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TRANSPORTATION RESEARCH BOARD

**NCHRP Project 20-102**  
**Impacts of Connected Vehicles and Automated Vehicles**  
**on State and Local Transportation Agencies**

Announcement of New Tasks, September 2019

The **National Cooperative Highway Research Program** (NCHRP) is supported on a continuing basis by funds from participating member departments of the American Association of State Highway and Transportation Officials (AASHTO), with the cooperation and support of the Federal Highway Administration, U.S. Department of Transportation. The NCHRP is administered by the Transportation Research Board (TRB) of the National Academies of Sciences, Engineering, and Medicine. The NCHRP is an applied contract research program that provides timely solutions to problems facing highway and transportation practitioners and administrators.

The objectives of [NCHRP Project 20-102](#) are to (1) identify critical issues associated with connected vehicles and automated vehicles that state and local transportation agencies and AASHTO will face, (2) conduct research to address those issues, and (3) conduct related technology transfer and information exchange activities. This announcement contains preliminary descriptions of those tasks that will be undertaken next by NCHRP Project 20-102.

Nominations for panel members to oversee each of these tasks are currently being sought (except for Project 20-102(19)B). A [nomination form](#) and résumé should be sent to Mr. Ray Derr ([rderr@nas.edu](mailto:rderr@nas.edu)) by **October 8, 2019**. You may nominate yourself or others. Panel members will be responsible for (1) developing the final scope of work, (2) selecting the best contractor, (3)

overseeing the contractor's work, and (4) reviewing and recommending publication of interim and final deliverables.

The tasks included in the NCHRP 20-102 portfolio have been largely drawn from a research roadmap developed through [NCHRP Project 20-24\(98\)](#) and updated through [NCHRP Project 20-102\(19\)](#). That roadmap is available on the project webpage and describes policy, planning, and implementation issues that will face state and local transportation agencies. The research described exceeds the resources that are expected to be available through the NCHRP and it is hoped that other organizations will choose to undertake some of the described efforts.

A competitive process was used to identify four task-order contractors for NCHRP Project 20-102. For each task, it is expected that proposals will be requested from the selected task-order contractors and unsolicited proposals from other organizations will not be considered. The oversight panel for a particular task may choose to use an open solicitation of proposals. In that case, a typical NCHRP request for proposals will be released.

**Address inquiries to:**

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**IMPORTANT NOTICE**

**The research tasks described are tentative.** The final program will depend on the level of funding available from the Federal-aid apportionments for FY 2020. To accelerate the research program, the NCHRP is proceeding with the customary process through the selection of research agencies.

## **NCHRP 20-102(19)B, Research Roadmap for NCHRP 20-102**

**Funds:** \$125,000  
**Fiscal Year:** 2020

### **BACKGROUND**

In 2014, NCHRP Project 20-24(98) developed a Connected Vehicle/Automated Research Roadmap addressing the policy, planning, and implementation issues facing state and local transportation agencies. The roadmap was based on the research team's knowledge of the topic, a workshop with the project oversight panel, and review by various parties. This roadmap has served as a key reference for the NCHRP 20-102 panel in selecting projects to pursue. Developments in this area continue apace and the research roadmap is in need of refreshing. NCHRP 20-102(19) reviewed this roadmap and recommended tasks for two years of NCHRP 20-102 funding.

### **OBJECTIVE**

The objective of this research is to update and maintain a research roadmap of projects suitable for NCHRP 20-102 funding that reflects the current landscape. The research team will be expected to bring knowledge gained from many sources to the roadmap, including the literature, relevant AASHTO events, relevant research underway or planned by institutions, the Cooperative Automated Transportation (CAT) Coalition, the annual Automated Vehicle Symposium sponsored by TRB and AUVSI, and the TRB Forum on Preparing for Automated Vehicles and Shared Mobility.

The project work plan will include a one-day meeting between the NCHRP 20-102 panel and the research team to establish common expectations for the roadmap.

### **NOTE**

This task will be overseen by the already established NCHRP 20-102 panel. Panel nominations are not requested.

## **NCHRP 20-102(25) Readiness and Effectiveness of Freeway-Based Corridor V2X Applications for Improving Congestion and Safety**

**Funds:** \$500,000  
**Fiscal Year:** 2020

### **BACKGROUND**

This research will focus on freeway-based vehicle-to-everything (V2X) applications that are at various levels of development, proof-of-concept, or pilot stages. The development of these applications is changing and evolving at a rapid pace. Various applications can be researched based on current developments and gaps in knowledge. Applications to be researched in this study would be from the V2X applications currently listed on the Connected Vehicle Resource Implementation Architecture site (<https://local.iteris.com/cvria>).

### **OBJECTIVES**

This research will develop a guidebook for transportation agency staff to assess the readiness of these applications for deployment. The research plan will: (1) Develop criteria and methodology for determining the technological readiness of current and future CAV applications; (2) Identify several representative freeway corridor scenarios covering urban, suburban and intercity environments with different levels of traffic volume; (3) Quantify the safety and/or congestion performance benefits of each application for each corridor scenario at different levels of market penetration; (4) Develop a methodology to determine a return on investment for agencies to help determine the benefit of investment into connected vehicle infrastructure; and (5) Evaluate the benefit-cost relationship for application deployment for various connected and automated vehicle penetration rates for each corridor scenario.

### **NOTE**

This work will be coordinated with the Cooperative Automated Transportation Coalition's IOO/OEM Forum that is promoting improved freeway mobility. While that effort is focused on the technical level, this project should look at the

strategic and policy implications, particularly with a mixed fleet.

