perspectives on transportation infrastructure trends.

The Future of Transportation Infrastructure:
What? Where? How?

Session 329

Session Summary

- **Trends for the Nation's Transportation Infrastructure: Extent, Condition, Performance, and Investment**
  Patricia Hu, OST-R/ Bureau of Transportation Statistics

The United States is experiencing several concurrent shifts in the way users are engaging with the transportation infrastructure. This shift is being realized in both travel demand and demographics. While U.S. regions are all experiencing similar challenges, southern and western regions are experiencing the greatest growth in terms of population. A similar challenges faced by all regions is the need to identify strategies to manage the nation's transportation infrastructure. AV legislation has been implemented in 21 states across the nation as one such strategy.

Session Summary

- **Perspective from a State DOT Director**
  Patrick McKenna, Missouri DOT

Many DOT's are acknowledging that developing or emerging strategies to address transportation challenges are not necessarily being implemented evenly in both rural and urban environments. Missouri DOT (MoDOT) Director identified areas where this divide can be bridged to service all users. By beginning with common goals, strategies can be developed to improve safety, travel time/reliability regardless of environment. MoDOT has begun integrating real time data in system operations, engaging the private sector to identify funding opportunities, investing in models vs. infrastructure expansions, utilizing cost/benefit and cause/effect benefits in the project deliver process, and identifying low cost solutions through the use of data analytics.

Session Summary

- **Perspective from Private-Sector Finance**
  Jeffrey Holt, Bank of Montreal Capital Markets

Jeffrey Holt of the Bank of Montreal Capital Markets led a discussion on the state of infrastructure funding and the private market's appetite for investment. While there has been a decrease in investors gravitation to tradition infrastructure funds, there has also been an aggressive movement toward new infrastructure investment. A profound desire to fund the big, Super Mega projects is being experience throughout North America. Projects like the TransHudson Crossing will find investors. With this in mind, transportation agencies must be leveraging, not selling, infrastructure assets and improvement projects. It is paramount that transportation agencies acknowledge this investment appetite when setting , not agreeing, to project terms.

Session Summary

- **Perspective from a Transit Director**
  Gary Thomas Dallas Area Rapid Transit (DART)

This portion of the session was not included.

The Future of Transportation Infrastructure:
What? Where? How?

Session 329

Session Summary

- **A Marine Perspective**
  Mary Brooks, Dalhousie University

Mary Brooks of Dalhousie University challenged attendees to consider marine infrastructure more broadly in their work efforts. Traditionally, people only consider dredging, or port activity in terms of marine infrastructure. Therefore, the responsibility of the marine infrastructure users is likewise limited. Ms. Brooks identified this limitation fails to consider the context of marine infrastructure and how its users employ it – the movement of goods along road and rail as well as the impacts of this movement. Where are the benefits from the marine infrastructure realized and where are the costs borne. Unless the user is accountable for his/her share of the infrastructure cost, the current automation and expansion at port facilities will deliver an unintended loss of revenue for the traditional marine infrastructure maintenance and management, as well as the broader marine infrastructure.

Monday, January 8, 2018

Session 406 – Planning for a Future with Autonomous and Connected Vehicles

Planning for a Future with Autonomous and Connected Vehicles (AV - CV - CAV)

Session 406

Topic Area\Presenter

- **How Autonomous Driving May Affect the Value of Travel Time Savings for Commuters**
  Felix Steck, DLR – German Aerospace Center

- **Shared Mobility vs. Private Car Ownership: A multivariable Analysis of Public Interest in Autonomous Vehicles**
  Fatemeh Nazari, University of Illinois, Chicago

- **The Impact of Private Autonomous Vehicles on Vehicle Ownership and Unoccupied VMT Generation**
  Wenwen Zhang, Georgia Institute of Technology

- **Impact of Ridesharing on Operational Efficiency of Shared Autonomous Electric Fleet**
  T. Donna Chen, University of Virginia

- **A Model of Ridesourcing Demand Generation and Distribution**
  Patricia Lavieri, University of Texas, Austin

Planning for a Future with Autonomous and Connected Vehicles (AV - CV - CAV)

Session 406

Session Summary

Transportation agencies must be planning for the changes required to support the potentially paradigm-shifting technologies of connected and automated vehicles (CAV). These changes will most probably impact how multimodal transportation is planned, designed, modeled, and operated. The session explored and discussed the research, modeling and forecasting of CAV as part of multimodal transportation infrastructure and mobility services.

