Incorporating Connected Vehicles into the Transportation Planning Process

AMPO Annual Meeting

Max Azizi
US DOT

October, 2015

U.S. Department of Transportation

Purpose of the Study

To help facilitate the consideration of CV in transportation planning processes and products by States, MPOs and local agencies:

- 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

Project Tasks

Task 2

- Identify and analyze the short and long term impacts of C/AV on planning processes and products
- Identify the roles/responsibilities of stakeholders

Task 3

- Identify and analyze the needs for new or enhanced tools, techniques and data

Task 4

- Develop 11 illustrative case studies

U.S. Department of Transportation

Project Scope

Task 5

- Identify skills needed to carry out CA/V planning and analyze options to address gaps

Task 7

- Develop a web-based Planning Reference/Guide
- Develop outreach packages for Highway Capacity Manual, Modeling and Communication with Planning Community

U.S. Department of Transportation

Project Focus

- This technology is evolving and advancing in a rapid pace
- Automated Vehicles (AV)
- Vehicle to Vehicle Communication (V2V)
- **Vehicle to Infrastructure Communication (V2I)**
- **Connected Vehicles (CV)**
- **Automated Connected (C/AV)**

Task 2 – Impacts of C/AV On planning processes and products

U.S. Department of Transportation

Impact of C/AV on Transportation Planning

- How can agencies incorporate C/AV-related planning processes and products into their planning and programming functions in the next few years?
- What activities and products are impacted by C/AV and how? Need to start understanding:
  - C/AV market trends and implications for mobility
  - Changes in infrastructure investments and operational strategies
  - Roles and responsibilities of stakeholders, both existing and new

Consideration

Short term planning

- Incorporation of Dedicated Short Range Communication (DSRC) for data gathering and operational strategies on arterial corridors
- Benefit-cost for C/AV-related projects
- Engagement of new stakeholders
- Track technology developments
- Data collection opportunities that require relatively small CV market penetration

Consideration

Medium and Long term planning

- Change in physical infrastructure requirements
- Change in project life cycles with more focus on communications
- Plan for increasingly rapid technological change
- Possible changes in agency roles and new skill requirements
- Need to manage and make useful information out of “big data”

Task 3 – Tools and Techniques

U.S. Department of Transportation

Background

Task 3 objectives:

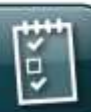
- Modifications to existing tools (or development of new tools) to evaluate the impacts/outcomes of CV and AV applications
- Describe the data required in order to modify and/or develop these tools
- Develop a roadmap for modifying and developing these tools

Task 3 Approach

1. Summary of existing products & tools

2. Evaluation/comparison of existing tools

3. Gap analysis for existing tools & data



4. Roadmap for addressing gaps

U.S. Department of Transportation

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.

Geographic Scope	Sketch Planning Tools	Travel Demand Models	Highway Capacity Manual	Simulation Models
Isolated location	○	○	●	●
Segment	◒	○	●	●
Corridor or small network	◒	◒	◒	●
Regional model	◒	●	○	◒

● *Highly relevant* ◒ *Limited applicability* ○ *Poorly suited*

Detailed results for other comparison categories are provided in the Task 3 report.

Research Roadmap for Addressing Gaps

- Long and short-term research tasks needed
- Levels of effort, time frame, potential lead agency, and possible data sources
- Five levels of automation associated with each task and C/AV impacts addressed
- Empirical data needed
- Prioritization of the tasks based on
  - Level of need
  - Synergy with other tasks.

Task 4 – Case Studies

U.S. Department of Transportation

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

Long Range Metropolitan Transportation Plan

Basic Steps

Step 1:	Gather System Baseline Information
Step 2:	Establish Goals and Objectives
Step 3:	Develop Performance Measures and Targets
Step 4:	Alternatives Analysis
Step 5:	Financial Plan and Investment Priorities
Step 6:	Transportation Plan and Programming
Step 7:	Implement and Monitor the Plan

Considerations for LRMTP

Step 1 - Gather System Baseline Information

- Identify new stakeholders and their roles
- Identify infrastructure that must be upgraded

Step 2 - Establish Goals and Objectives

- Identify emerging technologies and estimate market penetration of C/AV technology
- Engage stakeholders in development of visions for the region

Step 3 - Develop Performance Measures and Targets

- Revisit performance targets by considering the impact of C/AV technology on safety, mobility and environment
- Establish a regular process for review of C/AV technology and applications

Considerations for LRMTP

Steps 4/5 - Alternatives Analysis/Investment Priorities

- Analyze alternative investment choices and develop a preferred investment strategy
- Identify and analyze the potential adverse impact to vulnerable road users

Step 6 - Transportation Planning and Programming

- Consider deploying C/AV technology when existing infrastructure is scheduled for upgrades

Step 7 - Implement and Monitor the Plan

- Monitor and document the effectiveness of C/AV deployments

Task 5 – Workforce Skills and Training

U.S. Department of Transportation

Required Skills/Expertise

Factors to Consider

- Obtaining technological expertise that may not be needed full-time
- Time sensitivity of technologies
- Options for acquiring skills
  - Peer-to-peer networks
  - Educational partnerships
  - On-the-job training
- Specific training needs and costs
- Ability to take advantage of existing resources (Professional Capacity Building Program ITS, safety, operations and planning)
- Timeline estimates for training/development programs
- Near-Term Preliminary Guidelines for CV Professional Capacity Development

Task 7 – Outreach Materials

U.S. Department of Transportation

Outreach Materials

Outreach

- Highway Capacity Manual Community
- Modeling community outreach
- Planning community outreach
- Desk Reference/Guidance Document

Schedule

Task 2 – Impact on planning processes and products – complete

(Technical Memorandum #2: Connected Vehicle Planning Processes and Products and Stakeholder Roles and Responsibilities. http://ntl.bts.gov/lib/55000/55700/55711/FHWA-JPO-16-246.pdf)

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

(Analysis of the Need for New and Enhanced Analysis Tools, Techniques and Data. http://ntl.bts.gov/lib/55000/55700/55712/FHWA-JPO-16-247.pdf)

Task 4 - 11 illustrative case studies – underway, complete by 12/2015

Task 5 - Workforce training and skills – underway, complete by 12/2015

Task 7 – Outreach materials

- Highway Capacity Manual Tech Memo – complete
- Modeling Tech Memo – To be complete by 3/2016
- Planning Community Outreach Packet - To be complete by 3/2016
- Desk Reference - To be complete by 3/2016

Questions/Comments

U.S. Department of Transportation