North Central Texas Council of Governments

KITTELSON & ASSOCIATES

AV2.1 FINAL REPORT EXECUTIVE SUMMARY

AV2.1: CONDUCT A PLANNING PROCESS TO HELP THE NORTH TEXAS REGION PREPARE FOR AUTOMATED VEHICLES AND RELATED TECHNOLOGIES

June 9, 2022

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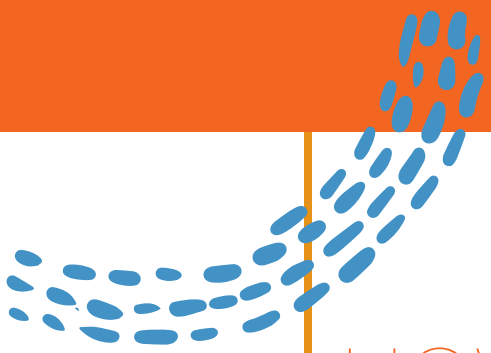
Contract Number TRN6551
Project Number 25425

INTRODUCTION

Technology impacts all aspects of transportation, and these technologies are ever evolving.

Local agencies need guidance on how to plan for uncertainties in the future of transportation. Proactive planning can help North Central Texas communities create unified plans to use technology to solve local and regional transportation needs.

Decision makers want to understand **HOW** technologies could change travel behaviors and land use patterns, **WHEN** these impacts are likely to occur, and **WHAT** additional infrastructure or policy changes, if any, agencies may need to support the future travel demands.



HOW ARE TECHNOLOGIES CHANGING TRANSPORTATION?

New technologies are changing how we travel, when we travel, the cost of travel (time or money), or replacing the need to travel at all (like teleworking or telemedicine). These changes to travel patterns and behaviors can lead to changes in land use patterns (such as where people live or work, or the locations of freight distribution centers).

Some transformational technologies are in use today and are already impacting travel behavior and land use patterns. For example, many North Texas residents, students, and employers quickly adopted telework or virtual learning due to the COVID-19 pandemic. Increasing e-commerce demands have moved goods warehouses and distribution centers closer to urban areas.

Some technologies are in pilot phases, such as TxDOT's Connected Freight Corridor, Arlington's Rapid AV ride-hail program, Wing's drone delivery pilot, and sidewalk delivery robot pilots on several college campuses in the region.

Some technologies will require local government support, such as expanding electric vehicle charging infrastructure.

Some impacts are still unknown, like the sustainable cost of emerging technologies or the travel behavior impacts of new modes of transportation like automated vehicles.

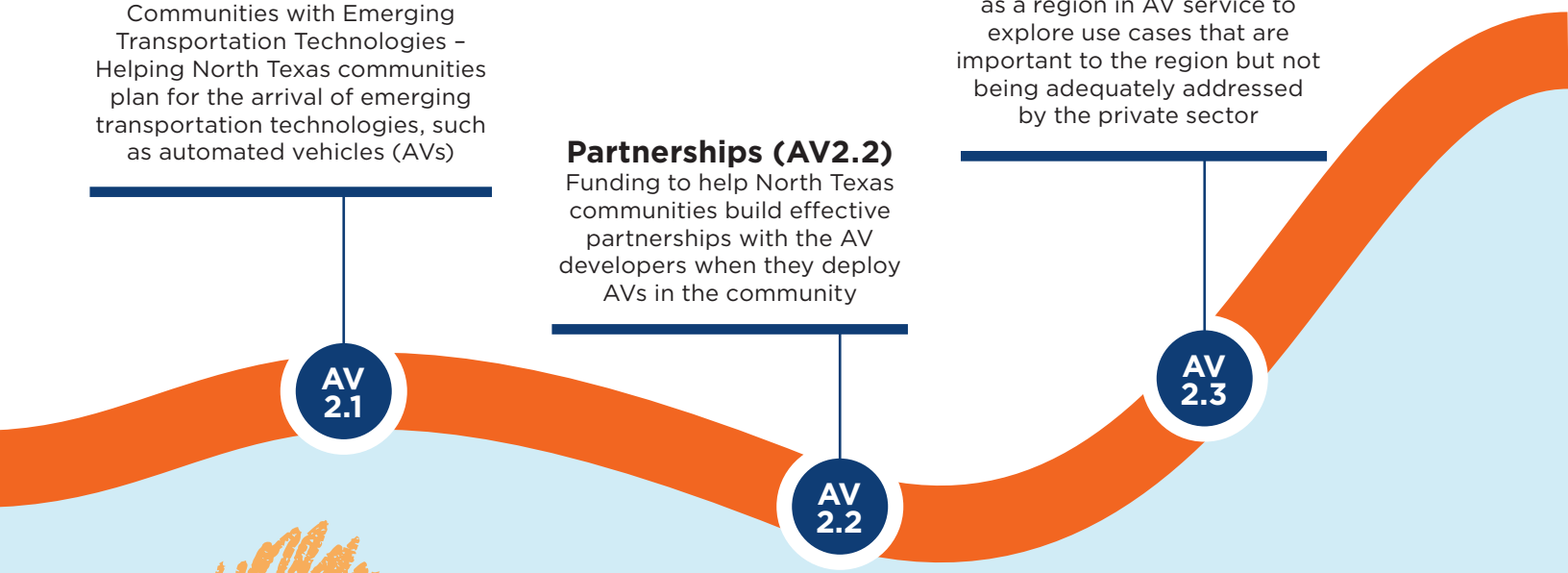
HOW IS NCTCOG PREPARING FOR THIS CHANGE?