Planning for a Future with Autonomous and Connected Vehicles (AV - CV - CAV)

Session 406

Session Summary

- **How Autonomous Driving May Affect the Value of Travel Time Savings for Commuters**

  Felix Steck, DLR – German Aerospace Center

Autonomous driving is being discussed as a promising solution for transportation-related issues and might bring some improvement for users of the system. For instance, especially high mileage commuters might compensate for some of their time spent travelling since they will be able to undertake other activities while going to work. At the same time, there are still many uncertainties and few empirical data on the impact of autonomous driving on mode choices.

The study addresses the impact of autonomous driving on value of travel time savings (VTTS) and mode choices for commuting trips using stated choice experiments. Two use cases were addressed – a privately owned and a shared autonomous vehicle – compared to other modes of transportation. The collected data were analyzed by performing a mixed logit model.

The results show that mode-related factors such as time elements, especially in-vehicle time and cost, play a crucial role for mode choices that include autonomous vehicles. The study provides empirical evidence that autonomous driving may lead to a reduction in the VTTS for commuting trips. We found that driving autonomously in a privately owned vehicle might reduce the VTTS by 31% compared to driving manually and is perceived similarly to in-vehicle time in public transportation. Also, riding in a shared autonomous vehicle is perceived 10% less negatively than driving manually. The study provides important insights on VTTS by autonomous driving for commuting trips and can be a base for future research to build upon.

Planning for a Future with Autonomous and Connected Vehicles (AV - CV - CAV)

Session 406

Session Summary

- **Shared Mobility vs. Private Car Ownership: A multivariable Analysis of Public Interest in Autonomous Vehicles**

Fatemeh Nazari, University of Illinois, Chicago

Autonomous vehicles (AVs) are expected to hit the roads in the near- to mid-term future. Shared mobility services such as car and ride sharing have been gaining momentum in recent years and show prospect for diminishing the need for private car use. Coupling these two emerging mobility trends, shared AVs could further remove the obstacles for widespread use of shared mobility services by providing a low-cost, convenient, and door-to-door travel mode comparable to private car. Therefore, it may be argued that future urban mobility is a public utility and AV private ownership may no longer be necessary. The paper aimed to address this question and shed light on whether different mobility options of AVs have complementary, substitute, or no relationship. A multivariate ordered probit model, which accommodates the correlation between AV mobility options, is estimated using a stated preference data from the Puget Sound region in the Washington State. Specifically, the study investigated public interest in considering AV as an owned asset as well as three shared mobility services: AV rental, AV taxi without a backup driver, and AV taxi with a backup driver present. It was found that public interest in the four mobility options have complementary relationship and, thus, it is not true (at least at present) to assume that future urban mobility is purely a public utility. The study also examined explanatory factors including socio-economic, residential location, travel pattern, technology awareness, and psychological factors that shape public interest in AV mobility alternatives.

Planning for a Future with Autonomous and Connected Vehicles (AV - CV - CAV)

Session 406

Session Summary

- **The Impact of Private Autonomous Vehicles on Vehicle Ownership and Unoccupied VMT Generation**

Wenwen Zhang, Georgia Institute of Technology

With 36 ventures testing autonomous vehicles (AVs) in the State of California, commercial deployment of this disruptive technology is almost around the corner. Different business models of AVs, including Shared AVs (SAVs) and Private AVs (PAVs), will lead to significantly different changes in regional vehicle inventory and Vehicle Miles Travelled (VMT). Most prior studies have already explored the impact of SAVs on vehicle ownership and VMT generation. Limited understanding has been gained regarding vehicle ownership reduction and unoccupied VMT generation potentials in the era of PAVs. Motivated by such research gap, this study developed models to examine how much vehicle ownership reduction can be achieved once private conventional vehicles are replaced by AVs and the spatial distribution of unoccupied VMT accompanied with the vehicle reduction. The models were implemented using travel survey and synthesized trip profile from Atlanta Metropolitan Area. The results showed that more than 18% of the households can reduce vehicles while maintaining the current travel patterns. This can be translated into a 9.5% reduction in private vehicles in the study region. Meanwhile, 29.8 unoccupied VMT will be induced per day per reduced vehicles. A majority of the unoccupied VMT will be loaded on interstate highways and expressways, and the largest percentage inflation in VMT will occur on minor local roads. The results can provide implications for evolving trends in household vehicles uses and the location of dedicated AV lanes in the PAV dominated future.

