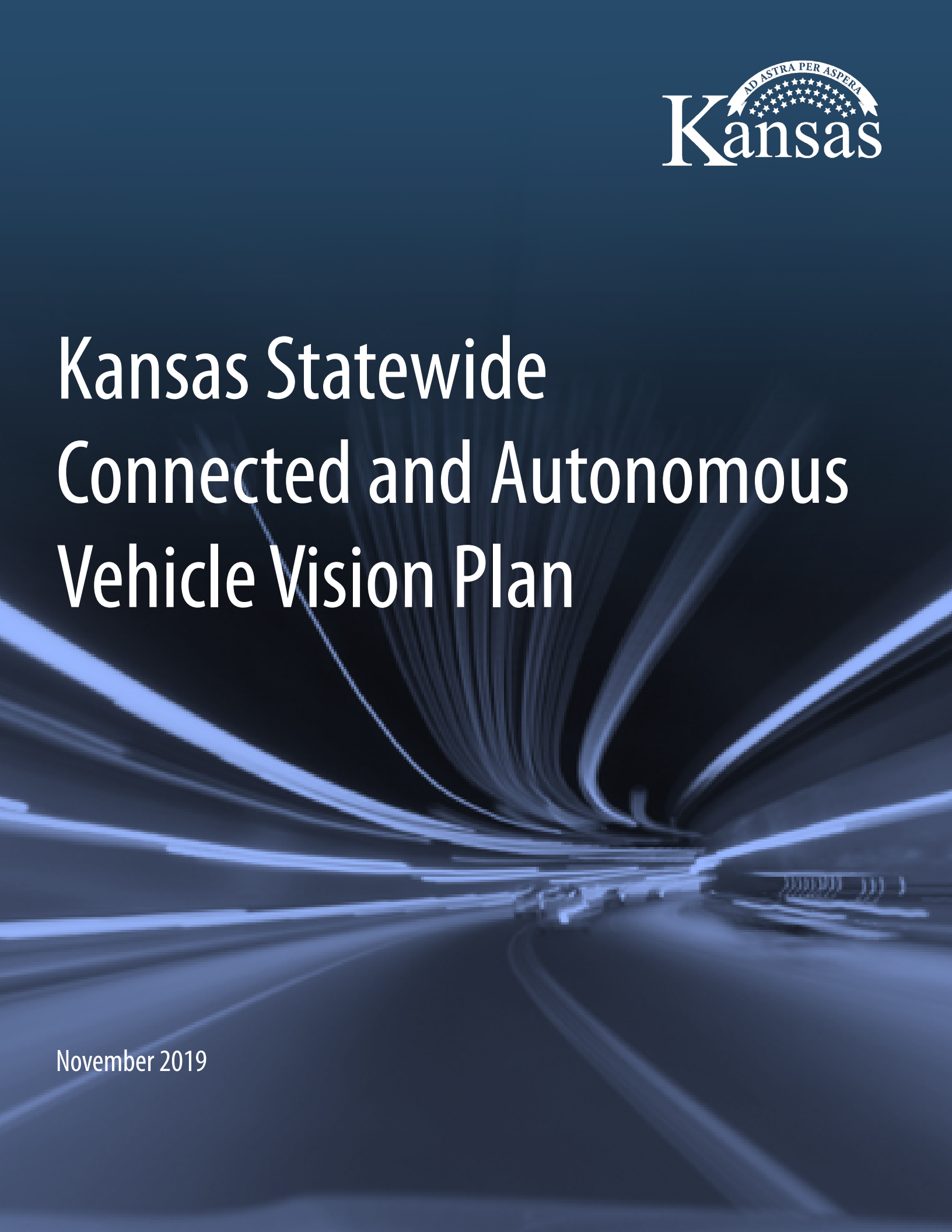

Kansas Statewide Connected and Autonomous Vehicle Vision Plan

November 2019

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ACKNOWLEDGEMENTS

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1. INTRODUCTION

Purpose

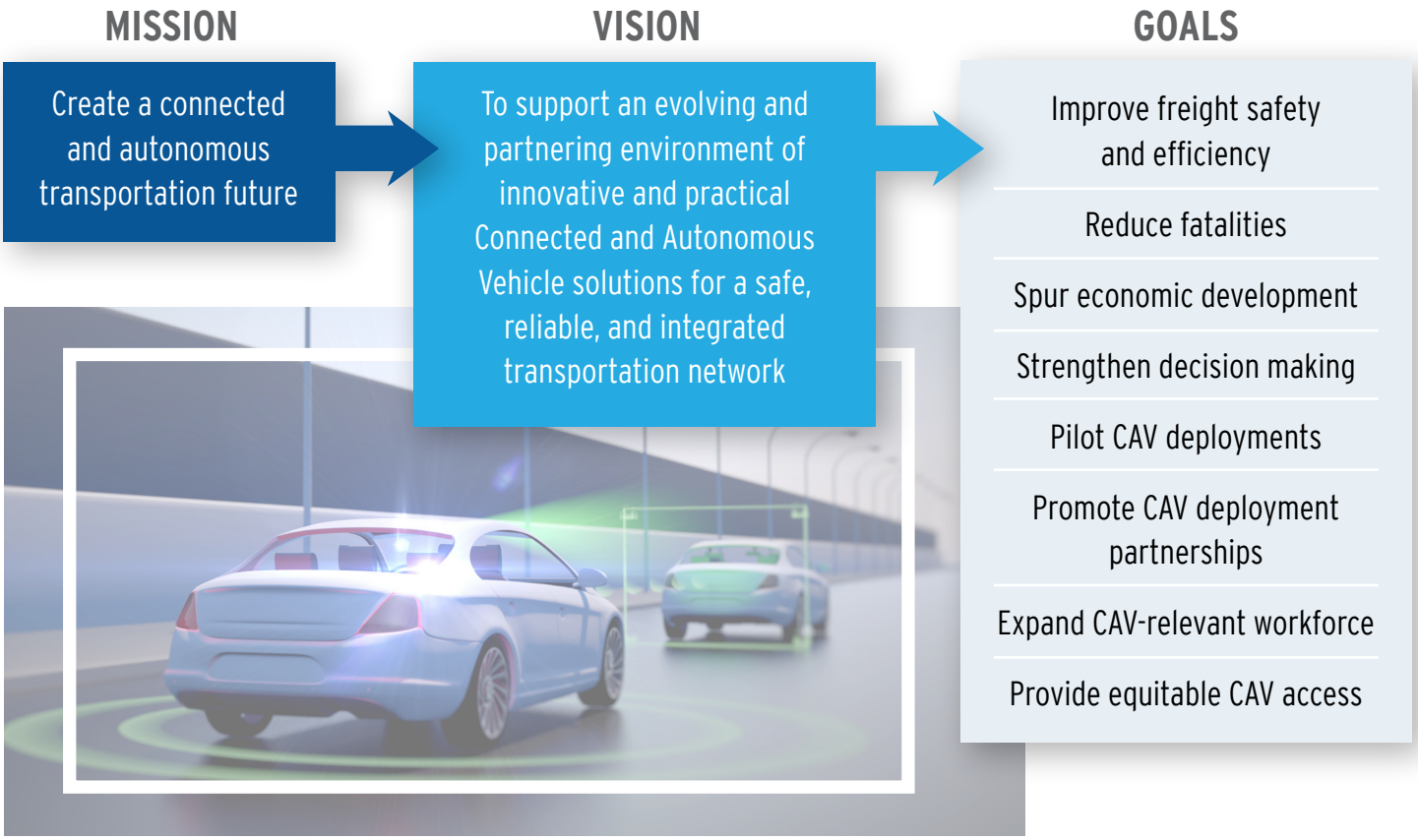
The evolution and deployment of connected and autonomous vehicles (CAV) and the infrastructure to support these vehicles will transform the safety, economic and personal mobility opportunities that Kansas residents, businesses and visitors experience. The ability to leverage these opportunities requires a statewide CAV vision and framework in place for agencies and stakeholders to maximize CAV deployments and realize benefits for Kansas travelers.

In 2018, the Kansas Department of Transportation (KDOT) created the Statewide Connected and Autonomous Vehicle Task Force (Task Force) to increase awareness and educate state agencies on the potential benefits of deploying CAV systems in Kansas. The following year, KDOT and the Task Force developed a CAV Vision and framework for the State of Kansas documented in this Kansas Connected and Autonomous Vehicle Vision Plan. This Vision Plan includes individual blueprints for Kansas state agencies involved in CAV policy, deployment, and operational considerations (see Appendix). Each blueprint provides a high-level plan for how state agencies can incorporate connected and autonomous vehicles into their organizational business planning, staffing and activities.

Vision, Mission and Goals

KDOT and the Task Force collaborated in developing a statewide CAV vision, mission and supporting goals that combine to provide a foundation for advancing emerging technologies in the state. This work was done through surveys, interviews and four interactive work sessions with the Task Force, all of which is documented in the Appendix. The state's integrated, comprehensive approach is visualized below in Figure 1.

