BUREAU OF RESEARCH

# 2018 NJDOT TRB Roundtable Discussion

February 26, 2018





- 1. Introduction to TRB and the Annual Meeting
- 2. Education about how attend and get involved with TRB
- 3. Transfer of Knowledge
- 4. Open Discussion

TRB's mission is to promote innovation and progress in transportation through research.

- Established in 1920
- **Division of the National Research Council of the US** independent adviser to the POTUS, Congress, and federal agencies on scientific and technical questions of national importance.
- Jointly administered by the National Academies of Sciences, Engineering, and Medicine
- Annually engages more than 7,000 engineers, scientists, and other transportation researchers and practitioners from the public and private sectors and academia, all of whom contribute their expertise in the public interest by participating on TRB committees, panels, and task forces.
- **Funded by state transportation departments**, federal agencies including the U.S. Department of Transportation, and other organizations and individuals interested in the development of transportation.

### **TRB** Activities

- provide a mechanism for the exchange of information and research results about highway technology.
- undertake management of ad hoc research projects under the National Cooperative Highway Research Program
- conducts studies of national transportation policy issues
- management responsibilities for the Transit Cooperative Research Program,
- guidance of ongoing research programs such as the Long-Term Pavement Performance studies
- management of the Innovations Deserving Exploratory Analysis programs.
- new cooperative research programs in airports, freight, and hazardous materials transportation, and the second Strategic Highway Research Program.

# TRB Subcommittees & Benefits of Participating

- Over 200 committees, almost every transportation topic is represented
- Provide you with an opportunity to contribute to advancing the state of the art and the state of the practice in transportation.
- Visit **www.TRB.org/AboutTRB/Committees.aspx** for a list
- Contact the Chair to express interest and share your qualifications
- Become a "friend" of the committee. Membership requires a formal process, however participation in committee activities is not limited to members.
- Participate in committee meetings and conference calls
- Volunteer your time to review papers, work on committee projects, give presentations, etc.
- When a member space opens up, Chair looks at list of "friends"

## TRB Annual Meeting

Held every January in Washington, D.C. January 13-17, 2019

Registration opens late August (program finalized mid Nov)

Save

the

**Date!** 

One of the largest transportation conferences in the world,

• attracting almost 14,000 transportation professionals, featuring approximately 5,000 presentations in more than 800 conference sessions.

Virtually every aspect of transportation is covered at the conference.

# Benefits of Attending the TRB Annual Meeting

Benefit to you, NJDOT, and the transportation community at large

- Networking with colleagues and establishing professional relationships
- Broaden knowledge and perspectives
- Receipt of valuable and timely information about current practices
- Gain early awareness of new research findings and emerging technologies
- Assist NJDOT in contributing to the broader transportation community

### How do I attend the TRB Annual Meeting?

- Registration for NJDOT staff is FREE, but travel expenses are **NOT**.
- Registration opens in late August. To register, set up an account on www.mytrb.org
- Attendees must coordinate with their respective Managers and Directors to express interest in attending, and get permission.
- Travel expenses (transportation, lodging, per diem meals) must be planned for within each unit's own travel budget. **PLAN NOW**
- Stephanie Nock is NJDOT's TRB travel coordinator and manages the travel paperwork for all attendees.
- Emails and notifications about the event will start in late Summer
- Travel Packages are due to Stephanie early-mid October

### Your Travel Package Should Include:

- Permission from your Manager and/or Director
- Funds in your unit's travel budget for your travel expenses
- Registration confirmation from TRB
- NJDOT FORMS:
  - PB 141 Request for Travel Authorization
  - AD 270 Request for Attendance at Outside Event
  - AD 281 Request for Travel Authorization
  - AD 280 Request for Travel Exception
- List of sessions that you will be attending

The full TRB Annual Meeting program is finalized in mid-November, so you'll have to wait until then to pick your specific sessions

### Valuable Online Resources

• TRB <u>www.trb.org</u>

Explore all that TRB has to offer you as a transportation professional

• MyTRB <u>www.mytrb.org</u>

Register for TRB Annual Meeting here

• TRID Database <u>www.trid.trb.org</u>

>1M worldwide transportation research records (articles, conference proceedings, reports, books, research papers)

• RiP Database <u>www.rip.trb.org</u>

Helps prevent duplication of effort, lists current or recently completed transportation research

- NJDOT Research Library <u>http://www.state.nj.us/transportation/refdata/library/</u>
- NJDOT Technology Transfer <u>www.njdottechtransfer.net</u> Bureau of Research's new website - events, news, Lunchtime Tech Talks, STIC info, etc.
- NJ Transportation Research Ideas <u>www.njdottechtransfer.ideascale.com/a/home</u> Crowd sourcing platform for the intake of research needs and ideas

### Your Presenters Today:

- Traffic Operations
- Statewide Planning
- Environmental Resources
- Civil Rights & Affirmative Action
- Multimodal Services
- Capital Program Support
- Bridge Engineering & Infrastructure Management

Traffic Operations --Transportation Systems Management

> Sal Cowan Jon Martinez Jeff Rockower Ahsan Ali Saidul Islam









### & the future of transportation





NJDOT – Transportation Systems Management "Improving Lives by Improving Mobility"

### Findings from the Automated Vehicles Symposium 2017

TRB's Session # 129

**By: Salvatore Cowan** 

- 27 Countries, 43 States, 45% of Attendees from the Manufacturing Industry
- Four main topics:
  - Regulation
  - Trucking
  - Shared Mobility
  - Policy
- Kevin Dopart is FHWA ITS-JPO's primary POC for CV/AV



- 1<sup>st</sup> Speaker LA General Manager for Transportation
  - "LA Transportation Strategy" from 2016
  - Provide data as a service
  - Waze
  - GOLA app that combines multiple transportation service applications (MAAS)
  - 4500 Traffic Signals with 2-way communication is a carrot for those looking to do pilots



- 2<sup>nd</sup> Speaker from German University
  - Pegasus project research that has supported prototypes, pilots, and lab testing into products they're using in Germany
  - Research looking into the "Analysis of Scenarios" that vehicles in the AV/CV environment could encounter.



- 3<sup>rd</sup> Speaker from Britain DOT
  - FITS (Future ITS). Pillars of the program: Connected, Automated, Electric, Shared, and Pricing
  - HUGE amount of information CV/AV will require and inclusion of insurance industry
  - Britain DOT established a Data Board to understand what they have, how to use it and find the data gaps
  - Working to develop Connected Intelligent Infrastructure (CITS)
  - MAAS to be a focus in Britain
  - Pacing to spend \$250,000,000 on 51 CV/AV pilot/test programs by 2020



- 4<sup>th</sup> Speaker from RAND Corp
  - Focused on the regulations
  - Barrier to deploying certain AV's (lack of driver) but there are exemptions for limited use (exemptions only allow 2500 vehicles to use an exemption – limited testing)
  - New federal regulations (SELF DRIVE Act and AV START Act) increase # of exemptions OEM's can file for (up to 100,000 per year)
  - Regs will likely not be corrected at first...no way to demonstrate the safety prior to real-environment deployment
  - Learn to balance tradeoff between risk and information and don't wait for perfect technology, no such thing





NJDOT – Transportation Systems Management "Improving Lives by Improving Mobility"

**Sessions Attended** 

- 191 After the Hurricanes
- 203 Mobility of the Future
- 268 Competing Visions of Transportation's Future
- 354 Intelligent Transportation Systems: State of Industry 2018

#### **RTSMO** Connected and Automated Vehicles Submittee, AHB10(12)

- 476 Economic Benefits of Connected, Autonomous, and Shared Mobility
- 614 Connected and Autonomous Vehicle Sensory System Performance
- 675 Why You Will Own an Autonomous or Connected Vehicle Part 2
- 755 Connected and Automated Vehicle Systems in Complex Transportation
- 881 Vision Zero Evaluation Workshop

#### **By: Jon Martinez**

### Mobility of the Future

- Projecting Travelers into a World of Self-Driving Vehicles: Estimating Travel Behavior Implications via a Naturalistic Experiment
  - Georgia Tech
  - ITS UC Davis Institute of Transportation Studies
  - ITS Berkeley Institute of Transportation Studies
- With self-driving vehicles quickly approaching and governments racing to develop policies, how will fully autonomous vehicles impact travel and activity behavior?

Presenter: Jon Martinez



### Mobility of the Future

- Key Findings
  - 83% increase in VMT
  - Change in Activity Patterns
- Project Limitations
  - Resource Limitations
  - Context Limitations
  - Technology limitations

Presenter: Jon Martinez



#### RTSMO Connected and Automated Vehicles Subcommittee, AHB10(12)

- Eileen Singleton Baltimore Metropolitan Council
- AMPO's Connected & Autonomous Vehicle Planning Working Group
  - Comprised of 15-20 Core Members
  - Variety of backgrounds
    - Policy
    - Operations
    - Modeling
    - ITS
  - Three working group meetings and a fourth planned
    - April 2017 MPO Focused
    - August 2017 State DOT and MPO Focused
    - November 2017 Federal/State DOT and MPO Focused
    - Early 2018 Private Sector Focused

Presenter: Jon Martinez



#### RTSMO Connected and Automated Vehicles Subcommittee, AHB10(12)

- Blain Leonard Utah DOT
- AASHTO SPaT Challenge
  - DSRC RSU
  - 20 Signalized Intersections
  - 50 States
  - Year 2020
  - 7 projects 5 States March of 2017
  - 29 projects 19 States January of 2018
  - Resources
    - National Operations Center of Excellence Website
  - Next Steps?
    - Connected Fleet Challenge

Presenter: Jon Martinez





NJDOT – Transportation Systems Management

"Improving Lives by Improving Mobility"

# **Sessions Attended**

#### 191 – After Hurricanes

Critical Transportation Infrastructure Protection Committee Meeting **Physical Security Sub-committee Meeting** 

Information Systems in Construction Management Joint Sub-committee Meeting

461 – The Future of Transportation and Reliance on Knowledge Sharing Among Transportation Organizations

**Cyber Security Sub-committee Meeting** 

592 – Cybersecurity Challenges for Connected and Autonomous Vehicles: Fact vs. Myth

801 – What did the 2017 Solar Eclipse Teach Us about Resilience?