Planning for a Future with Autonomous and Connected Vehicles (AV - CV - CAV)

Session 406

Session Summary

- **Impact of Ridesharing on Operational Efficiency of Shared Autonomous Electric Fleet**

  T. Donna Chen, University of Virginia

Autonomous vehicles have the potential to significantly increase user access to ridesharing programs. Ms. Chen's paper aimed to quantify the impact of dynamic ride-matching on the operational efficiency of a fleet of shared autonomous electric vehicles (SAEVs), including identifying fleet size, charging station sites, ability to meet trip demand, user wait times, and induced "empty" vehicle miles traveled (VMT). In the study, a discrete-time agent-based simulation model evaluates fleet operations in a spatially discretized metropolitan area. The problem of determining optimal routes to pickup and drop-off multiple travelers within a given time interval using vehicles with fixed capacities is formulated as Capacitated Vehicle Routing Problem with Time Windows (CVRPTW). A case study illustrates the benefits of ridesharing in comparison to traditional Call-n-Ride service in the context of city street operations of SAEV. Model results indicate that it is possible to substitute up to 13 privately owned vehicles (on average) with one shared autonomous vehicle, and the proportion of ride-shared trips can constitute up to 50.4 percent of all vehicle miles traveled (VMT). This study also shows that SAEVs could provide comparable (if not improved) service to travelers with cost savings and overall reduced vehicle miles traveled, compared to private vehicle ownership.

Planning for a Future with Autonomous and Connected Vehicles (AV - CV - CAV)

Session 406

Session Summary

- **A Model of Ridesourcing Demand Generation and Distribution**

Patricia Lavieri, University of Texas, Austin

Ridesourcing has had an exponential growth in the past years, yet its impacts on individual travel are unclear and have not been adequately examined. Recently, an Austin-based ridesourcing company released a large dataset containing disaggregate trip-level information. In this research, this new dataset is used in tandem with several publicly available data sources to estimate two models: a spatial multivariate count model, which is used to describe how many trips are generated in a specific zone on both weekdays and weekend days, and a fractional split model, which helps us identify the characteristics of zones that attract ridesourcing trips. The results show spatial dependence in ridesourcing trips among proximally located zones, as well as correlation between weekday and weekend day trips originating in a zone. Another interesting finding is the identification of a possible substitution effect between ridesourcing and transit use for weekday trips. Moreover, the results suggest that different income segments in the population may use ridesourcing for different activity purposes. From a travel behavior researcher perspective, the results in this paper identify aggregate area-level variables impacting ridesourcing, which can guide future efforts to better understand the demand for ridesourcing as well as the demand for autonomous and connected.

Sessions Attended: Tuesday, January 9, 2018

- Session 471 – Smart Transportation: Getting Organized
- Session 546 – International Progress Toward Vehicle-Highway Automation

Tuesday, January 9, 2018

Session 471 – Smart Transportation: Getting Organized

Topic Area\Presenter

- **Measuring and Modeling Smart Transportation on Travel Choices**
  Martin Engelmann, Contra Costa Transportation Authority
- **Regional Connectivity Needs and Questions from Smaller Cities and Rural Areas**
  Mia Zmud, MZ Insights
- **Moving Forward: Methods for Knowledge Development and Sharing Across Stakeholders, Within a City, and Across Cities**
  Denise Bedford, Georgetown University
- **Incorporating Smart Data Into Transportation Network Modeling**
  Elise Miller-Hooks, George Mason University
- **Leveraging Weather and Traveler Information Data**
  Jack Stickel

Smart Transportation: Getting Organized

Session 471

Session Summary

U.S. Agencies are leveraging data streams to inform travel behavior and transportation policy efforts but working at different paces and with varying needs and priorities. Even as these agencies seek to improve the communication and flow of transportation-related data within their regions, the transportation community as a whole would benefit from the ability to access details about successes and lessons learned from others who are further along in the process. This session allowed the opportunity to consider the different components of smart transportation and identify options for how to best stimulate the flow of communication across the transportation community as a whole.