Figure 1. Kansas Connected and Autonomous Vehicle Vision, Mission and Goals



The supporting goals developed by the Task Force involve the following:

Table 1. Kansas CAV Supporting Goals

Improve Freight Safety and Efficiency	• Support a freight specific CAV operational environment, resources, and policy so that goods movement in the state is safe and efficient.
Reduce Fatalities	• Provide a CAV environment that further enhances traveler information for weather conditions and incidents on Kansas roadways for all travelers. • To provide a CAV environment that promotes safety for travelers and first responders on Kansas roadways.
Spur Economic Growth	• Support economic growth in the state by improving freight conditions, enhancing workforce transportation, and improving overall system reliability.
Strengthen Decision Making	• Advance existing and emerging technologies for data collection, management, and analysis that support a strong CAV environment in a secure and proactive manner.
Pilot CAV Deployments	• Develop and participate in Kansas CAV pilot (and regional partners') projects by 2020 so that benefits and lessons learned can be captured to advance a CAV future.
Promote CAV Deployment Partnerships	• Promote private sector partnerships in Kansas CAV pilot projects by 2020 so that the CAV industry advances in Kansas. • To promote partnering opportunities to expand academic and business ventures that advance emerging technology solutions for a CAV future.
Expand CAV-relevant Workforce	• Train and provide workforce advancement that aligns with future CAV applications and needs in Kansas.
Provide Equitable CAV Access	• Ensure the benefits of CAV technologies and operations are available to all Kansans • Develop educational and outreach materials for state agencies that adopt CAV solutions. • Inform Kansas residents about the CAV future for the state through public information pieces (newspaper articles) and other available information means (websites and tweets).

Together, these goals and progress towards them will position the State of Kansas to achieve its vision to support an evolving and partnering environment of innovative and practical Connected and Autonomous Vehicle solutions for a safe, reliable and integrated transportation network.

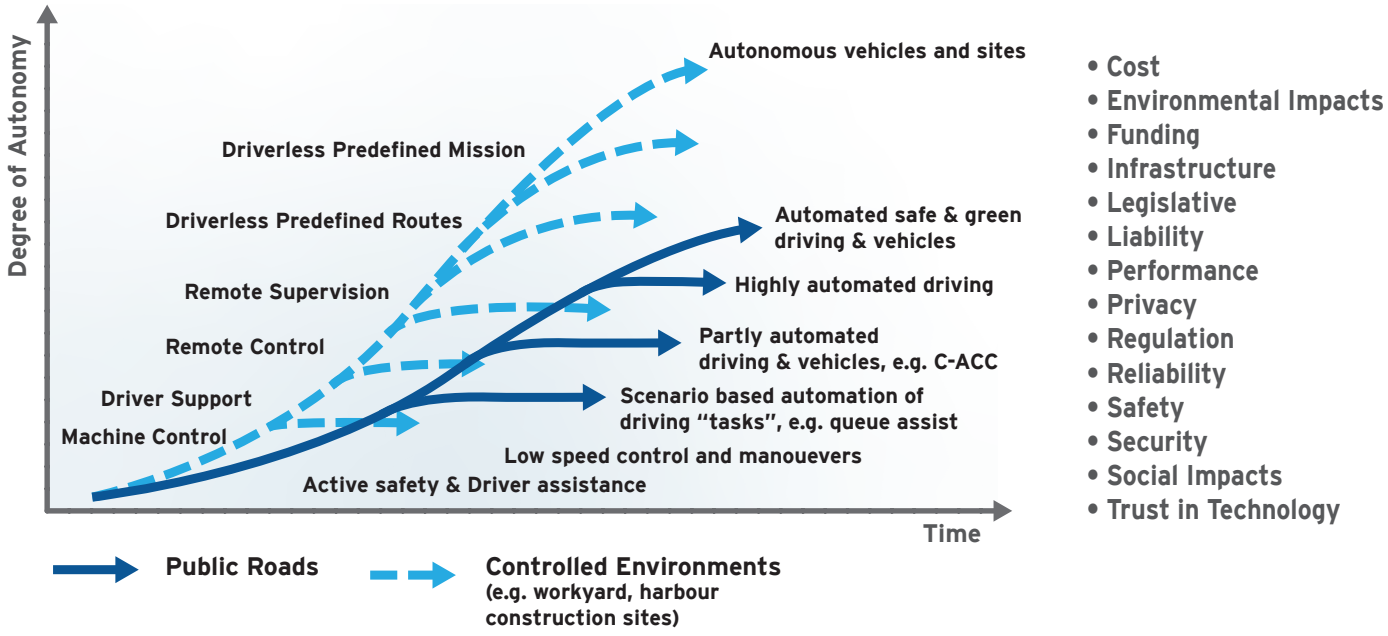
2. CURRENT STATE OF CONNECTED AND AUTONOMOUS VEHICLES AND RELATED TRENDS

Predictions for Commercial Availability and Market Penetration

The CAV Vision developed by KDOT and the Task Force provides a framework for considering CAV related projections and trends, and to better understand how they may affect Kansas and how the state can proactively manage and adapt to a rapidly evolving CAV technology environment. This begins with considering how quickly CAVs will be deployed in Kansas. Many agencies and organizations are advancing CAV technologies using timelines driven by their own agendas and assumptions about consumer demand. As a result, their respective projections for market penetration timing and levels vary widely in terms of methodology and results. Regardless of the projection used, CAV technologies and their impact on transportation policies and investments will be experienced incrementally by most users, which provides Kansas with an opportunity to develop policies and investments in a pragmatic, incremental fashion, concentrating first on those users and uses that are most pressing.