Automated transportation solutions are part of the long-term transportation strategy for North Central Texas Council of Governments (NCTCOG). NCTCOG is preparing for emerging transportation technologies through a three-phase Automated Vehicle 2.0 (AV2.0) program.

Planning (AV2.1)
Connecting North Texas Communities with Emerging Transportation Technologies – Helping North Texas communities plan for the arrival of emerging transportation technologies, such as automated vehicles (AVs)

Partnerships (AV2.2)
Funding to help North Texas communities build effective partnerships with the AV developers when they deploy AVs in the community

Investment (AV2.3)
Making strategic investments as a region in AV service to explore use cases that are important to the region but not being adequately addressed by the private sector



When envisioning the AV2.1 program, NCTCOG used the following terminology:

"Automated Vehicle" or "AV" refers to both connected and autonomous vehicles. The term is inclusive of technologies that are precursors to the introduction of AVs, such as emerging modes of micromobility and rideshare, and related to AVs, such as vehicle-to-infrastructure technology.

In addition to the AV2.0 program, NCTCOG is preparing for emerging technologies by:

- Collaborating on TxDOT's **Connected Freight Corridors Project**.
- Leading a **Freight Optimization Project** to improve flow of freight.
- Standardizing work zone reporting using the **Work Zone Data Exchange** Specification.
- Utilizing **connected vehicle data**—especially video—to improve maintenance, operations, and safety through a Situational Awareness App.
- **Advancing electrification** to support automated vehicles.
- Calming traffic, **creating safer streets for all people**, including for bicyclists and pedestrians will improve operational environment for automated vehicles.
- Leading **Uncrewed Aircraft System** (UAS) education, planning, and pilots.

WHERE ARE WE TODAY?

Studying existing conditions and assessing the technology market help agencies understand the impacts of automation on North Central Texas. The **Existing Conditions Report** details the current state of transportation and emerging technologies in North Central Texas. By knowing the existing conditions (or baseline), agencies can monitor trends and understand impacts.

KEY FINDINGS FROM THE EXISTING CONDITIONS REPORT

Personal mobility. Many roadways in the region have high congestion levels and unreliable travel times. Local emerging technology mobility efforts include high-speed rail, demand-responsive passenger services, first-mile/last-mile connections via micromobility, mobile ticketing and scheduling applications, and people movers.

Freight Movement. Increasing traffic congestion in the region will have a negative impact on freight movement. Automated trucking, unmanned aerial system (or drone) delivery, and enhanced traffic and congestion management strategies could improve freight movement reliability.

Equity. The North Central Texas region is committed to providing the same level of access to essential destinations to all residents, irrespective of their residence location, race, age, gender, income, and/or abilities. Agencies need guidance on how to develop equity-focused policies and programs related to emerging technologies.

Safety. There were 820 crash-related fatalities in North Central Texas in 2019. Emerging Technologies could provide new opportunities to improve transportation safety in the region.

Infrastructure readiness and resiliency. Public infrastructure that supports emerging technologies includes roadways, traffic management systems, sensors, and the electric grid. Infrastructure readiness and resilience can be measured through assets, data, and integration. Agencies want guidance on when and what to invest in.