840 – Private Data and Public Interest: Access to Data for Understanding Transportation Network Company Impacts in Urban Areas

881 – Vision Zero Evaluation Workshop

**By: Jeff Rockower** 

#### After the Hurricanes

- Sparse supplies of IV bags
- Oversized trucks getting through toll roads
- InfraGuard Communication System

Presenter: Jeff Rockower



### Security – Physical & Cyber

- Physical security is not limited to bridges, culverts, and other key structures in our infrastructure
- Cabinets, controllers, and data centers
- Cybersecurity challenges what we are doing about it
- ITS Communications Redundancy Elmwood Park, Cherry Hill,
- Co-located Data Centers
- Following the NIST Cybersecurity Framework

Presenter: Jeff Rockower



### **CV/AV** Complexity

- Carputer and infotainment challenges for multiple computing systems
- Use of a flat computer network
- Landing on the moon 141,000 lines of code
- CV/AV millions of lines of code
- CV/AV Security
- Car Hacker's Handbook
  - http://opengarages.org/handbook/

Presenter: Jeff Rockower





NJDOT – Transportation Systems Management

"Improving Lives by Improving Mobility"

# **Sessions Attended**

#### 194 – Selecting Your Sector

### 285 – Maintenance and Operations Workforce: Assessing the Effects of Technology and Demographics

354 – Intelligent Transportation Systems: State of the Industry 2018

#### 547 - Diets, Diamonds, and Daring New Ideas for Intersections

611 – Using Decision Support Sybsystems to Automate the Use of Traffic Operational Strategies and Control Plans

585 – Six-Minute Pitch

686 – Traffic Signal Timing for Multimodal Operations

819 – Drivers Behavior as a Function of Their Characteristics and the Driving Environment

Regional Transportation Systems Management and Operations Committee

881 – Vision Zero Evaluation Workshop

Misc – Next Step in Automated Vehicles

#### By: Ahsan Ali

#### Maintenance and Operations Workforce: Assessing the Effects of Technology and Demographics

- 1<sup>st</sup> Speaker: Utah DOT
  - Discussion about training their employees as the sector evolves
  - Problem started with retention, and it wasn't Millennials that were an issue, it was Maintenance
  - Estimated cost of overturn: \$17, 492
    - Including Safety, Training, Interviews, etc.
  - Safety risk is greatest in first year
  - Physically, emotionally, mentally happy staff perform better
- 2<sup>nd</sup> Speaker: University of Wisconson
  - Surveyed Maintenance about Technology Basis
    - Early days of Internet, GIS, microprocessor, computer modeling, etc.
  - Automation will take time to adjust
  - Controlled environment: such as connected vehicles enable growth
  - · Obstacles are uncontrolled or unknown environment

Presenter: Ahsan Ali



#### Daring Ideas in Intersection Design



Presenter: Ahsan Ali



### Vision Zero Workshop

- What is it?
  - Project that aims at no fatalities or serious injuries involving road traffic.
- Workshop format: think tank strategies & idea sharing
- Vision zero presentations and ideas discussed:
  - Road Diet
  - Traffic calming
  - Expanded public education
  - Better enforcement
- Practice at NJDOT
  - Local aid funding available for cities looking to participate in Vision Zero
  - Engineers should take mitigation measures into account for each project

Presenter: Ahsan Ali



#### Next Step in Automated Vehicles



Presenter: Ahsan Ali





NJDOT – Transportation Systems Management

"Improving Lives by Improving Mobility"

# **Sessions Attended**

Advanced Traffic Signal Performance Measure (ATSPMs) Innovation in Control Delay Calculation Work Zone Lane Capacity Proactive Signal Control Systems for Congestion Mitigation on Arterial **By: Saidul Islam** 

#### Advanced Traffic Signal Performance Measure (ATSPMs)

- At present the existing ATSPMs are focused on the performance of performance of individual movements or intersections
- A need for system level metrics has emerged
- Purdue U researchers developed a method for evaluating corridor performance at the system level using high-resolution data
- This method develops five sub scores for the areas of communication (percentage of intersection online)
  - Detection
  - Safety (Rate of red light violation)
  - Capacity allocation (split failure)
  - Progression (platoon ratio, v/c ratio)

Presenter: Saidul Islam



#### Advanced Traffic Signal Performance Measure (ATSPMs)

- Several shortcomings of the tool are a lack of data quality control and the extent of resources required to properly use the tool for system-wide management
- To address these shortcomings, Iowa State, Portland State, and Northern AZ U collaboratively performed a research which looked interesting to me
- They presented ITSPMs, using the concepts of machine learning, traffic flow theory, and data visualization to reduce the operator resources needed for overseeing data driven signal management systems

Presenter: Saidul Islam


### **Innovation in Control Delay Calculation**

- Purdue and UDOT developed a method for computing control delay using commercial probe vehicle trajectory data
- To identify relevant data for the study, virtual detection box were defined between eight signalized intersections along a corridor in Utah
- The method they developed will allow agencies to scale travel time studies cost-effectively

Presenter: Saidul Islam



### Work Zone Lane Capacity

- Short term work zones have a significant effect on the capacity of signalized intersections
- HCM methodology incorporates a reduction factor which was based on a study done by some researchers in 2012
- This study done by NYU prof Elena Prassas found that current HCM methodology underestimates capacity when estimating capacity at work zones

Presenter: Saidul Islam



#### Proactive Signal Control Systems for Congestion Mitigation on Arterial

- The system utilizes connected vehicles to accurately predict the volumes entering the intersection through different movements
- The optimal signal is bases on a short-term prediction of total delay at the intersection
- For three consecutive intersections, the system was able to reduce the average vehicle stop delay up to 49%

Presenter: Saidul Islam



### THANK YOU!!

#### FROM: TRANSPORTATION SYSTEMS MANAGEMENT



NJDOT – Transportation Systems Management "Improving Lives by Improving Mobility"

# Statewide Planning

### Tom Houck



## TRB 97<sup>th</sup> 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



- 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**



# 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?**



## **Organization Structure**



Right of Way Negotiator Trainee

Secretarial Assistant 3

Technical Assistant, MIS

STATE OF NEW JERSEY

**CIVIL SERVICE COMMISSION** 



COLORADO

**Department of Transportation** 

## ...Impact on FUNDING\$\$\$\$



## Where are Transportation Agencies Going?



## **Develop A CAV Vision**



## **Plan for Attainable CAV Benefits**





**FATALITIES** 

PERSONS LEFT OUT

**EMISSION** 

STRESS

## **Social Acceptance**



## Collaborate









European Commission









## 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

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.

#### • 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.

• 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.

### • 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.

#### • 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

Plan mpact a n s d(

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.

### **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.

### **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.

### **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

Session 2/1

**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?

### **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

Session 2/1

### **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.

Session 2/1

### **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

Vhere :

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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.

Vhere :

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• 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. <u>Nhere</u>:

#### • 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.

Where r

#### • 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 329

Where f

• Perspective from a Transit Director

Gary Thomas Dallas Area Rapid Transit (DART)

This portion of the session was not included.

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#### • 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.

Session 329

where

# Monday, January 8, 2018

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

## **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

#### **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.

#### **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.

#### **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 doorto-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.

#### **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.

#### **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.

• 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

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.

• 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.

 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.

 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.

• 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.

#### • 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

#### **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

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.

 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.

Session 546

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

#### **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 5<sup>th</sup> SIP-adus Workshop that will take place in Tokyo from November 13 to 15, 2018.

#### **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.

#### **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.

## Bureau Research

Mac Rashid (Local Aid) Giri Venkiteela Pragna Shah Carol Paszamant



# Presentation on 2018 TRB Annual Meeting

By Mac Rashid Local Aid and Economic Development

## Optimizing Work Zone Lighting (Session 384) Poster Presentation

- Recognized by AASHTO Research Advisory Committee as high value research in safety and maintenance section
- The objective of this project is:
  - to investigate the visual needs of workers and drivers in work zones, and the technical performance of new technologies and approaches for improving visual effectiveness while reducing glare and visual chaos

#### Optimizing Work Zone Lighting (Session 384)

Mamun Rashid<sup>1</sup> and John D. Bullough<sup>2</sup>

<sup>1</sup>New Jersey Department of Transportation, Trenton, NJ; <sup>2</sup>Lighting Research Center, Rensselaer Polytechnic Institute, Troy, NY

#### Introduction

Work zones are inherently complex and confusing visual environments, where the usual patterns of traffic flow are perturbed, and where lights used by workers for task visibility can create glare not only to workers but to nearby drivers. The use of delineation and signage, in addition to warning lights that may be flashing, can all contribute to "visual chaos."

The New Jersey Department of Transportation (NJDOT) commissioned the present study to address and begin to overcome these issues. The objective of the present study was to identify the needs of workers and drivers in different work zone environments, and to review existing knowledge about ways in which lighting practices and technologies can be deployed to provide workers with sufficient illumination while minimizing glare and confusion to all individuals in and near the work zone.



Visual performance values for one of the tasks performed by workers at work zones, as a function of light level (illuminance) and task contrast.



Balloon lights can provide adequate illumination for task visibility while substantially reducing glare for workers and drivers in and near the work zone.

	10-10-10-10-10-10-10-10-10-10-10-10-10-1	one of the operation	
New Jersey Department	of Transportation	willing willing	Slow-moving operations include painting, road surface patching.
Bureau or Research		and snow plowing, where	
Technical Brief		reduced speeds.	
Optimizing Work Zone L	ighting	Humination Systems	
This prejact investigated the visual needs of workers and drivers in work somes, and the seclosical		Vehicle Mouries Light Towers	<ul> <li>Not recommended, game can be problemate and light levels.</li> </ul>
performance of new sectorologies and approaches for improving visual effectiveness while reducing given and visual closes. This Technical Brief summittes the vestor higher and maffer control guidelines; for zeroral different scenarios, based on the findings from this study.		Vehicle-Mounted Balloon Lights	For increment, provide 1 flootuardle 15 feet ahead of slow moving equipment and 50 feet ahead of face-moving equipment Votel tasks such as inspection of parement for defects may require higher floorinarioss of al least 6 dottamiles.
Long Term, Stationary Projects		Use equation on reverse to estimate illuminance	
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- period of several weeks or			<ul> <li>Peak intensity of 200 candelas (affective intensity of 140</li> </ul>
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x x 8 8 8			<ul> <li>Oneen lights equipped with dimming for give control</li> </ul>
Resident and Andrews		Emergency Incidents	
Portable Trailer-Mounted Light Towers	<ul> <li>110 foot spacing provides 5 footcandles of illumination within two traffic lanes.</li> </ul>	Emergency roadway situations include motor vehicle accidents, fallen power lines or trees where time for planning is unavailable.	
Balloon Lights	<ul> <li>Distance (D. feet) at which illuminance (E. footcandies) is</li> </ul>	T a D Revisio	of Systems
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Semi-Permanent High Mast Lighting	<ul> <li>Used for projects of several months duration</li> <li>Streament property of several 125 fast post our side</li> </ul>	Compared Seasons	<ul> <li>Consider driving and switching of fashing lights if multiple witicles, are present</li> </ul>
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Signage and Delineation		11 Barrison	Use Type 8 harricade lights     Use Type 8 harricade lights
ordin prevening women and	<ul> <li>Agitte type III sufficient in most conditions, type IV or XI for very bright, complex visual environments.</li> </ul>	- Plans	<ul> <li>Use fares or other warring devices intaily</li> </ul>
	<ul> <li>Increased fort size (*I inches) for legibility at longer distances</li> </ul>	For More Information:	
Barricades and Barrels	<ul> <li>ASTM Type I sufficient in most conditions; Type IV or XI for</li> </ul>	Autor Proper Manager	Manue Kashki
Warning Lights	WED SC OF DRIVING		505 500 (25)
All Flashing Lights	<ul> <li>"High-low" Rashing rather than "on-off" should be used</li> </ul>	Principal Investigations	Att D Bullout and Mark 5 Rea
Venice-Mourned Beacons and	<ul> <li>Peak intensity at least 100 candelos (effective intensity 430</li> </ul>		Lanted Resorts Center, Ranspedier Roylectric, Addute
	<ul> <li>Peak intensity of 200 candelas (effective intensity of 140</li> </ul>		50000 45 81000 45
	candelas) for nightime visibility	A final report is available online a	at http://www.state.nl.up/transportation/refdata/research/.
Environte Lobie	Orean tights equipped with christing for glare control	If you would like a copy of the ful	I report, send an e-mail to: Presearch Ibureau@dot.state.rt.us
	<ul> <li>Sequential fashing for lane closure tapers</li> </ul>	Optimizing Work Zone Lighting	a NJDOT Research Report No: NJ-2016-004

Project findings were converted into preliminary guidelines for lighting and traffic control in different work zone situations, including long- and short-term operations.