For example, it is likely that agricultural vehicles, freight trucks, ride-hailing companies, and transit vehicles likely will be early adopters of CAV technology. In these sectors, the expected opportunities to reduce labor costs and increase safety offer significant benefits to current business models. Ride-hailing companies have predicted that highly automated vehicles may be part of the commercially available ride-hailing fleet as early as 2030.

Figure 2. Factors Affecting Adoption/Deployment Rates

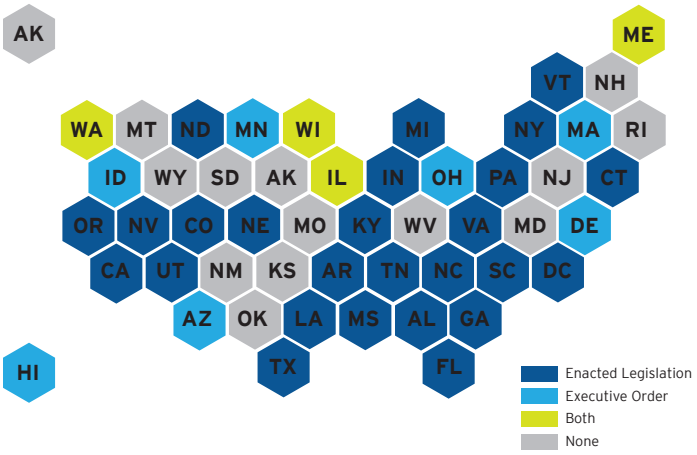


The broader, deeper deployment of connected vehicle (CV) technologies, let alone substantially or fully automated vehicles, operating on other than well-maintained highways in clear weather conditions, will depend upon the interplay of a broad range of factors and how they are resolved. These may mean that Kansas, like many other states, could benefit most by analyzing the interplay of factors affecting adoption and deployment rates to prioritize how and when state intervention and assistance is needed.

Source: HNTB Legislative and Regulatory Overview.

Another key factor in how easily and quickly CAVs may deploy in Kansas will be state legislative action. One example that states have enacted is legislative action to test autonomous and connected vehicles. Kansas has not yet legislatively defined how and when autonomous vehicles can be tested, deployed or operated. Although it is one of 41 states and the District of Columbia that have considered such legislation since 2012, it is not among the 30 states that have taken legislative action as of 2019.

Figure 3 – States with Autonomous Vehicles Enacted Legislation and Executive Orders



Source: Adopted from Autonomous Vehicles | Self-Driving Vehicles Enacted Legislation, National Conference of State Legislators.

Task Force members, coupled with the experiences of other states, suggest that in the long run three broad areas of legislative and regulatory action will be needed to make sure Kansas and its residents, taxpayers and businesses are successful in a CAV future:

1. **Transportation planning and funding –** CAV deployment likely will take place over decades with many intervening changes in policy and technology. (Estimates suggest it could be 40 years or more before autonomous vehicles are the majority of the state's vehicle fleet.) As the CAV infrastructure is built, Kansas will need to maintain, and even expand, its legacy infrastructure, resulting in the need for more flexible planning processes and funding sources and amounts.
2. **State agency change management –** It is difficult to fully identify the impacts CAV technologies will have on every state agency's roles, responsibilities and operations. Resources and processes will need to be put in place to help each state agency identify and respond to those changes in a flexible and likely incremental fashion. Additionally, it will be critical that state agencies are well positioned to identify, recruit and retain staff with the necessary skills.
3. **Human capital –** The autonomous vehicle revolution likely will come with workplace and other social disruptions. As a result, Kansas may be called upon to make new or greater investments in job training, income security, business recruitment and retention incentives and other workforce-related actions as part of normal state government activities.

What Will Success Look Like?

There are many ways to gauge the effectiveness of legislative and regulatory efforts. However, these can be summarized in five ways. Did the effort appropriately:

1. Assist in creating a climate for research and innovation?
2. Encourage the development of CAV vehicles, testing and uses that make sense for Kansas?
3. Enable the safe and rational testing of the vehicles for operation on Kansas roads?
4. Address safety standards and enforcement related to the operation of CAV's?
5. Accelerate the deployment of CAV technologies in ways that advance the safety and economic interests of Kansas while minimizing or mitigating potential negative impacts.

While KDOT can assess many aspects of the potential answers to these questions, there are political, legislative, economic and other facets that may be more appropriately evaluated by the legislative and/or executive branches of government (in tandem or without local planning partners). Consideration should be given by KDOT and by the Task Force regarding how best to incorporate these other parties and perspectives in evaluating the state's success in preparing for a CAV future.