WHICH TECHNOLOGIES SHOULD COMMUNITIES PLAN FOR?

We created a **Market Analysis Report** to help municipalities understand which technologies are coming to North Central Texas, including:

- Micromobility
- Aerial Mobility
- Emerging Vehicle Technologies (Connected, Automated, Electric, Shared)
- Highway Systems Technologies
- Parking System Technologies
- Integrated Technologies
- Data Guidance

The market analysis report outlines:

- Status and trends in emerging transportation technologies,
- Likely applications and adoption timelines,
- Potential challenges to greater deployment,
- Potential challenges to ensuring equitable deployment, and
- Opportunities for public sector involvement.

KEY FINDINGS FROM THE MARKET ANALYSIS REPORT

Technology is changing rapidly. The planning process should be flexible to adjust to changing technologies, business models, regulatory frameworks, and market conditions. Agencies should plan for applications of technology, rather than specific technologies, which may change over time.

Lay the groundwork early. Engage with stakeholders to understand common challenges, build partnerships, and establish strong relationships to deliver transportation access needed today while preparing for future technological changes.

Manage the increase in the quantity of data. Public agencies will need to develop new data management approaches to collect, analyze, manage, share, and utilize data to understand and improve the transportation system.

Plan for multiple possible future scenarios. Many technologies are still in the research and development stage. Until the technologies are in the hands of the general public in real-world use, and until the sustainable price point of the new technologies or services is known, the long-term, real-world impacts of emerging technologies remain unknown. Agencies need to consider multiple potential future scenarios and monitor system performance and trends to learn how these new technologies are impacting the region.

WHAT MATTERS TO RESIDENTS?

The project team engaged with residents, businesses, and regional stakeholders through a project website, public meetings, an online survey, focus groups, and Project Advisory Committee meetings.

Public Meetings. We held two virtual public meetings. Meeting recordings and questions and answers are available on the **Get Involved** page of the project website.

- **Public Meeting #1** (August 2021) introduced attendees to emerging transportation technologies through a video and interactive presentation. Participants shared feedback through live polling and learned how to provide more input through the project's online survey.
- **Public Meeting #2** (February 2022) discussed education and workforce development needs to prepare for emerging technologies. We also shared the **K-12 lesson plan** on automated vehicles that the project team created to help excite the next generation of leaders and problem solvers in the region.

Online Public Survey. We used an online survey to ask North Texas residents and employees about their current transportation modes, use of current transportation-related technologies, and perspectives on emerging transportation technologies. We received 483 survey responses. The **Engagement Phase 1 Report** summarizes the survey responses.

Focus Groups. We engaged 83 residents through focus groups to gain a deeper awareness of the public's needs and perspectives on current, new, and emerging transportation technologies. The **Focus Groups Report** summarizes what we learned.

Project Advisory Committee (PAC). We held eight bi-monthly PAC meetings to present, review, and collect feedback on analyses, key findings, and deliverables throughout the project. The PAC was made up of a diverse group of about 20 stakeholder representatives from local and state transportation providers, local governments, technology developers, workforce and education institutions, and other community organizations.

Project Website. The project website (www.connectntxfutures.org) is the public's central information hub for the project. It provides materials for the public to learn more about emerging transportation technologies, including:

- Informational videos
- Project reports
- Meetings notes
- Automated vehicle lesson plan
- Resources on AV deployment efforts locally and nationally

We learned from the survey and focus groups that residents are concerned about the amount of traffic, delays from construction and train crossings, few transportation options, and access to high-speed internet. Younger respondents are more willing to consider using the emerging technologies. As household income increased so did the willingness to use emerging technology.

For more information on public and stakeholder engagement conducted as part of this project, including public surveys and focus groups, please refer to the **AV2.1 Engagement Phase 1 Summary Report**, **Focus Group Report**, or **What We Heard From Residents** on the project website.

HOW WILL AVS AFFECT TRANSPORTATION AND LAND USE?

The greatest uncertainty in planning is private sector market forces and what will emerge as the sustainable price point of automation and other emerging transportation technologies.

Currently, planners do not have enough data to assign probabilities to potential future scenarios, so proactively identifying a diverse suite of potential future scenarios to assess potential needs provides a framework that agencies can use to start the planning process and adapt agilely as more information emerges from external market forces.