#### Conclusions

Following a literature review of recently published information on lighting and traffic control in work zones, and a questionnaire of safety engineers, technical analyses of illumination systems, signage and delineation materials, and warning lights were undertaken. The results of the technical analyses led to the development of several preliminary guidelines for illumination system selection/layout, application of sign and delineation devices and materials, and the use and control of warning lights to provide workers and nearby drivers with visual information in work zones. Implementation of the preliminary guidance in the present report can assist NJDOT in improving visual conditions in several different types of work zones through lighting that maintains visual performance while reducing glare and distraction from excessively bright lights.

#### Acknowledgments

The authors gratefully acknowledge support from the New Jersey Department of Transportation (NJDOT) and the Federal Highway Administration, and from the University Transportation Research Consortium (UTRC) of the City University of New York, for conducting this study. Robert Cassiello, Anthony Pellegrino, Robert Zydorski and Angelo Nucci from NJDOT provided very useful input throughout the project. Camille Kamga and Penny Eickemeyer from UTRC assisted in project management and administration. Mark Rea, Nicholas Skinner and Timothy Plummer from the Lighting Research Center also made important contributions to this study.






## Long Term, Stationary Projects

Illumination Systems		
Portable Trailer- Mounted Light Towers	• 110 foot spacing provides 5 footcandles of illumination within two traffic lanes	
Balloon Lights	• Distance (D, feet) at which luminance (E, footcandles) is produced by a balloon light with a light output (L, lumens) and a mounting height (H, feet) can be estimated by: $D = \sqrt{\frac{18L}{250E} - \frac{H^2}{2}}$	
Semi-Permanent High Mast Lighting	<ul> <li>Used for projects of several months duration</li> <li>Staggered arrangement spaced 320 feet apart per side provides 10 foot-candles along six traffic lanes</li> </ul>	
Signage and Delineation		
Sign Sheeting Materials	<ul> <li>ASTM Type III sufficient in most conditions; Type IV or XI for very bright, complex visual environments</li> <li>Increased font size (&gt;8 inches) for legibility at longer distances</li> </ul>	
Barricades and Barrels	• ASTM Type I sufficient in most conditions; Type IV or XI for very bright, complex urban environments	

## Long Term, Stationary Projects contd..

Warning Lights		
All Flashing Lights	"High-low" flashing rather than "on-off" should be used	
Vehicle-Mounted Beacons and Lights	<ul> <li>Peak intensity at least 600 candelas (effective intensity 430 candelas) for daytime visibility</li> <li>Peak intensity of 200 candelas (effective intensity of 140 candelas) for nighttime visibility</li> <li>Green lights equipped with dimming for glare control</li> </ul>	
Barricade Lights	<ul> <li>Type A for rural environments; Type B for urban locations</li> <li>Sequential flashing for lane closure tapers</li> </ul>	

## **Slow-Moving Operations**

#### **Illumination Systems**

Vehicle-Mounted Light Towers	• Not recommended; glare can be problematic and light levels excessive	
Vehicle-Mounted Balloon Lights	<ul> <li>For movement, provide 1 footcandle 15 feet ahead of slow moving equipment and 50 feet ahead of fast-moving equipment</li> <li>Visual tasks such as inspection of pavement for defects require at least 5 footcandles</li> </ul>	
Signage and Delineation		
Barrel Wrap (if used)	• ASTM Type I sufficient except in most brightly illuminated, complex urban environments	
Warning Lights		
Vehicle-Mounted Beacons and Lights	<ul> <li>Peak intensity at least 600 candelas for daytime visibility</li> <li>Peak intensity of 200 candelas for nighttime visibility</li> <li>"High-low" rather than "on-off" flashing should be used</li> <li>Green lights equipped with dimming for glare control</li> </ul>	

## **Emergency Incidents**

Illumination Systems		
Vehicle Headlights	• Direct away from oncoming traffic	
Signage and Delineation		
Traffic Cones	• Use devices with ASTM Type IV or XI sheeting	
Warning Lights		
Vehicle-Mounted Beacons	<ul> <li>Consider dimming and switching off flashing lights if multiple vehicles are present</li> <li>Use "high-low" rather than "on-off" flashing</li> </ul>	
Barricade Lights (if available)	<ul> <li>Use Type B barricade lights</li> <li>Use sequential flashing to indicate lane closure</li> </ul>	
Flares	• Use flares or other warning devices initially	

## A Collection of Roundabout Topics: Safety, Design, and Operations



## **Safety of Roundabout: The Details Matter**

By University of Louisiana, Lafayette

- Louisiana currently has 30 roundabouts in operation and hundreds of roundabouts in the planning and designing stage.
- This study investigates 19 roundabouts performance
- Significant reduction in injury crashes because of lower operating speed, reduced right-angle collisions, and elimination of head-on and left-turn crashes.

• Based on the changes in the number of conflicting points and traffic control method, roundabout is the biggest and most consistent safety improvement



## How Do Roundabout Entry Design Parameters Influence Safety?

Transport Research Centre (CDV), Czech Republic

- Most Czech roundabout crashes were found to occur on entries.
- This study comprised three analyses: crash-based safety performance functions, speed analysis, and finally safety performance functions which incorporated speed.
- All three analyses proved that entry design parameters have a statistically significant influence on safety, in terms of crash frequency, severity and speeds

## Investigating Driver Yielding Behavior at Roundabout Approaches

University of Wisconsin, Madison

- In order to investigate the effects of pavement markings on yielding, a survey was conducted.
- The word "YIELD" provided the largest variance in yielding locations.
- When a pedestrian crosswalk was present, participants chose to yield at the pedestrian crosswalk between 38% and 50% of the time regardless of pedestrians' presence.

 When "shark teeth" pavement marking were present participants yielded approximately five (5) feet further upstream than scenarios without.

 The results suggest drivers yield in different locations depending on different pavement marking configurations at roundabout approaches, which may influence the number of rearend collisions.



## Safety Performance Analysis of Roundabout Interchanges in Missouri

University of Missouri, Columbia

- This presentation describes a safety performance study of roundabout terminals
- A significant data undertaking involved the review of 1,681 individual crash reports for 13 roundabout terminals.
- The study showed single-lane roundabouts replacing stop-controlled ramp terminals reduced crashes by 32.8%, 23.1%, and 24.4% for Fatal and Injury (FI), Property Damage Only (PDO), and Total (TOT) crashes, respectively.

• The results were not as high as the safety benefits of roundabout intersections.

• Dual-lane roundabout ramp terminals, as an aggregate, showed an increase in crashes of 28.8% in FI, 33.6% in PDO, and 33.3% in TOT crashes

 In a separate presentation by the City of Hilliard, Ohio showed crash rate has been increased by implementing dual-lane roundabouts • The reason behind the crash rate increase in dual lane roundabout is driver's lack of knowledge about markings and exiting the roundabouts



## **Bicycle and Pedestrians Committee**

- Attended two committee meetings
  - Bicycle Committee
  - Pedestrians Committee
- The purpose was to get an idea what new technologies/ methods are available to reduce bicycle and pedestrian crashes
- The committee members presented brief presentations for each of the sessions/ workshops they were presenting at TRB 2018

### **Takeaways for NJDOT**

- The poster presentation was a good representation of NJDOT to the nation
- Learned more about roundabouts and its implementation
- 2X2 lanes roundabouts seems difficult for the drivers to maneuver
- As a result of that, crash rates are higher than the signalized intersection
- If designed properly, 1X1 and 2X1 lanes roundabouts are the safest intersection design
- Attending Committee meetings allowed me to learn more about different successful practices

# Giri Venkiteela, PhD Bureau of Research

#### TRB Committee Member-2

Polymer Concretes, Adhesives, and Sealers Committee AHD40

**Corrosion Committee AHD45** 

Presentations attended-28

Lectern Session 271 Impact of Connected and Automated Vehicles on Transportation Forecasting and Planning

- 1. Starting Points for CVAV Planning: What Is Known and What Is Unknown
- 2. Modifying the Planning Process for Colorado DOT and Connected and Automated Vehicles
- 3. Investigative Efforts to Address the Impact of CAV on Transportation Forecasting and Planning in Florida
- 4. Connected Vehicles Versus Automated Vehicles: Changes That Need to Occur in the Planning Process to Help Manage the Changes Ahead
- 5. City-Level Efforts to Prepare for Connected and Automated Vehicles
- 6. Austin to China and India: Illustrating the Spectrum of Mobility Paths Off Oil and Carbon

#### Lectern Session 406 Planning for a Future with Autonomous and Connected Vehicles

1. How Autonomous Driving May Affect the Value of Travel Time Savings for Commuting

2. Shared Mobility Versus Private Car Ownership: A Multivariate Analysis of Public Interest in Autonomous Vehicles

3. The Impact of Private Autonomous Vehicles on Vehicle Ownership and Unoccupied VMT Generation

- 4. Impact of Ridesharing on Operational Efficiency of Shared Autonomous Electric Vehicle Fleet
- 5. A Model of Ridesourcing Demand Generation and Distribution

#### Lectern Session 479 Proven Performance of Concrete Overlays: Part 1 (Part 2, Session 541)

 Performance of Concrete Overlays on Illinois Interstates: 1967 Through 2016
 A Tale of Two Pavements: Forensic Investigation of an Unbonded Concrete Overlay and a Concrete Pavement Reconstruction on I-40 near Flagstaff, Arizona
 A Long-Term Performance Evaluation of an Experimental Concrete Overlay
 Comparing the BCOA-Me Design Procedure and the Short Jointed Plain Concrete Pavement Module in the Pavement Me Design Procedure

#### Lectern Session 549 Corrosion Determination and Prevention for Infrastructure Preservation

#### **1.** Duplex Zinc Coatings for Corrosion Protection of Steel Structures

2. Corrosion Resistances of Steel Pipes Coated with Two Types of Enamel in Electrostatic and Wet Spraying Processes

3. Influence of Bridge Deck Cracking on Corrosion Initiation of Corrosion-Resistant Reinforcement

4. Simulation of Corrosion of Galvanized Steel Under Accelerated Conditions

Lectern Session 605 Sustainability and the Use of Recycled Materials

1. Sustainability of Using Recycled Concrete Aggregates in Concrete Pavements

2. Use of Reclaimed Asphalt Pavement Aggregates in Portland Cement Concrete for Pavement Application: A Critical Overview

3. Evaluation of Selected Durability Properties of Portland Cement Concretes Containing Ground Glass Fiber as a Pozzolan

4. Investigation of Engineered Cementitious Composite for Culvert Repair

Lectern Session 841 Machine Learning Methods for Crash Prediction and Safety Analysis