3. KANSAS CONNECTED AND AUTONOMOUS VEHICLE VISION PLAN

KDOT and the Task Force used stakeholder interviews, input from state agencies, one-on-one interviews, working meetings and other methods to identify needs that the state's CAV Vision Plan must tackle to facilitate the efficient implementation of CAV technology in Kansas. These needs are summarized in Figure 4 and detailed in the Appendix (Needs Assessment) along with agency input regarding strategies or resources required to address those needs.

The needs assessment helped set the stage for KDOT and the Task Force to conduct an analysis of the state's strengths, weaknesses, opportunities and threats (SWOT) in delivering a beneficial CAV future in Kansas.

The SWOT analysis also helped filter out elements common to all governmental initiatives generally, and transportation efforts specifically. This meant excluding generalized concerns about funding, public acceptance and others that are inherent in policy initiatives of all kinds. This approach enabled KDOT and the Task Force to focus exclusively on a CAV-specific SWOT analysis (see Table 2 below).

Kansas CAV Deployment Needs

- **Data Management**
- **Funding**
- **Infrastructure**
- **Legislation**
- **Network**
- **Organization**
- **Partnerships**
- **Regulation**
- **Staffing**
- **Stakeholder Engagement**
- **Workforce Development**

Table 2: Kansas CAV SWOT Analysis

Strengths	Weaknesses
• Diverse community typology for testing • Significant transportation system in good repair • Momentum to strengthen statewide broadband access • Robust existing fiber network • Significant CAV-friendly interests/experience » National/international agri-businesses » High freight movement and "center for trade" » Aviation manufacturing » Defense and military bases • Established CAV champions and advocates » KDOT "point person" Mike Floberg » CAV Vision Task Force » Partnerships with MARC/WAMPO	• Lack of clear-cut legislative direction » Pilot project guidance » Enabling legislation for agency action » Insurance regulations and legislation » Liability • Lack of broad-based agency engagement » Leadership unengaged » Lack of CAV planning or budgeting » CAV-pertinent staff recruitment, development and retention • Market barriers » Lack of national tech sector interest » Conservative nature of Kansans in accepting/using technology » Cost/feasibility of addressing rural use cases
Opportunities	**Threats**
• Pilot partnerships • Engaging public enthusiasm through outreach • Leverage researchers at state universities • Collaboration with communications industry • Leverage CAV technologies to advance VMT mileage-based funding • Leverage CAV technologies to advance core state enterprises for economic growth (ag, aviation, manufacturing, etc.)	• Data management limitations • Threats to data security • Failure to properly assign risk and liability • Loss of local control over technology use and standards • Mandates on local governments • CAV congestion (deadheading, empty vehicles, etc.) • Impacts of electric vehicles on fuel tax revenues • Reduction in jobs • Legislative inaction

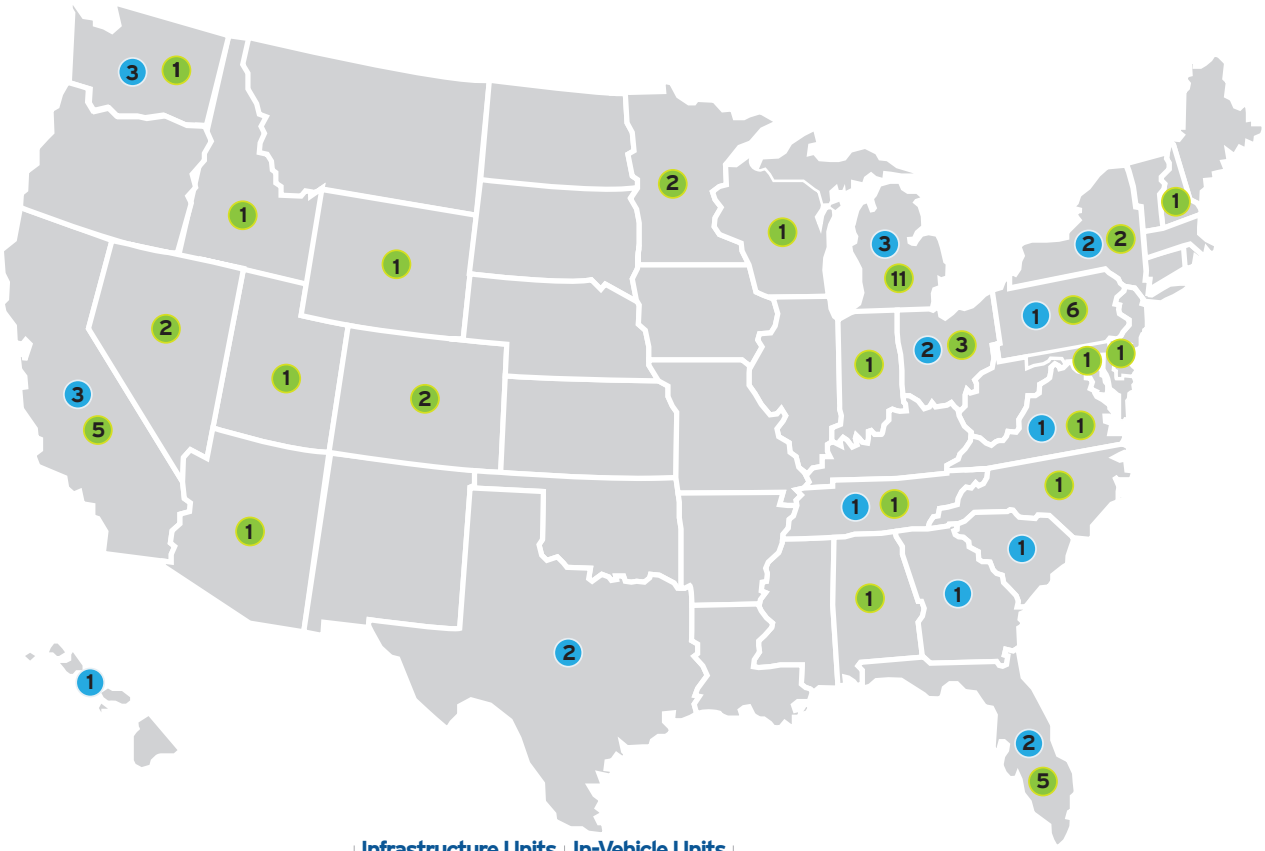
Identifying Potential Kansas Initiatives & Projects