**NCHRP 20-102(26), Dynamic Curbside Management in the Era of CAVs, SAVs, Scooters, Transportation Network Companies (TNCs), and Traditional Vehicles**

**Funds:** \$250,000  
**Fiscal Year:** 2020

**BACKGROUND**

As the transportation ecosystem evolves and urbanization accelerates, local governments are struggling to effectively and efficiently manage curb space to keep up with the rapid mobility technology changes and meet each city's environmental, safety, and social equity goals. For instance, it is expected that TNCs operating highly automated vehicles (HAVs) have the potential to dramatically increase multi-occupancy trips in a city and therefore reduce vehicle ownership. However, every TNC trip starts and ends at the curbside, which would mean more curb utilization using TNC than anytime before. Dynamic pricing is envisioned as an effective innovative strategy for managing curbsides efficiently in such environments. By dynamically pricing access to public curb space, cities may be able to meet environmental, safety, and social equality goals, while generating new revenue streams that can offset decreases in parking revenue. The pricing strategies and associated policies will need to be designed carefully to achieve the intended goals while avoiding unintended consequences.

**OBJECTIVE**

This study will identify city goals (environmental, safety, socioeconomic) and investigate data needed from other industries to adapt a reliable dynamic pricing strategy. The study will perform cost-benefit analysis for different scenarios of dynamic curbside management. Finally, barriers to implementation will be investigated such as private sector opposition, public opposition, access to data, and law enforcement concerns. Insofar as practical, model policies should be developed.

**NCHRP 20-102(27), Realistic Estimates of CAV Implementation Timing**

**Funds:** \$150,000  
**Fiscal Year:** 2020

**BACKGROUND**

Public agencies planning for the changes that are likely to confront them with the growing use of connected, automated vehicles (CAVs) and shared mobility systems need to have realistic information about when these new services are likely to be introduced and how rapidly they are likely to expand. The internet and media are full of unrealistically optimistic marketing predictions that are not grounded in reality, and there have not yet been any careful estimates that could provide a solid basis for agencies' decision making. This project should define estimates of market introduction and growth profiles for a broad range of representative CAV and shared mobility services, accounting for the important factors that will constrain these, such as:

- technological progress needed to ensure that highly automated systems can be proven to be safer than human-driven vehicles for use within their intended operational design domains
- level of technical effort and investments needed to expand operational design domains for each CAV application from their initial limited deployment sites to a wider range of conditions
- the time needed for different sectors of the user population to become comfortable with the use of the new technologies and services
- inertia associated with vehicle lifetimes and the rate of turnover of the vehicle fleet
- historical data regarding the rate of growth in new vehicle features from options on high-end vehicles to standard equipment on all new vehicles

Because of the large uncertainties involved, these estimates should also be defined over a range of assumptions from optimistic to pessimistic so that planners can appreciate and account for these uncertainties.

## OBJECTIVE

The objective of this research is to compile useful information on CAV implementation timelines that will be useful to transportation agencies and credible to their decision makers. Assumptions currently being made by planners, real estate developers, and international market analysts should be documented. A survey approach for updating the estimates annually will be developed in coordination with the original equipment manufacturer (OEM) trade alliances. It is hoped that this survey approach will be a model for future efforts dealing with topics such as electrification of the fleet and shared mobility.

### **NCHRP 20-102(28) Best Practices in Work Zones for AVs and CVs**

**Funds:** \$250,000  
**Fiscal Year:** 2020

## BACKGROUND

Work zones have been identified as one of the tougher environments for automated vehicles to navigate. In addition to rapidly changing conditions, work zone layouts can vary significantly across jurisdictions.

Ongoing efforts that should be taken into account include:

- FHWA's Projects on the Impacts of Automated Vehicles on Highway Infrastructure and the Work Zone Data Initiative
- Pilot deployments, including those in Michigan, Texas, Ohio, and Maricopa County
- ATSSA's Smart Work Zone efforts

## OBJECTIVE

The objective of this research is to document best work zone practices for automated vehicles, connected vehicles, and vehicles using both technologies. These practices should include the physical characteristics of the work zone that the vehicle senses and the digital information supplied to the vehicle (including through the FHWA's

Work Zone Data Initiative). The best practices should cover the range from major construction projects to maintenance work zones (e.g., pothole filling) to moving maintenance activities (e.g., striping) to utility activities. As appropriate, the deliverables should discuss applicability to similar situations such as incident management and other lane closures. Whenever possible, information should be provided to allow agencies to evaluate the return on investment for alternative designs.

### **NCHRP 20-102(29), Incorporating New Mobility Options into Transportation Demand Modeling**

**Funds:** \$125,000  
**Fiscal Year:** 2020

## BACKGROUND

Transportation demand modelers are challenged by the new mobility options available to travelers. These options include shared mobility services, automated vehicles, and micromobility technologies. Modeling may be done for the near term (when evaluating new services) and longer term (when preparing transportation improvement plans) and the longer term projections are particularly difficult. NCHRP Report 896, *Updating Regional Transportation Planning and Modeling Tools to Address Impacts of Connected and Automated Vehicles*, and AMPO's *National Framework for Regional Vehicle Connectivity and Automation Planning* describe new approaches for planning that consider uncertainty and agencies could benefit from knowing how these approaches are being applied. A topic of particular interest is travelers' proclivity to share rides with strangers.

## OBJECTIVE

The objective of this research is to identify the key transportation demand modeling parameters related to traveler use of the new mobility options, review and summarize traveler behavior studies that could inform selection of those parameters (including factors that positively or negatively affect traveler acceptance), and recommend approaches to track and project changes in traveler acceptance of these mobility options.