1.Beyond Grand Theft Auto V for Training, Testing, and Enhancing Deep Learning in Self-Driving Cars

2. Classification of Distracted Driving Based on Visual Features and Behavior Data Using a Random Forest Method

3. An Improved Deep Belief Network Model for Road Safety Analyses

4. Mobile Sensing and Machine Learning for Identifying Driving Safety Profiles

5. Adaptable Advanced Driver Assistance Systems (ADASs)

#### Presentation given

Corrosion Committee AHD45 Wednesday, 8:00 AM - 12:00 PM, *MM Scarlet Oak (Mezz)* 

**NJDOT** Research Project Presentation -Giri Venkiteela

Evaluation of different paints systems for Over-coating exiting Structural Steel



Cyclic Weathering Test-Chamber used for Accelerated Testing



20 Millimeter Pull Off Dolly: After Pull Off Test



20 Millimeter Pull Off Dolly: Over Coat Paint Removed After Pull Test

#### The project was well received by the FHWA and other States.

*Currently in conversation with FHWA office of infrastructure research and development for collaboration.* 



## key takeaways.....

- 1. Autonomous vehicle transportation planning and effects needs to be studied for NJ
- 2. Autonomous vehicle updates and knowledge should research out to local level for complete readiness of the technology and public interest needs to be evaluated
- 3. Regular reports regarding our infrastructure condition and materials can help to prevent failures
- 4. Advanced coatings (zinc) can help infrastructure from corrosion which can save maintenance costs
- 5. Usage of the recycled materials in roadway construction can be a potential alternative. NJDOT need more exposure regarding these type of materials
- 6. Advanced safety models needed for accurate crash prediction on our roadways. This will eventually help us to systematic improvements of our roadways



7. Not only in the history but even today NJDOT focused on many new technologies and materials development. But we need to promote more aggressively our own research to national level. And TRB annual meeting is the excellent platform for this purpose

# Thank you for your attention



## TRB Overview Pragna Shah

February 26, 2018



### Sessions Attended

- Creating a Culture of Innovation
- Vision Zero at a Crossroads: Identifying Challenges and Developing Partnerships to Eliminate Traffic Deaths in the United States
- Diets, Diamonds, and Daring New Ideas for Intersections
- Zero Traffic Deaths: How Close Can We Get? What Will It Cost?
- Corrosion Committee
- Lessons Learned from Roundabout Implementation



#### Vision Zero at a Crossroads: Identifying Challenges and Developing Partnerships to Eliminate Traffic Deaths in the United States

What is Vision Zero?





#### Equity and Vision Zero: Portland Bureau of Transportation

Speed impacts the severity of a crash. A person walking struck by a person driving 40mph is eight times more likely to die than one struck by a person driving at 20 mph.



DEATH DUE TO SPEED

U.S. DEPARTMENT OF TRANSPORTATION, LITERATURE REVIEWED ON VEHICLE TRAVEL SPEEDS AND PEDESTRIAN INJURIES. MARCH 2000. http://www.nhtsa.gov/about.nhtsa/traffle.techs/ current/literature.reviewed.on.yphicle.travel.speeds.and.pedestrian+injuries

In a city where people walking make up a disproportionate number of traffic deaths, slowing speeds is critical. Getting there will take a suite of policy, infrastructure, education, and enforcement actions.





- A 25 member Vision Zero Task Force: Strong Commitment to advancing equity
- Enforcement (Tightly focused tools)
  - No increased enforcement by officers
  - Focus on existing resources on most dangerous behaviors
  - Prioritize street design instead
- Community Engagement
  - Contracting with community groups
  - In language education



### Road to Zero

Vision: Keep people safe on the road every day

Mission: To reduce injury and death due to motor vehicle crashes and promote safe travel

How We Get to Zero:

- Double down on what works
- Accelerate Technology
- Change the Culture

Road to Zero Safe System Approach:







#### Key Takeaways:

- With consistent implementation, we can make an impact on the number of lives lost
- Need to pay attention to equity and prioritize equity
- Important to involve stakeholders and the community
- Critical role for data
- Role for Researchers in evaluation and monitoring

TRB 97<sup>th</sup> Annual Meeting Jan 7-11, 2018

# **Presentations, Meetings, and Workshops Attended**

Carol Paszamant – NJDOT Research Library

# Reminder from last year: Why are librarians at TRB?



Learning, for . . .
 Improving access to research
 Presenting and coordinating

## What did I attend?

# Meetings!



- ∞ Library & Information Science for Transportation (LIST) Committee
- •• TRB Information Services Committee
- Transportation Research Thesaurus (TRT)
   Subcommittee



 "Competing Visions of Transportation's Future" / Rachael Nealer, USDOT; Lewis Fulton, UC-Davis; Joan Walker, UC-Berkeley; Ken Laberteaux, Toyota Research.
 This session explored varying perspectives of where transportation is heading with an emphasis on energy consumption:

Disrupting trends/the 3 Revolutions: automation, shared mobility, and electrification - won't solve congestion or necessarily change human behavior. Bottom line: need changes in policy and more systems thinking.

# Sessions (continued) –

 "The Future of Transportation and Reliance on Knowledge Sharing Among Transportation Organizations" / Jack Polczywa, SAE International; Eric Rensel, Gannett Fleming; Thomas Kern, AASHTO.
 Session focused on structural challenges in the sharing of knowledge essential for advancing the safety, mobility, and environmental goals of the transportation industry.

Bottom line: Collaboration is essential; methods include development of resource centers and standards, streamlining of metadata, interactive and innovative peer exchanges, and creative knowledge capture methods. KM needs champions.



 "Humanizing Highway landscape Design" / Zhonghua Wei, Beijing University of Technology; Yuntian Fu, Tongji University; Karen Van Citters, Van Citters Historic Preservation, LLC.

Session looked at human perception characteristics of the highway roadside environment.

Bottom line: Monotonous landscape can cause fatigue and drowsiness. Van Citter's *A Brief History of Trees* was most engaging.

(one more . . .)
#### Last session -

 "Tools for the Zombie Apocalypse: Avoiding the Brain Drain in Transportation Organizations" / Leni Oman, Washington State DOT; Dr. Donna Cuomo, Mitre Corp; Frances Harrison, SpyPond Partners; Benjamin Pecheux, AEM Corporation.

**Results of research:** 

NCHRP Project 20-104 > NCHRP Report 867:

Keeping What You Paid For—Retaining Essential Consultant-Developed Knowledge Within DOTs

NCHRP 20-103 > NCHRP Research Report 865:

Guidance for Development and Management of Sustainable Enterprise Information Portals

### The Coordinating:

#### **Presentation of Poster:**

#### Attention: AASHTO Committee Members:

**AASHTO Digital Publications** - Before you download .... (Don't!!)



For AASHTO Committee members notified of new digital publications with download/"purchase" instructions -

#### Abstract

Given all the confusion since AASHTO started providing their publications to state DOTs in digital format, and given the complexities of the download process, the limit of one free download per institution, and the need for DRM account login and password to open such documents, the credentials for which, once used, cannot be transferred to another account, it would therefore be helpful for state DOT libraries to inform their organizations of the best practice of letting their department library download these publications so that access can be predictable and consistent for all such publications.

#### Who?

AASHTO Committee Members who receive email notifications of new digital publications your agency receives as part of its AASHTO State DOT membership.

#### What?

#### Let Your Library Register First!



Let your Library do the Downloading!!

#### Why?

- Consistent login access to digital publications.
- ✓ No need to find the "owner" who originally did the download to get their credentials.
- ✓ Document storage and ease of retrieval.
- ✓ Reliable notification of new publications.
- ✓ Save your time, and your and your coworkers' sanity!
  - Time of downloading.
  - Time of figuring out what to do with the document -
  - Time to notify others –

#### What Happens If I Register It?

 The promotion code to register the complimentary publication can only be used



#### ONCE.

publication can only be accessed within your organization using YOUR

Once a publication has been registered, it can't be transferred to another owner (like the library).

If you download, you're responsible!!!

#### **No Library or Librarian?**

Your state DOT may already have a Designee who is responsible for registering, downloading, saving and archiving a copy.

Not sure who it is? Ask the AASHTO Publications Department, your agency's **Director's Office or Research Division** Administrator.



#### More Information



- Renée McHenry, Transportation, Librarian, Missouri DOT, 573-522-
- 1948, email renee.mchenry@modot.mo.gov
- John Cherney, Wisconsin DOT Library, 608-264-8142, email
- john.cherney@dot.wi.gov Karen Waters, Technical Reference Librarian, Illinois DOT, 217-782-6680, email Karen.Waters@illinois.gov
- UBLICA IONS

#### And Handout:

#### AASHTO Digital Publications LibGuide http://guides.libraryconnectivity.org/aashtoepubs

#### **Basic Information – From AASHTO's Publications Department**

ASITIO	Digital Fublications. Dasic mornation	Geardy this Guide	Searc	
is LibGuide sh	ares information in one place on suggestions for how state DOTs can manage the AASHTO E-Publications process. Prepared b tation with AASHTO's Publication Department	by a member of the Midwest Transports	ation Knowledg	
work in consul	auton with AASHTO'S Publication Department.			
Basic Informa	tion State DOT Best Practices			
atest News				
01-03-2018	AASHTO announced availability for purchase of print or single user PDF copies of subject compilations for 2017 Materials Book. This is outside the complimentary publications program for state DOT members.			
11-30-2017	Updated historical transmittal spreadsheet			
11-20-2017	Uploaded revised Access Instructions for Missouri DOT (staff can now install FileOpen software using MoDOT's Software Center; does not require administrative access to a PC)			
10-24-2017	Uploaded IDOT Library Intranet page, LA DOTD LTRC Shared Drive Instructions, and MnDOT Deputy Commissioner email to staff			
October	Updated Registration information to include issues encountered when another staff member registers for a publication before the library (or designee) does			

#### FAQs

- FAQ Complimentary Copies Distributed to AASHTO Members (July 2017)
  Prepared by AASHTO Publications Department
- AASHTO Bookstore Web-Based Publications
- AASHTO Bookstore PDF Downloads
- AASHTO Publications Editorial Calendar Includes listings of formats (like 5 print + 5-user digital license)
- Sign-up to receive monthly newsletter-AASHTO Publications Update
- WE Example Distribution Notification (Sept. 2015) This may be too old. See more recent screenshots on State DOT Best Practices page.

AASHTO Digital Publication Releases 2016 to Date - updated 1-3-18
 Lists in release date order all titles published since 2016. The list can be filtered to show which titles must be registered for by member agencies before the 12-month registration period expires.