KDOT and Task Force activities such as the SWOT analysis will help Kansas better explore potential opportunities through its own pilot initiatives and projects as well as from lessons learned from initiatives occurring across the country.

For example:

- AV proving grounds are being built across the country to meet a growing need for AV testing.
- More than 10 states currently are conducting ongoing state pilots of low-speed AV shuttles.
- There also have been many Connected Vehicle (CV) or CAV pilots across the country, including three U.S. DOT CV pilots in New York City, Tampa, and Interstate 80 in Wyoming.

Figure 4. Planned and Operational Connected Vehicle Deployments Where Infrastructure and In-Vehicle Units are Planned or In Use



	Infrastructure Units	In-Vehicle Units
Operational (52 Projects)*	2,044	3,340
Planned (23 Projects)**	242	0
Total	2,286	3,340

* Projects shown include those sponsored by U.S. DOT and others.
** Device numbers for many of the planned projects are currently unavailable.
Source: USDOT Sept. 2018

Source: Adapted from Preparing for the Future of Transportation: Automated Vehicle 3.0, U.S. Department of Transportation.

Learning from Others

This extensive testing environment creates opportunities for Kansas to establish formal or informal collaborative relationships with California, Florida, Colorado, Michigan, Iowa, Texas and other states involved in these pilot projects, accelerating the state's development and deployment of CAV policies, projects and technologies. Kansas also will benefit from the fact that most CAVs being tested are electric or hybrid vehicles, giving it additional insights in how best to accommodate the likely ongoing fuel switch in the national vehicle fleet from petroleum to electric.

This potential collaboration possibly extends to the U.S. DOT, which has more involvement in testing CV and their capability to communicate with one another, infrastructure, and other modes of travel. U.S. DOT sponsored pilot programs will be documenting their results through 2021. Their findings will provide a resource for Kansas to incorporate as its own CV projects and pilots move forward and present an opportunity for Kansas to leverage federal creation of standard design and data exchange protocols.

With the Kansas Connected and Autonomous Vehicle Vision Plan, the State of Kansas is well-positioned to pull from these national best practices and peer-state examples to develop a strategic, practical, and tailored roadmap that leverages CAV technologies to improve safety, mobility, and economic development in Kansas.

There is, after all, knowledge and experience Kansas can draw on by building and maintaining collaborative relationships with other CAV leaders. Many government bodies and agencies at the federal, state, and local level are conducting – or recently have conducted – planning activities for CAV. They often share common attributes that make them amenable for modification to meet the specific needs of Kansas over the long term:

- Although many of these plans are spearheaded by transportation agencies, several statewide bodies and economic development agencies also have led or played significant roles in CAV planning efforts with a focus on economic development. These map well to the approach Kansas adopted and may add valuable lessons and information.
- These plans are generally high-level strategic approaches to address priority needs related to research, pilots, workforce development, collaboration, agency processes, systems, and overall strategic direction. They help identify and raise awareness of key issues that government agencies are expected to face in the earlier phases of CAV penetration – such as how to manage and design infrastructure for a mixed fleet of CAVs and traditional vehicles, which may have different lane width requirements or standard following distances. As such, they offer opportunities to serve as models for specific Kansas agency adoption or incorporation into their own agency-specific planning.
- Several states have established CAV working groups, like the one Kansas created, with participants from a wide range of public sector, private sector, and academic roles. This is also a frequently recommended best practice by national research as it builds awareness of diverse perspectives for all involved in the working group and helps states understand what outreach/education needs may be priorities. This creates an opportunity for Kansas agency personnel to tap into the experiences and insights possessed by others across the country who work in similar government agencies and face comparable needs and issues.

