Incorporating Connected/Automated Vehicles into the Transportation Planning Process

Max Azizi
US DOT

November, 2015
The Study aims to help facilitate the consideration of C/AV in transportation planning processes and products by States, MPOs and local agencies by reviewing:

- Impacts on planning activities
- Impacts on roles and responsibilities of existing and new stakeholders
- Impacts on tools, techniques and data
- Impact on organizational skills and expertise
Automated Vehicles (AV)
Vehicle to Vehicle Communication (V2V)
Vehicle to Infrastructure Communication (V2I)
Connected Vehicles (CV)
Connected Automated Vehicles (C/AV)
Task 2 - Impacts on Planning Processes and Products

This task is completed
Impact on products
- Long-Range plans
- Corridor plans
- ITS/operational plans

Impact on processes
- Data collection methods (using DSRC technology as probes for travel time data and for arterial operations)
- Incorporation of DSRC into arterial and intersection improvement projects
- Tools - Potential long term change in analytical tools
- Impact to transportation, land use, and economy in the long term
A Summary of Some of the Outcomes

Skills needed
- Data analyst and data “scientist” to manage a significant amount of data
- Hardware, software and communications technology specialists
- Potential shift of analytical responsibilities from the public sector to the private sector

New stakeholders
- Communications companies
- Vendors of C/AV equipment and systems
- Vendors providing data management and analytical services
- Companies that will provide security
- Educational institutions
- New niche organizations that have not yet emerged.
Task 3 - Impacts on Tools, Techniques and Data

This task is completed
Task 3 Approach

1. Identified existing tools and models
2. Evaluated and compared existing tools
3. Conducted gap analysis for existing tools & data
4. Developed a roadmap for addressing gaps
Comparison of Tool Capabilities

* Comparison of geographic scale by tool category
  - Generally a criteria used for initial tool selection
  - Ranges from small, isolated locations to large, regional models.

<table>
<thead>
<tr>
<th>Geographic Scope</th>
<th>Sketch Planning Tools</th>
<th>Travel Demand Models</th>
<th>Highway Capacity Manual</th>
<th>Simulation Models</th>
</tr>
</thead>
<tbody>
<tr>
<td>Isolated location</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Segment</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corridor or small network</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Regional model</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **Highly relevant**
- **Limited applicability**
- **Poorly suited**

Detailed results for other comparison categories are provided in the Task 3 report.
Identified short and long term research needs
- Levels of effort
- Time frame,
- Potential lead agency
- Possible data sources

Need for empirical data

Long term need for enhancing analytical tools

Considered five levels of automation associated with each task
Task 4 - Case Studies

This task is currently underway
Case Studies Based on Planning Products

1. **Long-Range Metropolitan Transportation Plan**
2. Transportation Improvement Plan
3. Transportation Asset Management Plan
4. Regional ITS Architecture/Operations Plan
5. Strategic Highway Safety Plan
6. State Implementation Plan
7. Transit Development Plan
8. Bicycle and Pedestrian Plan
9. Public Involvement Plan
10. State Freight Plan
11. Financial Plan
### Basic Steps

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1:</td>
<td>Gather System Baseline Information</td>
</tr>
<tr>
<td>Step 2:</td>
<td>Establish Goals and Objectives</td>
</tr>
<tr>
<td>Step 3:</td>
<td>Develop Performance Measures and Targets</td>
</tr>
<tr>
<td>Step 4:</td>
<td>Alternatives Analysis</td>
</tr>
<tr>
<td>Step 5:</td>
<td>Financial Plan and Investment Priorities</td>
</tr>
<tr>
<td>Step 6:</td>
<td>Transportation Plan and Programming</td>
</tr>
<tr>
<td>Step 7:</td>
<td>Implement and Monitor the Plan</td>
</tr>
</tbody>
</table>
Factors to Be Considered in Developing LRTP

- Identify emerging technologies
- Estimate market penetration of C/AV technology
- Engage all stakeholders in development of visions for the region
- Revisit performance targets by considering the impact of C/AV technology on safety, mobility and the environment
- Establish a regular process for review of C/AV technology and applications
- Identify and analyze the potential adverse impact to vulnerable road users
- Monitor and document the effectiveness of C/AV deployment
Task 5 – Workforce Skills and Training

This task is currently underway
Topics covered

- Training needs and costs
- Timeline estimates for training/development programs
- Capability to take advantage of existing resources (ITS Professional Capacity Building Program)
- Options for acquiring skills
  - On-the-Job Training/Continuous learning opportunities
  - Part time employees (Obtaining “niche” technological expertise that may not be needed full-time)
  - Peer-to-peer networks
  - Educational partnerships
  - Closer ties to operations training
Task 7 – Desk Reference and Outreach Materials

This task is currently underway
Outreach Materials

Outreach

- Highway Capacity Manual Community
- Modeling community outreach
- Planning community outreach
- Desk Reference/Guidance Document
Task 2 – Impact on planning processes and products – complete

Task 3 - Impact on tools, techniques and data - complete

Task 4 - 11 illustrative case studies – complete
Task 5 - Workforce training and skills – underway, TBC by 12/2015
Task 6 – Final Report - To be completed by 3/2016
Task 7 – Outreach materials
- Highway Capacity Manual Tech Memo – complete
- Modeling Tech Memo – To be completed by 3/2016
- Planning Community Outreach Packet - To be completed by 3/2016
- Desk Reference - To be completed by 3/2016