#### Pending Registration Expirations for the Rest of 2018

Guide Specifications for Wind Loads on	Evelope Didigo 40	
Bridges During Construction, 1st Edition (GSWLB-1-UL)	Expires 2/1/2016	
Construction Handbook for Bridge Temporary Works, 2nd Edition (CHBTW-2-UL)	Expires 2/21/2018	

#### Guide Authors/Contacts

Renee McHenry Transportation Librarian Missouri Department of Transportation View Profile



Erin K. Grady Director of Publications Production (202) 824-8182 egrady AT asshto.org

MTKN



### **More Information**

#### Available from:

∞ *TRB* /

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∞ NJDOT Research Library

"You wiedge-sharing partner"



### Multimodal

### Ashwin Patel Genevieve Boehm-Clifton



#### Summary of Aero Sessions Attended

#### Unmanned Aircraft Systems

- Stating the Initiative: Aviation Programs, funding, support, and Developments Among States
- Current Trends in Aviation System Planning, System performance and Resiliency
- Essential Elements for Airport Operations: Pavement Repair, Aircraft Arresting, and Anti-Icing

#### Unmanned Aircraft systems

- Focused on how UAS are currently used for various infrastructure monitoring/inspections
- Various Research efforts by FAA and States

## Stating the Initiative: Aviation Programs, funding, Among States

- Traditional airport improvement programs from federal and state sources, including block grants, and identify reform where improvement can be made.
- Identify innovative state programs for airport and aviation development funded

#### **Current Trends in Aviation System Planning**

- Focused on current trends in aviation system planning with a particular focus on performance measures, system resilience, and disaster planning and preparedness.
- The primary purpose of airport system planning is to study the performance and interaction of an entire aviation system to understand the interrelationship of the member airports
- The airport system planning process should be consistent with state or regional goals for transportation, land use, and the environment.

#### **Essential Elements for Airport Operations**

Focused on Pavement Repair, Friction, Marking, Aircraft Arresting, and Anti-Icing

#### Take Aways

- Use of NJDOT materials for General Aviation airports with design load less than 30,000 lbs for about 20% cost savings
- Add Airport Inventory and Capital Improvement Management Tool in next NJ state aviation system plan. The tool to be developed can be cloud based or website hosted with secure access for airport sponsors to their facility site and NJDOT staff to the entire database. Airport sponsors, their designated consultants and NJDOT will be able to update database information in real time.

### Summary of Maritime Sessions Attended

- Where to Go with Transportation Taxes? Past evidence and future visions
- Emerging Technologies: The role of LIDAR and Unmanned Aerial Systems in supporting the transportation spatial information infrastructure
- Transportation Agency Data Governance and Open Data Efforts
- Freight Systems and Marine Transportation Work in Progress (Poster Session)
- Marine Safety and Human Factors Committee Meeting
- A Comparison of Existing and Potential Ferry Services in Norway, Australia and Washington DC
- Freight Day 1: Making Short Haul Intermodal Work
- Improving Ferry Operations and Planning with Digital Information

### Take Aways

- Freight related presentations seemed a bit pedestrian compared to the work that NJ does in relation to the Port of New York & New Jersey as well as Delaware River ports
  - > A TRB focus on large-scale marine highway initiatives would be of value; less academic analysis
- Use of LIDAR and Drones in transportation planning could also be well-represented by NJDOT
- Open data sharing efforts focused more on "how-to" and less on what really matter to OMR which is more of the Policy related implications
- Ferry presentations were of greater value and interest, in particular aspects of:
  - System integration
  - > The importance of modern terminal services and how and why they matter
  - Development of multimodal terminals and the development of practical opportunities
- Use of data and technology in the build-out of the NYC Ferry service was educational and of interest
- Of most value was attendance at the Marine Committee meeting for information sharing, exchange of perspective and knowledge, and meet/greet
  - Management level perspectives and presentations would be a robust addition to the overall Program

### **Environmental Resources**

Chirag Patel Caroline Birsner Lauralee Rappleye



## 2018 TRB ROUNDTABLE: BUREAU OF ENVIRONMENTAL PROGRAM RESOURCES

Monday, February 26, 2018

I. GLOBAL CHANGE RESEARCH PROGRAM (USGCRP) AND NCA4 VOLUME II (CLIMATE CHANGE IMPACTS, RISKS, AND ADAPTATION IN THE UNITED STATES)

**II.** IMPACTS TO URBAN AND RURAL TRANSPORTATION

**III.** TRANSPORTATION AT RISK

**IV.** ENVIRONMENTAL JUSTICE

Presented by: Chirag Patel, Environmental Specialist I NJDOT Bureau of Environmental Program Resources

## I. USGCRP and NCA4 Vol. II, What is it?





Speaker: Dr. Jennifer Jacobs (University of New Hampshire & Director of ICNet)

U.S. Global Change Research Program (USGCRP):

- Develop and coordinate "a comprehensive and integrated United States research program.
- Assist the Nation and the world to understand, assess, predict, and respond to human-induced and natural processes of global change.

- NCA4 Volume II contains technical scientific assessments. Does not make policy recommendations or evaluate existing or proposed policies.
- Volume II reflects on advances in the science of climate change impacts and adaptation with the inclusion of new national-level chapters on Air Quality; Climate Effects on U.S. International Interests; and a chapter on Sectoral Interdependencies, Multiple Stressors and Complex Systems
- Useful to NJDOT as it assesses a range of potential impacts, helping decision makers better identify risks that could be avoided or reduced.

### II. Impacts to Urban and Rural Transportation

- Speaker: Susanne Des Roches (NY City Mayors Office of Recovery and Resilience)
- Extreme events that increasingly impact the transportation network are inducing societal and economic consequences, some disproportionately affect vulnerable populations.
- <u>Rural</u> and <u>Urban</u> transportation networks have distinct levels of redundancy and ability to recover.





## **III.** Transportation at Risk

#### Adapting Coastal Infrastructure to Sea Level Rise and Land Loss



**Speaker:** Scott Douglas (South Coast Engineers)

- Climate change will continue to pose a risk to U.S. transportation performances and in the absence of intervention, projected changes may lead to increasing transportation challenges.
- Sea-level rise is making coastal roads and bridges <u>more vulnerable</u> and <u>less</u> <u>functional</u>.
- Physical stressors include: precipitation, coastal flooding and heat.
- Don't just build, build smarter or current improvements will become obsolete.

## **IV.** Environmental Justice AASHTO Community of Practice, TERI Database, EJ Courses

- EJ Community of Practice: increase technical assistance and coordination b/w state DOT and MPOs (specific to EJ Analysis and consistency of data and information exchange).
- TERI Database central storehouse for tracking and sharing new transportation and environmental research ideas including EJ research.
- National Highway Institute provides EJ Courses and technical assistance: <u>www.nhi.fhwa.dot.gov</u>



### V. DECARBONIZATION & GREENHOUSE GAS REDUCTION: PROGRESS, PRIORITIES, AND RESEARCH NEEDS

## **VI.** TECHNOLOGICAL ADVANCES IN ROAD ECOLOGY SCIENCE

Presented by: Caroline Birsner, Environmental Specialist I NJDOT Bureau of Environmental Program Resources

#### V. Decarbonization & Greenhouse Gas Reduction: Progress, Priorities, and Research Needs: Introduction

- Why should we care?
- Climate change & associated costs
- Transportation: 1/3 of all CO<sub>2</sub> emissions in US (EPA), surpassed electricity generation in 2016 to become #1 source of CO<sub>2</sub> (EIA)
- Decarbonization: eliminating or reducing carbon intensity of a system
- We have the technology we need to address climate change, we just need to prioritize it



# V. Decarbonization & Greenhouse Gas Reduction: *Methods*

- Project Drawdown (nonprofit think tank in CA that maps and models solutions to climate change)
  - "Drawdown": point in time where emissions begin to reduce and eventually can extract CO<sub>2</sub> out of atmosphere
  - Modeled transport solutions to achieving drawdown by 2050:
  - #1 solution to decarbonizing transportation sector is *electric vehicles* (EVs), followed by (in descending order) mass transit, truck fuel efficiency, car fuel efficiency, ship fuel efficiency, walkable cities, telepresence, bike infrastructure, airplane fuel efficiency, electric bikes, high speed rail, train fuel efficiency, and carpooling
    - Electric vehicles have low operational cost and high operational savings when deployed en masse
- Mobility as a service (MaaS): car share, bike share, car rentals, demandresponsive shared ride vans
- Maximizing efficiency through improving vehicle design: 0.3% to 0.5% of energy content of fuel actually moves the driver
  - Ultralighting: fuel savings from lighter mass
    - Carbon fiber: very cost effective at scale due to reduced manufacturing/maintenance costs (but only if all vehicle components are carbon fiber!)
    - Carbon fiber vehicles aren't necessarily more expensive to purchase
    - Very relevant to DOT operations/maintenance because most road wear and tear is based on weight



# V. Decarbonization & Greenhouse Gas Reduction: Conclusion

- Importance of incorporating sustainability and resilience in all stages of the transportation planning process
  - The earlier, the better (and more cost-effective in the long run)
- Be conscious of and resist the tendency to form "silos"
- Emphasis on intersectionality and increased coordination among all relevant parties
  - Engineers, scientists, planners, environmental staff



# VI. Technological Advances in Road Ecology Science: Introduction

#### Why should we care?

- Ecological impact: ~1 million vertebrates killed every day in US (Forman and Alexander 1998)
- Human impact: Significant motorist safety concern (Bissonette et al 2008), motorist trauma
- Economic loss:
  - Direct: \$8.4 billion in damages annually in US (*Huijser et al 2008*),
     \$150 million in damages annually in New Jersey (*NJDEP 2018*)
  - Ancillary: Incident management, carcass management/disposal, congestion
- State regulations

#### Technologies presented at TRB 2018:

- 1. Collecting and using big data for wildlife-vehicle conflict (WVC)
- 2. Roadside animal detection systems
- 3. Vehicle automation



# **VI.** Technological Advances in Road Ecology Science: *1. Data*

- "There is a current, critical need for accurate and standardized WVC data because these are the foundation for mitigation projects that protect both motorists and wildlife" (Olson et al 2014)
- Challenges: different methods of record collecting
- Data collection methods presented at TRB:
  - Pull data by querying an existing database (Californiaspecific)
    - Live and dead wildlife occurrence on roads: <u>http://wildlifecrossing.net</u>
    - Wildlife movement under/over roads: <u>http://wildlifeobserver.net</u>
    - Wildlife-vehicle conflict: <u>http://roadecology.ucdavis.edu/chips</u> (CHiPS is California Highway Patrol website updated in real-time)
    - Other systems from around the world: <u>http://globalroadkill.net</u>
  - EXIF (Exchangeable image file): information associated with images
  - Large-scale volunteer data collection: crowdsourcing
- NJDEP developing an app that the public can use to report roadkill as well as rare animal sightings



### **VI.** Technological Advances in Road Ecology Science: *2. Roadside Animal Detection Systems*

- Wildlife crossings are most effective way to mitigate WVC
- Technology: crossing structure, detection and warning system
  - Crossing structure: over roadway (overpass), under roadway (culvert, underpass)
  - On roadway (roadside animal detection systems [RADS])
    - Detection:
      - Laser beam sensors (break beam detection): mixed results
      - Buried cable detection: mixed results
      - Radar detection: promising
      - Lidar detection: not currently used in roadside monitoring but potentially promising
      - Thermal/infrared (FLIR) "camera" detection: promising and cheaper than radar
      - Radio collaring of animals: mixed results
    - Warning (signage):
      - What type? Fixed v. variable
      - Where? 1 mile apart, ½ mile apart
    - Most effective RADS technology: combination of thermal camera and variable message warning signs placed ½ mile apart
- Arizona elk crossing case study with CrossTek: benefits (\$1.86 million) of installing RADS far outweighed upfront costs (\$750,000). Reduced annual elk collisions around Preacher Canyon elk crossing by 75%.