Maximizing Current Initiatives

Kansas and several of its state agencies – such as the Kansas Department of Agriculture - have been exploring developing and deploying CAV technology in recent years as evidenced by the number of activities taking place in 2019.

Having identified state needs and conducted a CAV-focused SWOT analysis of Kansas, KDOT and the Task Force could better identify short-term, priority initiatives and projects that are well suited to advancing CAV technology development and deployment in Kansas. Table 3 provides an initial list of short-term potential initiatives and projects from the Task Force. Not all of these will be implemented in the first 3 years.

Figure 5. Current Initiatives Underway or Under Exploration

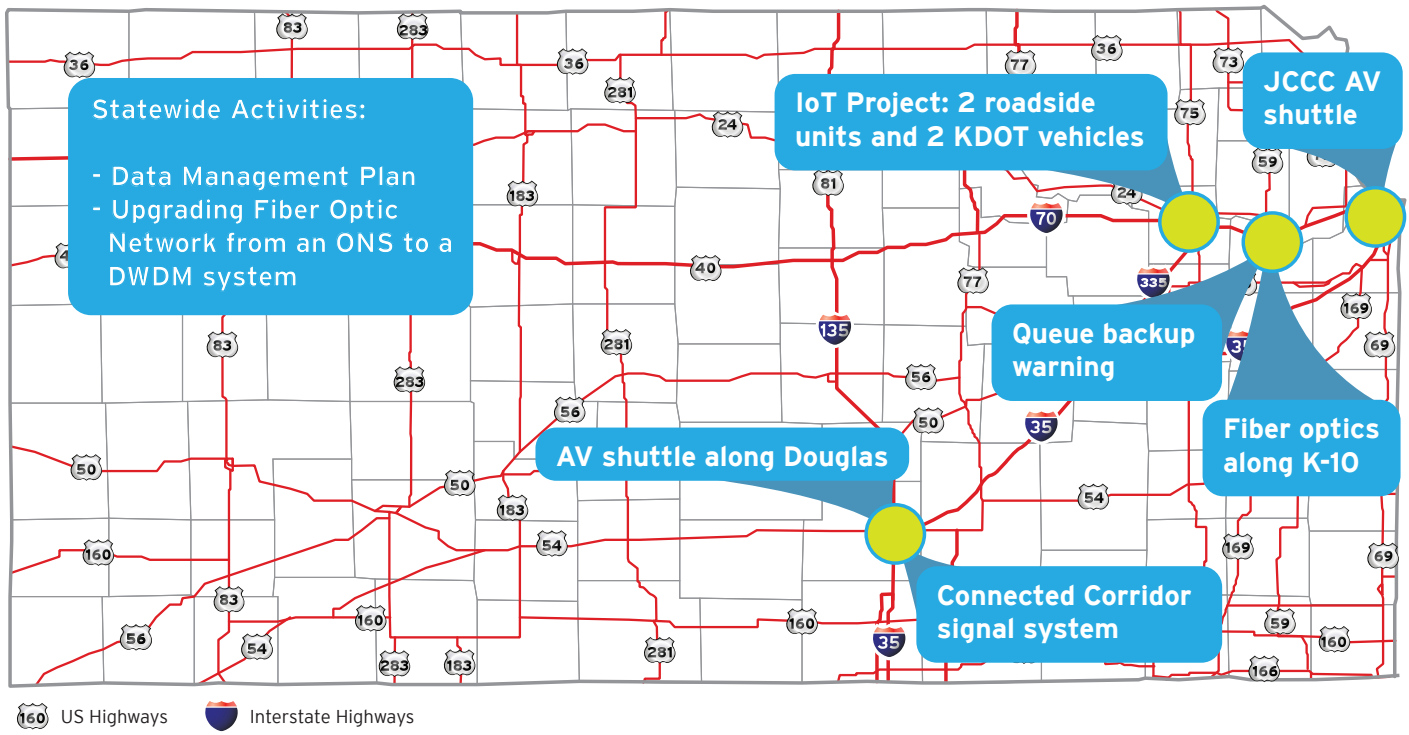


Table 3. 3-Year Initiatives and Project Examples

1. Data Initiatives	
• Develop dashboards to push out information • Establish edge computing capabilities • Develop IT working group with representatives from each agency • Assess ability to support broadband access expansion and network expansion to support CAV • Develop data governance policy and process (Kansas City Missouri, SANDAG and Smart Columbus examples)	• Develop performance measurement plan (Smart Columbus, Michigan DOT, FDOT) • Implement Kansas state IT Security Policy and extend to ITS networks • Create KDOT data management platform to support performance measurement plan and data governance • FHWA freight data technology exchange project (MARC)
2. Agency/Organization Initiatives	
• Each agency schedules a meeting with upper management to review CAV blueprint • Formalize the CAV Task Force and establish it as the Kansas state CAV Steering Committee	• Establish brand and marketing program for this committee (PlanetM, DriveOhio, RoadX, etc.)
3. Partnership Initiatives	
• Work with Kansas universities to identify research funding for CAV focused transportation institute • Partner with Kansas military for CAV use cases required for combat or military exercises and implement pilot projects / demonstrations (Michigan DOT) • Partner with aircraft industry to become leading state for unmanned aircraft systems (UAS) manufacturing and implement pilot projects for highway surveillance, inspections, etc.	• Partner with state universities to develop curriculum and joint R&D programs for CAV and UAS and implement a test environment in Manhattan (or elsewhere) for emerging mobility (Kansas state "sandbox") • Partner with industry to provide training for state employees
4. Policy/Legislation/Regulation Initiatives	
• Formalize ongoing CAV advisory group for legislature • Centralize CAV rulemaking and regulation at state level • Create state policies/procedures for CAV pilots and tests • Perform peer review of state regulations to craft optimal legislation for Kansas (Tennessee DOT)	• Establish internal program plan to institutionalize and mainstream CAV in budgeting, planning, etc. (VDOT, FDOT) • Use government relations to pass enabling legislation or executive order for testing, licensing, insurance and deployment of AVs in Kansas
5. Public Education and Outreach Initiatives	
• Identify CAV knowledgeable people willing to speak around the state concerning the benefits of CAV technology • Develop a comprehensive outreach plan (multifaceted to cover public, policy makers, and industry)	• Establish a brand and marketing program for CAV • Establish an internal webinar series and training to educate state staff • Present to legislators on an annual basis