Smart Transportation: Getting Organized

Session 471

Session Summary

- **Measuring and Modeling Smart Transportation on Travel Choices**

  Martin Engelmann, Contra Costa Transportation Authority

Martin Engelmann led a discussion of the Contra Costa Transportation Authority modeled V-3 level automation. By utilizing platooning principles, the highway headway can be reduced from 2 seconds to 1 second producing more than double the current highway lane capacity. However, a 20% increase in surface street delay is also anticipated as well as a 30 % increase in VMT. These increases are primarily the result of vehicle roaming between trip ends. It is also anticipated there will be significant reductions in transit ridership and increases in private SOV resulting from the use of CAV. A countermeasure suggested to influence these negative transportation outcomes was the use of congestion pricing to incentivize transit use and reduce the number of SOV.

Session Summary

- **Regional Connectivity Needs and Questions from Smaller Cities and Rural Areas**

  Mia Zmud, MZ Insights

The CAV implementation gap between urban and rural environments has been recognized and acknowledged. Armed with this knowledge transportation agencies must develop solutions to facilitate universal CAV implementation and smart city infrastructure. The Smart Cities challenge is developing and currently offers opportunities to smaller communities that until now were unavailable. These smaller communities can leverage their less complex environs, the ability to implement technology on a smaller scale, and the likelihood that technology will be more focused. It will be necessary for smaller communities to consider and address obstacles such as their limited resources available, financial and staff, for not only implementing, but sustaining a smart project. It will be important for these communities to have a data plan, engage in sharing/implementing best practices, and establish financing structures to ensure the operation and maintenance of smart technology and infrastructure.

Session Summary

- **Moving Forward: Methods for Knowledge Development and Sharing Across Stakeholders, Within a City, and Across Cities**
  Denise Bedford, Georgetown University

This portion of the session was not included.

Smart Transportation: Getting Organized

Session 471

Session Summary

- **Incorporating Smart Data Into Transportation Network Modeling**
  Elise Miller-Hooks, George Mason University

As smart transportation evolves, the original assumptions of the future require will require reconsideration. The initial movement toward a centralized management of the transportation (i.e. 511 system and variable message boards) has been replaced with crowdsourced data (i.e. waze, google maps,). Coupled with the need to manage big data, data analytics present opportunities for leveraging transportation network solutions. As solutions develop, transportation officials have a responsibility to ensure equity in mobility. We are in an age where intersection priority is real. Mobility options gained through traffic management systems must be managed to ensure our transportation is not left to simply address the desires of the highest bidder.

Session Summary

- **Leveraging Weather and Traveler Information Data**
  Jack Stickel

Jack Stickel of Alaska DOT highlighted the increased occurrence and severity of extreme weather to introduce the topic of leveraging weather and traveler information data. These events as well as annual or seasonal weather events disrupt the safety and mobility of users of the transportations systems. Similar to the daily real time use of mobility data, weather response data for the transportation system can be leveraged to facilitate the safe and efficient movement of goods and people. Implementing a real time system during sever weather events can save not only critical time, but the lives of motorists.

Tuesday, January 9, 2018

Session 546 – International Progress Toward Vehicle-Highway Automation

International Progress Toward Vehicle-Highway Automation

Session 546

Topic Area\Presenter

- **New European Commission Projects on Automated Road Transport**
  Ludger Rogge, European Commission

- **Japan's SIP-adus Program on Road Vehicle Automation**
  Hajime Amano, ITS Japan

- **Current Trends and National Police Agency (NPA) Initiatives regarding Automated Driving in Japan**
  Yuko Sano, National Police Agency, Japan

- **France's VEDECOM Institute Developing New Mobility Toward Technological and Societal Revolution**
  Remi Bastien, Alliance Technology Development Technocentre Renault

International Progress Toward Vehicle-Highway Automation

Session 546

Session Summary

The technology enabling connected and automated vehicle (CAV) as well as smart transportation infrastructure is not occurring in a bubble. Advances are being made throughout the globe. Transportation organizations around the world are engaging this technology to realize environmental and transportation improvements, as well as in reaction to a palpable future. The session explored perspectives from Europe and Asia discussing their efforts to perform research, develop innovative technology and infrastructure, and plan for future with connected and autonomous vehicles and infrastructure.