The **Scenario Development Report** explains how we developed seven potential future transportation automation scenarios for the region, and how we selected three of these scenarios for further modeling evaluation under the AV2.1 project:

1

AV Impact on Roadway Network Performance. This scenario assumes that vehicles that are both connected and automated will enhance network capacity and reduce the value of time for drivers.

2

AV Impact on Intersection Performance. This scenario assumes that connected vehicle-to-infrastructure technology will improve intersection capacity and reduce intersection delays.

3

AV Impact on Population and Employment Distributions. This scenario assumes that automated vehicles will cause travelers to make longer trips due to the decreases in their travel delay and the value of time for drivers. It will capture possible growth opportunity scenarios due to AVs. Each city or county can use these scenarios to define what it considers desired or undesired growth patterns for their area and to develop policies to incentivize their desired growth pattern.

The NCTCOG Modeling Group selected a modeling platform developed by the University of Texas Austin in conjunction with NCTCOG staff (the UTAV-TAFT model) for the AV2.1 project team to use to evaluate future technology scenarios.

The Scenario Evaluation Report summarizes the modeling methodology, assumptions, and results. For each scenario, we tested a range of AV fleet penetration rates (0%, 25%, 50%, and 100%). Model input assumptions include AV fleet penetration rate, link capacity improvement, AV value of time reduction, increased speed, increased non-freeway saturation flow rate, lower signal control delay, and demographic data for population and employment redistributions.

This is the first study to apply the new capacity adjustment factors for connected and automated vehicles from the *Highway Capacity Manual* to a regional travel demand model.

KEY FINDINGS FROM THE SCENARIO EVALUATION REPORT

AVs alone will not solve the region's future congestion problems. Additional travel demand management and capacity increasing strategies are needed to meet current and future transportation needs.

The model results followed predicted patterns. Under any capacity improvement scenario:

- Vehicle Miles Traveled (VMT) generally increases
- Vehicle Hours Traveled (VHT) generally decreases
- Average Daily Speed generally increases
- Daily Delay generally decreases

Change in VMT, VHT, Average Daily Speed, and Daily Delay varies between different roadway functional classes and by time period (morning peak, evening peak, off peak).

Agencies should collect and monitor model performance measures from real-world deployments to determine if our assumptions should be revised in future modeling efforts.

Local AV deployments could model sub-regional geographics like city or county level.

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HOW WILL AVS AFFECT TRANSPORTATION FINANCES?

Transportation funding comes from a variety of sources at the local, state, and federal level. Existing revenue sources include state and federal fuel taxes, vehicle registration, titling, and licensing fees, oil and gas production taxes, sales taxes, oil lubrication sales taxes, toll revenue, vehicle inspection fees, and traffic violation citations. Local revenues come from parking, local vehicle registration fees, and property and sales taxes.

Rapid population growth in the region, coupled with rising construction costs, aging infrastructure, and increased congestion are already straining transportation funding.

The **Financial Report** provides a high-level assessment of how automated transportation may affect local entity finances. The report also explores potential strategies for engaging the private sector to generate new revenue streams to supplement or replace funding streams affected by automated transportation and related technologies.

KEY FINDINGS FROM THE FINANCIAL REPORT

Emerging technologies (including more fuel-efficient electric vehicles, shared mobility, and automated vehicles) threaten traditional funding streams. Traditional transportation-centric revenues from motor fuel taxes, parking revenues, vehicle registrations, and traffic citations are most at risk in a shift to shared, electric, and automated mobility.

Alternative funding streams have potential to fill gaps in transportation revenues. Local entities should identify their current revenues; collect data to understand trends and potential vulnerabilities in a shared, electric, and automated future; and assess feasibility of implementing alternative revenue strategies.

Agencies need a toolkit for identifying existing funding mechanism and assessing their vulnerabilities in the context of emerging technologies. Funding mechanisms vary widely among local entities. A toolkit may help define a process to evaluating current revenues and identifying strategies to fill potential gaps.

Agencies should gather political and public support for alternative funding strategies. New fees and taxes are challenging to implement. Public engagement needs to clearly demonstrate the added value from new revenue opportunities.

HOW DO YOU HOST AN AV DEPLOYMENT?

The **AV Hosting Deployment Guide** provides guidance to cities to be an active player in advancing technology to solve local transportation problems. It also provides a realistic take on where technology is today and how cities can leverage technology and supporting policies to achieve their goals.