Note: Needs not addressed with initiatives in this table include Network, Infrastructure, Funding, Workforce – Agency, and Workforce – Public because these needs are expected to be implemented beyond the initial 3-year timeframe.

4. NEXT STEPS

Based on the work of KDOT and the Task Force, coupled with the state's CAV Vision Plan and the experience of other states, the State of Kansas should consider several immediate actions to sustain the momentum it's created for CAV deployment. These next steps include:

Legislative Action

Other states' legislative experience and the Kansas Statewide Connected and Autonomous Vehicle Vision Task Force input suggest Kansas should focus on five key legislative and regulatory initiatives in the short term:

1. Formalize the Task Force or comparable group as an ongoing entity that can advise legislators on needed CAV actions that reflect well-vetted private- and public-sector CAV policies and proposals;
2. Standardize Kansas regulation of CAV testing or deployment by pre-empting duplicative or conflicting county or municipal action;
3. Promote partnerships with state colleges and universities, as well as private-sector organizations, that lead to Kansas-appropriate CAV research and pilot projects;
4. Set policies and procedures for testing and regulating CAV deployments; and
5. Engage with the state's Congressional delegation to ensure that Kansas CAV needs and preferences are not negatively affected by ongoing U.S. Senate and House efforts to advance and pass an omnibus CAV bill and/or follow-on legislation.

State Agency Blueprints

The 2019 work by KDOT and the Task Force produced individual blueprints for several Kansas state agencies (see Appendix). Each blueprint provides a high-level plan for individual state agencies that incorporate connected and autonomous vehicles into their organizational business planning, staffing and activities. The intent of the blueprints is to provide an action plan outline that agencies can flesh out to advance CAV deployment in the state – and to do so in ways that align well their own missions, goals, user or customer needs, and resources.

CAV Strategic Plan Development and Implementation

As a follow-up to the Kansas Connected and Autonomous Vision Plan developed with Kansas state agencies, KDOT should develop and implement its own Connected and Automated Vehicle Strategic Plan.

This would provide an actionable plan for developing and deploying CAV-related institutional and organizational strategies along with CAV projects and technologies in line with the State of Kansas CAV Vision. Such a plan would:

- Adapt the state CAV vision and goals to a KDOT-specific context;
- Lay out strategies for achieving the vision and goals, including identifying infrastructure needs, costs, funding sources and prioritization methods;
- Develop tactics and implementation tasks and actions for progressing towards those goals;
- Define pilot projects to deploy CAV on KDOT infrastructure;
- Define performance measures and tracking/reporting processes for sustaining plan progress and improving the state transportation network's performance; and
- Detail engagement approaches for aligning the interests and activities of KDOT staff, Task Force members, local planning partners and other stakeholders to maximize the beneficial impacts of CAV deployment in Kansas.

It will be important for this plan to be nimble enough for KDOT to respond rapidly to the dynamic mobility environment. This will require a "forward-flexible" perspective, but also an eye toward longer term operations to ensure investment decisions made in the short-term yield positive longer-term outcomes.