International Progress Toward Vehicle-Highway Automation

Session 546

Session Summary

- **New European Commission Projects on Automated Road Transport**
  Ludger Rogge, European Commission

The New European Commission (EC) Project has been established to develop a cooperative approach to connected and automated mobility in Europe. This project establishes a regulatory framework, considers cross border testing and implementation, develops standards for data access and sharing, cyber security, social issues, and research and innovation. The EC has programed €114M for research and innovation projects fostering safety and end user acceptance, road infrastructure to support automation, traffic management systems for automated driving (AD), connectivity for AD functions, and large scale pilots. Ludger Rogge discussed projects such as Interact, TransAid, Inframix, Maven, CoExist, ADAS&me, Vi-DAS, Trust Vehicle, Gcar, L3Pilot, and AutoPilot. These projects allow for the consideration of urban driving, highway pilots, platooning, and automated valet parking.

Ludger Rogge concluded with an announcement and invitation to the TRA Conference that will take place in Vienna from April 16 to 18, 2018.

International Progress Toward Vehicle-Highway Automation

Session 546

Session Summary

- **Japan's SIP-adus Program on Road Vehicle Automation**
  Hajime Amano, ITS Japan

Hajime Amano of ITS Japan discussed the Strategic Innovation Promotion Program (SIP-adus) for road vehicle automation. The program has been established to enable the research and deployment of automated vehicles to reduce traffic fatalities and improve travel time reliability. Similar to the European Commission, ITS Japan has deployed a number of tests and pilots for the purpose of extracting challenges in real traffic conditions, validating tech. elements, enhancing cooperation and harmonization, as well as gaining social acceptance. These tests have been performed in varying environment, such as expressway, arterial roads and test facilities. Great advancements have been accomplished in the pilot areas with specific mention to the dynamic mapping area.

Hajime Amano concluded with an announcement and invitation to the 5th SIP-adus Workshop that will take place in Tokyo from November 13 to 15, 2018.

International Progress Toward Vehicle-Highway Automation

Session 546

Session Summary

- **Current Trends and National Police Agency (NPA) Initiatives regarding Automated Driving in Japan**

  Yuko Sano, National Police Agency, Japan

Yuko Sano of Japan's National Police Agency presented Japan's national strategy for autonomous driving. These strategies are established to reduce the annual number of casualties and to attain the safest road traffic in the world with an exposition of CAV at level 4 and above at the 2020 Olympics. Utilizing the Traffic Signal Prediction System (TSPS) and the Driving Safety Support Systems (DSSS) Japan encourages safe and eco-friendly driving with the use of traffic signal coordination and roadside sensors. It is through investment in smart infrastructure level 3 and 4 vehicles can be deployed to realize the benefits of CAV. To facilitate this deployment, a number of national and international legal issues must be addressed. Policies must be put in place to address not just the 1949 Geneva Convention, the Road Traffic Act, but also in defining level 3 and 4 activities that are permitted, ensuring automated driving (AD) system compliance, establishing penalties for AD violations, development of data recording and use from AD, and establishing interactions and communications with other users.

International Progress Toward Vehicle-Highway Automation

Session 546

Session Summary

- **France's VEDECOM Institute Developing New Mobility Toward Technological and Societal Revolution**

  Remi Bastien, Alliance Technology Development Technocentre Renault

VEDECOM is a French public private institute with a mission to advance electric vehicles, driving delegations and connectivity, and shared mobility. To achieve cross-border, autonomous, on-demand mobility, VEDECOM is advancing projects such as SCOOP, PACV2X, EVAPS, and AutoPilot. By advancing the goal of zero emission, zero fatalities, zero stress and zero persons left out, VEDECOM strives to translate these successes in environmental, safety, quality of life and equity benefits for all. Through the process of moving from target scenarios to data collection to safety validation and verification (simulation) to take over test, AD technology is being deployed to gain social acceptance.