Decision Support Part 1: Tools to aid travel planning

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Decision Support: Tools to Aid Travel Planning

Decision support systems are so much more than simply saying when to plow and how much chemical to apply. Speed and travel time are also of critical concern to road users. This session contains presentations that explore novel uses of decision support systems and investigate how these uses can benefit winter operations.

Decision Support: Tools to Aid Travel Planning

- Determining and monitoring travel conditions during inclement weather
- Speed modeling and speed management
- Driver decision support tools (for routing, travel planning, etc).
- Driver Behavior in Winter Operations

Breakout Session Info: Participants

State/Local Transportation Agencies (US)	13
Transportation Agencies (Abroad)	5
Universities/Research Centers (US and Abroad)	11
Private Companies (US)	7
Private Companies (Abroad)	4
US Department of Transportation	2
TOTAL	**42**

Breakout Session Info: Types of Tools

- Tools to determine and monitor road weather and travel conditions
- Tools for speed modeling and speed management
- Tools to support driver decision making
- Tools to analyze driver behavior in winter operations

Tools to Determine and Monitor Road Conditions (Current and Forecast)

1. What are the benefits of the decision support tools presented?
2. What are the lessons learned from the studies?
3. How can the research studies/tools be transferred to practice?
4. What are the challenges in adopting the proposed tools?
5. What are the short-term (2-5 year) actions needed to support the adoption/deployment of the tools?
6. What are the long-term actions needed (beyond 5 years)?

Tools to Determine and Monitor Road Conditions - Issues

1. A few State DOT's in the US collect mobile road weather data for condition assessment (MN, MI, NV, CO, UT)
2. In Finland, 15 fuel supply trucks are equipped with weather sensors
3. In Norway, vehicles provide friction estimates
4. Mobile road weather data is not yet used for forecasting
   - There is not enough mobile data to drive forecasts
   - Nowcast is more important than forecasts
5. Liabilities associated with putting Wx forecasts out to the public
   - Use private companies to get Wx data to public (assume risk)
   - Incentivize private companies to provide reliable/quality data

Tools to Determine and Monitor Road Conditions - Issues

6. Is it still useful/practical to build and maintain RWIS?
   - Are RWIS “dinosaurs”?
   - Very costly to install and maintain
7. Low visibility due to blowing snow
   - White out conditions a problem in many places
   - Snow fences are used to minimize blowing snow
   - Expensive to maintain visibility sensors
   - Japan uses mass flux to determine visibility
   - Norway uses a light system 4-5m high to determine visibility

Tools to Determine and Monitor Road Conditions – Action Items

1. Continue to conduct pilot studies, let private sector take findings and apply.
   - Prove that tools work
   - Public/private partnership may be needed for funding
2. Analyze potential of road weather as a pay service – some study shows that 18% of people would pay $10/mo. for good data.
3. Develop quality control and aggregation processes for data.

Tools for Speed Modeling and Speed Management

1. Variable Speed Limit (VSL)
   - Used in the US and in other countries
   - Criteria for VSL adjustment varies
   - Many State DOT's are still waiting/watching for more reported benefits of VSL (jury is still out).
   - The use of Advisory vs. Regulatory VSL still debatable

Tools to Assist with Driver Decision Making

1. Snow Plow Routing Algorithms

   - Needed more in urban settings with more dense and complex transportation network, maybe not as important in rural areas

Tools to Determine and Monitor Road Conditions (Current and Forecast)

1. Vehicles equipped with Wx sensors to determine existing and forecast conditions for weather and travel time decision support in Colorado
2. Remote sensing with optical sensors for input in MDSS, resulting in reliable forecasts
3. Use of quality checking algorithms (Pikalert) for more accurate static and mobile observations
4. Identification of road location features that are prone to blowing snow and low visibility
5. Related: Low visibility due to dust

Tools for Speed Modeling and Speed Management

1. Variable Speed Limit Study in Europe (virtual pilot in Norway)
   - VSL systems exist the US
2. Automated system in Iowa that measures and records reductions in speed during winter weather
   - Can be used to build empirical models that relate speed with winter weather variables (temp, wind, lane condition etc).
3. Related:
   Use of Advisory versus regulatory speeds
   Criteria for VSL reductions

Tools to Assist with Tripmaking

(Routing, Canceling Trip, Delaying Trip, Diverting Trip, Stopping, etc)

1. Automated Vehicle Decision Support System – using connected vehicle data to assist truck drivers
2. Snow Plow Routing Algorithm in Pittsburgh - minimize total time on network, considers limited resources on plows
3. Snow Plow Routing using Genetic Algorithm – adaptive routing strategy that minimize travel distance and unfavorable turns and takes into account road priorities
4. Snowstorm visibility alert system in Japan
5. Related Issues
   - Realism and practicality of snow plow routing algorithms
   - Minimizing exposure of truck drivers to adverse weather

Tools to Analyze Winter Maintenance Driver Behavior

1. Factors Affecting Driver Fatigue in Winter Maintenance Operations
2. Use of Naturalistic Driving and Actigraph data (sleep quantity and quality) - Virginia Tech
3. Related:
   - Snow Plow Driver Training and Education
   - Winter Maintenance Staffing, Planning and Scheduling