## VI. Technological Advances in Road Ecology Science: 3. Vehicle Automation

- Automated v. autonomous
- Cars heavily computerized already and increasingly 'connected'
- Challenges: size detection thresholds
  - Most technology thresholds are set for 20 lbs (small human child): how to detect smaller animals such as raccoons, skunks, possums, squirrels, turtles?
  - Driver complacency
- Vehicle automation technology does not preclude the need for data collection and wildlife crossings!!!



# **VI.** Technological Advances in Road Ecology Science: *Conclusion*

- WVC pose a serious hazard to the traveling public and cause significant material and economic damage
  - \$8.4 billion in annual damages nationwide
  - \$150 million in annual damages in New Jersey
- There are numerous technologies available to transportation agencies to reduce the risk of WVC
  - Data provides foundation for mitigation: need to strengthen and standardize data collection and tracking
  - Most effective and cost-effective roadside animal detection technology to reduce WVC: combination of thermal 'camera' sensors and variable warning signs
- Again, need for increased collaboration with other agencies and institutions researching and implementing WVC mitigation
- Opportunities for NJDOT to adapt this research to suit the needs of New Jersey
  - Deer and other non-protected species
  - Threatened/Endangered Species (State & Federal)



## Works Cited

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- Huijser MP et al. "Wildlife-vehicle collision reduction study: report to Congress." Bozeman: Western Transportation Institute. 2008.
- Olson DD et al. "Monitoring Wildlife-Vehicle Collisions in the Information Age: How Smartphones Can Improve Data Collection." Public Library of Science. 2014.

#### **VII.** WHAT'S HOT IN STATE DOTS

#### **VIII.** INCREASING INFRASTRUCTURE RESILIENCE THROUGH BIOENHANCEMENT

## **IX.** VISUALLY CONNECTING WITH STAKEHOLDERS USING VIRTUAL REALITY

Presented by: Lauralee Rappleye, Project Manager NJDOT Bureau of Environmental Program Resources

## VII. What's Hot in State DOTs: Delaware

- Coastal Green Infrastructure Pilot
- Issues:
  - 381 miles of shoreline
  - Sea level change
    - 20 communities experiencing impacts
    - Executive Order requiring state agencies to prepare for sea level rise, storm surge events
  - Nuisance flooding



## VII. What's Hot in State DOTs: Delaware (cont.)

- Guidance: Avoiding and Minimizing Risk of Flood Damage to State Assets: A Guide for Delaware State Agencies
- Solutions:
  - Mapping to identify/analyze vulnerable locations
  - Engineering
    - Cleaning of stormwater outfalls
    - Addition of 6" HMA to raise roadway elevations
    - Installation of tide gates to prevent
  - Green Infrastructure to Promote Resilience
    - Living shorelines/levees
    - Oyster castles and oyster shell bags
    - Partnering with Coastal Communities to Master Plans

## VII. What's Hot in State DOTs: Minnesota

- Roadsides as critical infrastructure
- Traditional View: Roadside Clear Zones = Safety or Refuge Areas
- Minnesota View: Roadsides = Opportunities with Critical Values
  - Safety
  - Traffic Calming
  - Stormwater Management
  - Soil Stabilization
  - Habitat
  - Biodiversity
  - Aesthetics
  - Health
  - Socioeconomic



## VII. What's Hot in State DOTs: Ohio



- Practical design: using the flexibility in practical design for both NEPA and Design
- Practical Design = Performance based project development wherein the proposed improvements are targeted and right-sized based on the project need
  - Identify what makes sense from broad perspective
  - Build many "good" projects rather than few perfect projects
- Develop Purpose and Need
  - Primary needs *must* be addressed
  - Secondary Needs addressed based on potential impacts and costs
    - Decision made during feasibility study
- Some fix/improvement is better than none, especially when funding or other obstacles limit project scope

# VII. What's Hot in State DOTs: Washington State

- Washington State DOT's Corridor Sketch Initiative
- Corridor Based Statewide Analysis
  - identification
  - what works sufficiently
  - what needs to change
  - performance gaps
  - ways to close gaps
- Data Collection comprises database
  - public engagement
  - chronic environmental Issues
  - stormwater treatment
  - wetland mitigation
  - wildlife sanctuary
  - noise issues/noise wall locations
  - historic bridges



Product: Corridor by Corridor Summary for Planning Future Investments, supported by a database with specific, mapped information
# VII. What's Hot in State DOTs: Ohio (cont.)

- Ohio's NEPA assignment experience
- NEPA Assignment =/ Total Delegation of FHWA Responsibilities
- FHWA Involvement Required
  - Training
  - Program Issues
  - Air Quality Conformity
  - Projects Crossing State Lines
  - Consultation with Native Peoples



- April 1, 2016 through March 31, 2017
  - Processed > 2,000 Projects
  - Added Staff:
    - 1 NEPA Assignment Manager
    - 1 Legal Reviewer
    - 1 Part time staff member
  - Savings:
    - Lower Level CEs (C List) 9-10 days/project
    - Higher Level CEs (D list) 52 days/project

Total Savings: 2,970 days, valued at \$13.12 Million

# VII. What's Hot in State DOTs: Utah

- NEPA assignment in Utah
- NEPA Assignment for Cat Exes (CEs) since 2008
- 2008 Present Have Processed approx. 1400 Cat Ex
  - None challenged; no longer audited
- In 2017 Processed 5 EAs and 4 EISs
- Reorganized staff for consistency, added 1 staff member
- Rewrote "manual of instruction"; subjected to legal sufficiency review



- Advantages:
  - Decisions made at local level; staff understands local issues & political climate
  - Utah DOT staff have to own answer to problems & outcomes
  - State decides where to take risk
  - Have ability to enhance the environmental and address transportation needs
  - Requires fiscal assurance; funding is programmed = commitment to build

# VIII. Increasing Infrastructure Resilience through Bioenhancement

- Andrew Rella, Stevens Institute Increasing the Resilience of Coastal and Marine Infrastructure through Bioenhancement
- Fact: Hardening of shorelines has replaced > 70% of the natural shorelines worldwide
- Fact: 70% of our coastal infrastructure is concrete based
- Fact: Concrete & fiberglass encapsulation are poor substrates for balanced biocommunities
  - Vertical relief
  - Smooth Surface
  - Surface chemistry high alkalinity

# VIII. Increasing Infrastructure Resilience through Bioenhancement (*cont.*)

- Goal: Enhanced Biogenic build-up to promote bioprotection of infrastructure
  - Increases strength of concrete
  - Reduces chloride infiltration/breakdown of concrete
  - Absorbs wave energy
  - Increases abundance of species and biodiversity of ecosystem
  - Increased populations of filter feeders improves local water quality



# **IX.** Visually Connecting with Stakeholders Using Virtual Reality

- Stephen Paul, AECOM
- Immersive Technologies
- Options:
  - Virtual Reality
  - Augmented Reality
  - Mixed Reality
- Equipment:
  - Mobile 360 Aps –Software designed to run on mobile device
  - Google Cardboard Phone mounted foldout cardboard viewer
  - Samsung Gear VR Samsung Phone mounted to headset
- Challenges: Need clarity of vision and need for information to be transmitted
  - Initial costs for research and development
  - Constant pace of change of the technology
  - The potential of the technology makes choices overwhelming







# Civil Rights & Affirmative Action

Tyronn Walker Shivani Patel Kwincy Brown



# REVENUE AND FINANCE: The Uncertainty of Funding





# **REASONS FOR UNCERTAINTY**

- Federal Recessions
- Funding Extensions (as opposed to long term bills)
- Lack of Gas Revenue for the Transportation Trust Fund



# **PROPOSED RESEARCH**

- The Revenue and Finance Research Subcommittee developed a problem
- statement to further understand how agencies are affected by and are managing
- the common issue of uncertain funding. They submitted their proposal to the
- National Cooperative Highway Research Program (NCHRP) for review. The
- subcommittee is requesting an estimated \$400,000 and research to take about
- 18 months.



# SOME OTHER INFORMATION

• Seattle Transit



# **SoundTransit**

Infragard





# Environmental Justice in Transportation Committee

• Center for Environmental Excellence identified challenges for EJ practitioners:

-Limited availability of case studies
-Very limited technical assistance
-Limited coordination between state DOTs and MPOs
-Citizen participation

# Challenges

• Case studies

#### -Shortage

-Seeking more than positive examples

Technical Assistance

#### -No manual

-Led to the development of The Practitioners Peer Exchange Roadmap Collaboration

-Within agencies and between state DOTs and MPOs

-Consistency of data and information exchange

• Involvement of citizens

-Early inclusion

-Maintain dialogue

# Environmental Justice Research with Texas Metropolitan Planning Organizations

• Lessons from The Center for Transportation Training and Research (CTTR) and MPOs in the Dallas and Houston, Texas Regions

-Houston Galveston Area Council (H-GAC) experienced problems using the traditional income and minority formula to determine EJ areas

-New ways to evaluate EJ communities

-CTTR examined social factors as a means to evaluate service for the regions

# Methodology

• Data Source-ACS

-Race

-Income

In addition:

-Age

-Persons w/o high school diploma

-Zero car ownership

-Senior population

-Non-English speaking HHs

-Female-headed HHs

# Methodology: The Seven Steps

- Step 1. Collect Equitable Target Area (ETA) population data
- Step 2. Creating the formula

for example- Minority Population Distribution (MGPop) total minority population  $[\sum(MGPop)/\sum(Pop)]*100)$  repeat for all variables

- Step 3. Determine the equitable target area regional average (ETARA). The four city regional average (RA) was calculated for each variable.
- Step 4. Develop categories. The variables were divided into four categories.
- Step 5. Identify equitable target areas (ETAs) score for each block group.
- Step 6. Determine ETA Ranges
- Step 7. Map ETAs

# What was Learned

- Most study areas had good access to public transportation
- One ward had the most access with 9 bus routes, 62 bus stops and 1 LRT line
- As expected, the percentage of households without cars declined as the study areas moved further away from the central city

#### • Additional studies needed:

-Examine the impact of zero car ownership on senior households and female headed households

-Study the impact of commute times and percent of money spent on transportation in severe EJ zones

# Importance to NJDOT

- Increase collaboration when dealing with EJ communities
- -Leverage knowledge and skills
- Maintain and share data
- Must consider access to public transportation when organizing public information centers
- Ensure citizen inclusion throughout all decision-making processes

#### Community Impact Assessment Committee Meeting

• Update to **Community Impact Assessment**: A Quick Reference for Transportation

-Practice has evolved over time

-Not changing the process but enhancing and updating

-New resources and examples

- Identify new ways in which the practice of CIA information can be applied to planning and project development
- Highlight that CIA happens in planning; not just project development



Community Impact Assessment



A Quick Reference for Transportation

# Importance to NJDOT

- Current use of "the purple book" is department-wide
- Good reference tool especially because there is no "one size fits all" solution to community issues
- Enhance the role of communities and increase public involvement -Need to start with the community (goals and needs)



#### **Transportation Research Board** 97th Annual Meeting

January 7–11, 2018 - Washington, D.C.