KEY FINDINGS FROM THE AV HOSTING GUIDEBOOK

Assess Potential Use Cases and Business Models. The applications and business models of automated transportation vary widely. Understanding the various use cases can help agencies assess the transportation challenges each use case might be best positioned to address.

Develop and Update Policies. Agencies should be proactive in assessing policies to support emerging technology. Policies connected to public goals can help emerging technologies address challenges facing the region and set expectations for the industry.

Build Partnerships and Share Data. Emerging technology is new and rapidly evolving, meaning everyone has a lot to learn from each other. Private industry understands the technical aspects of their technology. Agencies understand local policies and processes. Developing strong relationships and sharing data can form mutually beneficial partnerships for public agencies and technology companies.

Prepare Infrastructure. Agencies can be proactive in identifying infrastructure improvements to support existing and future deployments, including roadway, communications, and data management infrastructure; routing constraint considerations; and traffic signal systems.

Train the Workforce. Agencies should begin building internal agency capabilities and training workers needed by industry. Agencies and educators may partner with industry to understand their needs and tailor training and education to fit them. Training and education should be technology-agnostic, not focusing on a specific technology that may change, but rather focus on transferrable skills that can apply to a variety of future conditions.

Monitor Progress. Technology is not a "silver bullet" to the transportation problems facing North Central Texas. Agencies should develop performance metrics to continually monitor and evaluate the impacts of technologies in the community and making adjustments as needed to achieve the desired benefits.

WHAT SHOULD AGENCIES DO NEXT?

This project equips local agencies with tools to proactively shape the development and adoption of emerging technologies to solve transportation challenges in the North Central Texas region.

Municipalities. To support the transition to AVs and other emerging transportation technologies, municipalities should follow the four-step process outlined in **NCHRP Report 924: Foreseeing the Impact of Transformational Technologies on Land Use and Transportation**:

1

Prepare. Become familiar with AV technologies and agency regulatory powers, develop the agency's vision for technology, and set technology-related goals. Some policies may be pre-empted by Texas state law, but local agencies do have control over land use and development policy to support emerging technology. The **Market Assessment Report, Engagement Report**, and **AV Hosting Guidebook** provide this background information.

2

Self-assess. Review the agency's staffing, resources, capabilities, organization, policies, and plans. Identify needs and courses of action. The **Existing Conditions Report** and **Financial Report** are starting points for the self-assessment.

3

Take action. Address the policy gaps identified in the self-assessment. Identify and/or develop funding sources to address resource gaps. Train or hire new staff, or partner with others with the necessary expertise, to address capability gaps. Get your feet wet by testing technology and agency readiness through pilot deployments. The **final report** and the **AV Hosting Guidebook** provide guidance on agency and workforce development, partnerships, and local policy development.

4

Monitor and adjust. Monitor progress toward achieving the agency's technology-related goals and adjust programs, plans, and actions as necessary to meet the goals. The **Scenario Evaluation Report** predicts potential AV impacts. Agencies can monitor the model input assumption performance metrics to track trends and adjust policies as needed. NCTCOG can model additional future technology scenarios and can update model input assumptions as agencies collect more data on real-world deployments.

NCTCOG. To continue leading the region in the adoption of automated technology, NCTCOG can:

Pursue funding opportunities. This readiness sets the stage for the region to continue to be an active player in the deployment of emerging technologies. The region may also apply for federal, state, or local deployment funding to deploy or support new technologies.

Continue to monitor trends. Technology continues to change rapidly, and the long-term impacts remain unknown. NCTCOG should continually monitor industry trends and the impacts on the North Central Texas region to adapt as the AV market evolves.

Disseminate key findings. NCTCOG and other stakeholders can keep up the momentum created from this project with continued outreach to the public, policymakers, and local agencies. NCTCOG can lead a coordinated effort to share and disseminate key findings from this project to accelerate adoption of best practices among local agencies.

Develop tools to prioritize and evaluate pilot projects. Plan for and conduct evaluations of pilot deployment programs. Evaluations are a useful tool for understanding the impacts of a project, disseminating key findings and lessons learned, and identifying project success stories and limitations. Evaluations are critical for future deployers to build upon the work. They can also inform public agencies on how to structure pilot programs and select projects to pursue moving forward.

Develop a financial revenue assessment toolkit. Define a process for local agencies to evaluate current revenues and identify strategies to fill potential gaps as transportation shifts to shared, automated, and electric.

You can continue to stay connected, get involved, and learn more by visiting the project website here:
www.connectntxfutures.org