# DBE Program

#### Kwincy Brown



## DBE Program

- DBEs not finding work is the biggest problem that most Departments are noticing.
- Encouraged training and tailoring the program around the DBEs
- Encouraged to implement meet and greets

## DBE Program

- States with Big Projects notice an offset with the DBE program
- Developing a handbook for DBEs so they can understand their market better, include common problems that are seen by DBE and ways to overcome them.

## DBE Program

- DOTs DBE Liaison should report directly to the Commissioner
- A lot of states are having problems with the DBE trucking because of the oversaturation of the market
- Studies have shown when drops are made in the DBE program discrimination happens

## Montana's DBE Program

- In 2006, Montana achieved a 13.1% DBE utilization rate
- Montana, based on 2009 study, used for several years only raceneutral means to accomplish its overall goal for DBE utilization of 5.83%. After Montana ceased using contract goals post 2009 study, DBE utilization declined: in 2011 to 2.8% which is a 10.3% decrease from the 2006 reporting

## Montana's DBE Program

- The fact DBE utilization dropped when Montana ceased using contract goals strongly supports that there are significant barriers to minority competition in the public subcontracting market, raising the specter of racial discrimination
- In 2012-2014 DBE contract goals were used.

### Contract Compliance

- If a program isn't federally funded, try to mirror Part 26 anyway because it has already been defended by the government.
- Joint checks need approval from DOT and look at CUF if you notice a trend.
- Do not use alike goals for alike projects.

### Contract Compliance

- When goal setting it is very important to make sure you stay flexible and document the process.
- Use electronic software to track projects if possible, more importantly for bigger projects.
- Collect issues from previous projects and create a personal checklist for future alike projects

# CUF Red Flags

- If employees are found on the Prime and Subs Payroll
- Magnets on trucks or lack of signs
- DBE company has lack of equipment
- DBE owner has lack of expertise
- DBEs being constantly chosen

"Goal set is just a cover for the racial barrier in the market until we can figure out a way to fix discrimination. Don't be reactive but find a way to be proactive."

#### **Policy & Segregation**





amazon.com book image and Mapping Inequality site

# THE INTERSTATE: MITIGATING PAST AND CURRENT PROJECT IMPACTS• TRB ANNUAL MEETING 2018































# KING LINCOLN/BRONZEVILLE—LOCATION



213 | TRB Event 269 | Mending the Divide | 8 January 2018

### THE RISE OF THE SUBURBS

- Demand for better roads and a more extensive roadway network
- The Federal-Aid Highway Act of 1956, also known as the Interstate Highway Act
  - \$15 billion to construct an interstate highway system across the United States
- This led to a fundamental change in the way that people lived
  - People could live in the suburbs and commute to their jobs in the city
  - New suburban communities began to develop further and further from the urban centers.



#### INTERSTATE CONSTRUCTION...

The highways that resulted from and facilitated this movement to the suburbs divided communities

- In Columbus two major highways were constructed beginning in the 1960s: Interstates 70 and 71
- o They bisected many neighborhoods in Columbus
  - Cut them off from their neighbors, surrounding communities, and downtown
- Many of these neighborhoods were less affluent and did not have champions to fight for them. They were seen as the path of least resistance for the new highways.





#### DIVISION OF A COMMUNITY

- o Construction of the interstate affected all of King Lincoln/Bronzeville
  - o Many residents were uprooted by construction of the highway itself
  - The rest were cut off from downtown and further isolated
  - People who left and came back after the highway was built recall an enormous change in the community


## AN OPPORTUNITY TO MEND THE DIVIDE: THE COLUMBUS CROSSROADS PROJECT



217 | TRB Event 269 | Mending the Divide | 8 January 2018

### COLUMBUS CROSSROADS PROJECT

- o Massive undertaking to "untangle" the highway network in Columbus
- NEPA began in 2004; Finding of No Significant Impact signed in 2009
- o Multiple construction phases
  - o Long Street Cultural Wall was constructed as part of Phase 1 in 2014
- o Construction on other phases will continue for several years

The Ohio Department of Transportation, City of Columbus, Mid-Ohio Regional Planning Commission, and community leaders saw an opportunity to put right some of the damage done by the construction of the highway 40 years before...

### PUBLIC AND ADVISORY COMMITTEE INPUT

- Artistically honor and celebrate the history and culture of the King-Lincoln/Bronzeville community
- Tell a story in a visually compelling way
- Create a signature, iconic feature the first of its kind in the state of Ohio
- o Include the community in the decision-making process

### COLUMBUS LONG STREET BRIDGE CULTURAL WALL

- Asked the community to help select artist(s) to create the piece and determine what would be depicted on the wall
- Two artists who agreed to design the mural together were unanimously selected by the community



Renowned photographer and Columbus State Community College faculty member Kojo Kamau, right, collaborates with Miami University professor Larry Winston Collins on the design and layout of the Long Street Bridge mural.

### COLUMBUS LONG STREET BRIDGE CULTURAL WALL



Photo by Mike Cairns

## COLUMBUS LONG STREET BRIDGE CULTURAL



### COLUMBUS LONG STREET BRIDGE CULTURAL WALL



### Interstate 4 Tampa, Florida

"Major highway improvements often are accused of destroying communities, but in this instance, we're clearly enhancing one."

Ken Hartmann District Seven Secretary, Florida DOT as reported in Public Roads, September/October 2004 edition



## The Story Part 2

 In the 1970s, the part of Ybor C renaissance after being placed on Places and was designated a National Historic Landmark in 1991. Increased investment in the area brought additional brick streets and iron street lamps, originally found in Ybor City, as well as trendy clubs and urban shops to the commercial section. However, the edges of the residential areas bordering I-4 and the section of Ybor City to the north continued to decline.



## The Project

By the early 1990s, the Florida Department of Transportation (FDOT) and the Federal Highway Administration (FHWA) were planning an expansion of the original four-lane highway. Although the new plan would remove heavy trucks from city streets and correct other existing problems, Ybor City faced the removal of even more of its historic fabric. In 1991, however, Ybor's historic significance and the needs of its residents would be in the forefront as highway plans were developed.





### Before and After 2607 North 19<sup>th</sup> Street move and rehabilitation





## Community Impact Assessment



A Quick Reference for Transportation

of Transportation

### **Cramer Hill Access Improvement Project**

#### **Public Involvement Flow Chart**

#### **New Jersey Department of Transportation**









Capital Program Support

## Veronica Murphy





Transportation Research Board 97th Annual Meeting

January 7–11, 2018 • Washington, D.C.

# MyTRB Annual Meeting January, 2018

Veronica Murphy

## My Activities

### **Committee Meetings Attended**

- Joint Subcommittee on Community Impact Assessment (Chair)
- Public Involvement Committee (Member)
- Environmental Justice Committee (Member)
- Joint Subcommittee on Health & Transportation (Friend)
- Census for Transportation Planning (Friend)
- Health and Transportation (Friend)

#### **Workshops Attended**

- Including Social Equity in Community Transportation Planning and Design
- Public Engagement for Crisis Situations: Weaving your network with existing tools and Solid relationships

#### **Sessions Attended**

- Let us take you for a ride: Understanding Mobility on Demand
- The Future of Transportation and reliance on Knowledge Sharing Among Transportation Organizations
- Health Impacts of Transportation Noise
- Does Location Matter? Performance Analysis of the HUD Assistance programs
- Planning Process and Environmental Justice
- The Built Environment, Travel Behavior and Smart Growth

## **Overarching Themes**

### Equity

- Are we measuring
- How are we measuring
- Burden of transportation cost on vulnerable populations
- Equality of Opportunity

### **Effective Public Involvement**

- Flexibility to try new strategies
- We can always do better
- Helps to build public trust

### **Health Impacts**

- How do we incorporate health impact analysis into project planning and development
- Noise is a health impact more research needed on this topic

## Transportation and Public Health

What is the relationship between Health & Transportation

- How can transportation support better health outcome for underserved populations
  - Equitable access to transportation services and health services
  - Transportation amenities that can help to support better health outcomes (walking, biking, open space)

**Community Impact Assessment** 

- How can both Subcommittees work together to help bridge the gap between transportation and health.
  - Include health components into Community Impact Assessment
  - Identify health professionals as partners

NCHRP 201-112 - Health Research Roadmap NCHRP 25-25 - A Guidebook for Communications between Transportation and Public health Communities

## Public Involvement

**Workshop – Public Engagement for Crisis Situations** Georgia DOT – I-85 Collapse and Rebuild (Bridge Fire) Colorado DOT – Glenwood Canyon Rockfall Event

- No matter how bad it is, own it.
- Manage the press and the story
- The public need to see and hear you
- Leverage Social Media



Utilize as many outreach tools as possible to maximize reach

#### Discussion: How to incorporate Public Involvement in Engineering Curriculum – Can we make an impact?

- Committee to develop Public Involvement lesson for engineering curriculums
  Research Underway
- 08-105 B-06 Measuring the Effectiveness of Public Involvement in Transportation;
- NCHRP Synthesis Best Practices for Online Public Involvement;
- FHWA Techniques for Improved Engagement in Public Participation

## **Environmental Justice Committee**

## Training

- NHI Course Fundamentals of Environmental Justice Web-based (4hr)
- NHI environmental Justice Analysis Underdevelopment

https://www.fhwa.dot.gov/environment/environmental\_justice/training/



Planning Process and Environmental Justice Assessing the Equity Impacts of a Transportation Improvement Program, Alex Kramer & Aaron Grubb

- How can TIP Projects be assessed for fairness?
  - All transportation projects entail *benefits* and *burdens*
  - Considering benefits or burdens in isolation is not appropriate
  - Not all groups derive the same benefit from all investment
  - What is the burden on non-vehicle households
  - Both benefits and burdens decline with distance
- Using the projects in the TIP, researchers propose that a project level analysis might do a better job of assessing equity.
- Need to fine-tune methodology to arrive at more meaningful measures and metrics.

We should always be looking to answer this question:

• What is the share of the burden on the underserved and vulnerable populations ?

### Joint Subcommittee on Community Impact Assessment Veronica Murphy(Chair), Shivani Patel (Research Coordinator)

### **Committee Activities**

- State of the Practice Survey
- Poster Session
- Identifying Research Needs



SOCIOECONOMIC GUIDANCE MANUAL A Practitioner's Guide



Prepared for

Prepared by Management Interventions, Inc. In Association with The Louis Berger Group

### **Next Steps**

- Creating Practitioner Sharing Network
- Training Opportunity
- FHWA Updating the Community Impact Assessment Guide
- FHWA to host two webinar after release of updated Community Impact Assessment Guide

TRB provides best opportunity for practitioners to share and learn from each other.

#### Samples from the Community Impact Assessment Poster Session





#### **Exploring The Vicious Cycle of Mobility Inequality**

#### Bumjoon Bae, Ph.D.<sup>1</sup>, Ho-Ling Hwang, Ph.D.<sup>1</sup>, S.M. Chin, Ph.D.<sup>1</sup>, Brandon Worley<sup>1</sup>, Tim Reuscher<sup>1</sup>, Angel Canales, P.E.<sup>2</sup>

<sup>1</sup>Center for Transportation Analysis, Oak Ridge National Laboratory <sup>2</sup>New York State Department of Transportation



#### INVESTIGATING TRAVEL CHARACTERISTICS AND PATTERNS AMONG NYS POPULATIONS

This research addresses differences in travel characteristics and patterns among different socioeconomically disadvantaged groups. Person trips (PT) and person-miles traveled (PMT) were used below to demonstrate the mobility inequalities among NYS households, while considering household income.



0.2 0.4 0.6 0.8 Controletter properties of households date



#### MOBILITY AND INEQUALITY STATISTICS

Among various mobility measures, PMT was used to illustrate the mobility inequality in NYS between 2001 and 2009. The inequality was measured by the Lorenz curve and its associated Gini index, which are frequently used for representing inequality in a wealth distribution. The mobility inequality is referred to as the disparity of the distribution of PMT, among the households of NYS with consideration of household income. The Lorenz curve shows the cumulative share of total PMT against the cumulative proportion of households in NYS. The Gini index is defined as the area between the Lorenz curve and the line of perfect equality divided by the area below the perfect equality line.



0.0

#### **KEY OBSERVATIONS AND RESULTS**

- > Very-low income households in NYS had experienced slight mobility inequalities in 2009 compared to their neighbors with higher incomes
- Very-low income households in NYS used a personally owned vehicle (POV) less frequently than other income households for their daily trips, while the share of using public transit is much higher among the very-low income households.
- Very-low income NYS residents traveled 56% fewer miles and 22% fewer trips on average, compared to other income New Yorkers.
- People from NYS very-low income households were less likely to travel for work and social/recreational purposes compared to their neighbors with higher income level.
- > The mobility inequality, measured by PMT, for NYS residents showed a slight increase, on average, from 2001 to 2009.
- Among NYS's elderly households, mobility inequality increased between 2001 and 2009. mainly due to the increased PMT in 2009 for the highest income households; while the mobility inequality declined for their non-elderly neighbors during the same period.
- The mobility inequality within NYS's white households increased in 2009, due to the decrease in PMT among the lower-income white households. In contrast, the inequality of their counterpart non-white households decreased from 2001 to 2009.
- Based on Gini Index, there is no noticeable differences in mobility measure between the two age groups, or among the white vs. non-white households in NYS.

#### POTENTIAL FUTURE RESEARCH

- > To investigate mobility inequality with other mobility measures, such as trip frequencies (e.g., trip rates), total person/vehicle trips, and vehicle mile traveled (VMT).
- To examine mobility inequality trends over a longer period of time, as well as on work trips versus nonwork trips.
- To consider estimate variances of the Gini Index.

#### CONTACTS

- Angel Canales, P.E., M.B.A.
- (518) 457-4326, angel.canales@dot.ny.gov
- Ho-ling Hwang, Ph.D.
- (865) 946-1224, hwanghl@ornl.gov

BACKGROUND

It is known that socioeconomically disadvantaged households face more mobility challenges in their daily travels as compared to other households. In many cities, it is more difficult for those living in socioeconomically disadvantaged households to access jobs, goods, and services including health care. One of the macroeconomic goals of any government is to establish equitable distributions of resources, which is to ensure that all people are equal in terms of their ability to move, or be moved, freely and easily.

This study explored the use of National Household Travel Survey (NHTS) data, in examining the effects that socioeconomic disadvantages have on the mobility of New York State (NYS) residents. Specifically, the research aims to identify and guantify mobility inequalities between as examples, elderly and non-elderly, as well as white and non-white groups among NYS populations.

Along with 2009 NHTS data, prior year NHTS data were also used in this study to investigate trends in New Yorkers' travel patterns, and to evaluate changes in mobility inequalities over time. The mobility inequality measure explored under this study was the Lorenz curve with its associated Gini Coefficient (expressed as a normalized Gini index), which is a well-known and intuitive economic inequality measure. Specifically, this study quantified the inequality distribution numerically through the Gini Index.

#### DATA SOURCES

- 1995, 2001, and 2009 NHTS NYS Data
- American Community Survey (ACS) 2008-2012 data



#### P18-20581 A Multimodal Analysis to Identify Rural and Urban Areas of Low Accessibility to Healthy Food in Indiana

Lisa L. Losada<sup>1</sup>, V. Dimitra Pyrialakou<sup>2</sup>, Nadia Gkritza<sup>3</sup>

1 = Ph.D. Student, Lyles School of Civil Engineering, 2=Assistant Professor, Department of Civil and Environmental Engineering, West Virginia University, 3=Associate Professor, Lyles School of Civil Engineering and Agricultural & Biological Engineering

#### **Research Motivation and Objective**

- · Health problems such as obesity and related illnesses have been attributed to the lack of both spatial and economic access to healthy food.
- · Urban and rural locations often differ in both the availability and quantity of healthy food providers and in transit options and transportation costs.
- Access to healthy food in rural areas has not received much attention to date.
- · The lack of access to reliable transportation in rural areas also acts as a barrier for accessing healthy food, especially for individuals that might not have access to an automobile.
- This research proposes a cost-based accessibility measure for different transportation modes.
- · The methodology developed in this study can be used to identify areas with low access to healthy food as well as food deserts, in both urban and rural areas.



PURDUE

#### Data

Data	Source	Yea
County Boundaries	U.S. Census Bureau	201
Road and Walkable Network (TIGER/Line files)	U.S. Census Bureau	201
Average cost per mile of operating a motor vehicle	Bureau of Transportation Statistics	201
Hourly Wage by Census Block Group	Longitudinal Employer-Household Dynamics (LEHD) Census	201
Transit routes and stops (GTFS)	Google Transit Data Feed	201
Transit Fare Information	Agencies websites	201
Transit Speed Information	Indy Go	201
Supermarkets Information	ReferenceUSA	201

$$TC_{d} = \frac{\frac{100}{s}}{1609.34} X Hourly Wage + \frac{c}{1609.34}$$

 $TC_w = \frac{100}{w * 1609.34} * Hourly Wage$ 

Cost by transit – fixed route

$$TC_b = \frac{100}{b * 1609.34} * Hourly wage + fare$$

Cost by transit – demand response

$$TC_{dr} = \frac{\frac{100}{s}XHourlyWage}{1609.34} + \frac{m}{1609.34} + fare$$

#### Methodology

Where, Hourly Wage= average hourly wage by CBG zone in dollars, s=speed limit in mph. c=cost of operating a motor vehicle in cents, w=walking speed in mph. b=the bus speed, assumed to be 12.5 mph (IndyGo, 2010), m=cost per mile in cents. fare=service fee in dollars, and 1609.34 is a conversion factor between meters and miles.

#### Value of time

$$Hourly wage = \frac{(a * Low) + (b * Med) + (c * High)}{TotalWK}$$

where Low = number of workers classified in the low range income, Med = number of workers classified in the medium range of income, High = number of workers in the highest range of income, a=\$8.07\* per hour, b=\$14.80\* per hour, c=\$21.53\* per hour, and TotalWK = total number of workers at the CBG. \* Values in 2015 dollars

Results Average Cost of Driving Marior Average Cool of Dirive -05 23 - 31 55 -05 135 - 52 52 #52 63 - 54 05 #54 07 - 57 05 + Houldy food provider Loy to Modecite Inc. Terre Haut (Vige Newsge Cost of Driving -82/09-82/29 -82/24-84/09 -82/24-84/09 -854/20-87/89 -87/44-814/74

> Similar findings were observed when transit and walking related costs were estimated.

areas.

Conclusions

 It was found that by driving, population

located in more

urbanized areas would pay less to

 It was found to be more costly to reach a healthy food provider by driving in low- or moderate-income population areas than in higher income areas, especially within the Marion and

areas.

reach a healthy food

provider than in rural

Catch-a-ride service







## Structural Engineering

## Hannah Cheng



2018 TRB 97<sup>th</sup> Annual Meeting, January 7-11, 2018, Washington, DC

## NJDOT Annual Transportation Research Board Roundtable Discussion

## **.- Bridges and Structures**

Xiaohua "Hannah" Cheng, Ph.D., P.E.

**Bureau of Structural Engineering, NJDOT** 



### **TRB AFF00 Structures Section**

- AFF10 General Structures
- AFF20 Steel Bridges \*

(--- Member) (\* Friend)

- AFF30 Concrete Bridges
- AFF40 Testing & Evaluation of Trsprtn Structures \*
- AFF50 Seismic Design and Performance of Bridges
- AFF60 Tunnels and Underground Structures
- AFF70 Culverts and Hydraulic Structures
- AFF80 Structural Fiber Reinforced Plastics
- AFH40 Construction of Bridges & Structures
- AFH70 Fabrication & Inspection of Metal Structures
- AFS30 Foundations of Bridges & Other Structures
- AHD35 Bridge Management

### **Committee/Subcommittee Meetings Attended**

\*

AFF10 – General Structures

(\* Fully Attended)

- Truck weight & size; MASH Implementation; TSP; etc.
- AFF10(1) Traffic Structures (former Chair)
- AFF10(2) Bridge Aesthetics

#### • AFF50 – Seismic Design and Performance of Bridges

- Performance-based design; ABC connections; Aftershock Inspection; etc.
- AFF50(1) Geoseismic
- AFH70 Fabrication and Inspection of Metal Structures
- AFF00/AASHTO SCOBS/FHWA Structures Collaboration

- AASHTO updates; FHWA R&D updates; NCHRP updates/funding; Discussion

- AFF20 Steel Bridges
- AFF40 Testing & Evaluation of Transportation Structures
- AHD35(1) Safety and Security of Bridges and Structures
  - Resillience as a system (not only bridges) for all natural and man-made hazards

## **Workshops Attended**

- Workshop 166 "Truck Size and Weight: What You Need to Know"
  - Truck industry increased gross vehicle weight (GVW) & size;
  - Proposal to Congress for increase in legal load;
  - Bridge performance and condition/deterioration;
  - National and State Research (NJDOT & Rutgers)
  - Permit issuance & Permit Design Load
- Workshop 164 "Bridging the Gap Between Non-Destructive Evaluation and Structural Health Monitoring"
  - NDE/NDT QC/QA; Performance verification; Element inspection
  - SHM Performance; Response; Safety
  - FHWA/NBIS Performance-based management; -> Data-driven approach

### **Sessions Attended**

- Session 751 "Seismic Bridge Performance in Recent Earthquake" (Japan, Oklahoma)
- Session 810 "Additional Bridge Assessment, Bridge Rating, and Bridge Design"
- Session 811 "Advances in Steel Bridges"
- Sessions 846 & 868 "Recent Innovations in Bridge
  Construction": Part 1 & Part 2
## **Benefits to NJDOT Bridge Design & Construction**

- Problem statement
- Problem solving
- Upfront in new tech, new material, new methodology
- Information/idea exchange between Agencies
- Quick implementation
  - Design Manual for Bridges & Structures
  - Construction Standard Specifications
  - Standard Drawings and Details
  - Field solutions





## **THANKS YOU!**

Xiaohua.Cheng@dot.nj.gov



## Thank you!



