OKLAHOMA Transportation

2020 – 2045
Oklahoma Long Range Transportation Plan

Chapters 5: Demographic, Socioeconomic, and Emerging Trends

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Prepared by

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1. INTRODUCTION

An assessment of existing and future trends in topics such as demographics, socioeconomics, the natural and built environments, and technology are important in building the foundation for the 2045 LRTP. Understanding the users of the transportation system and their mobility needs help inform the development of the goals, objectives, policies, strategies, and funding decisions related to the delivery of transportation projects and services across the state.

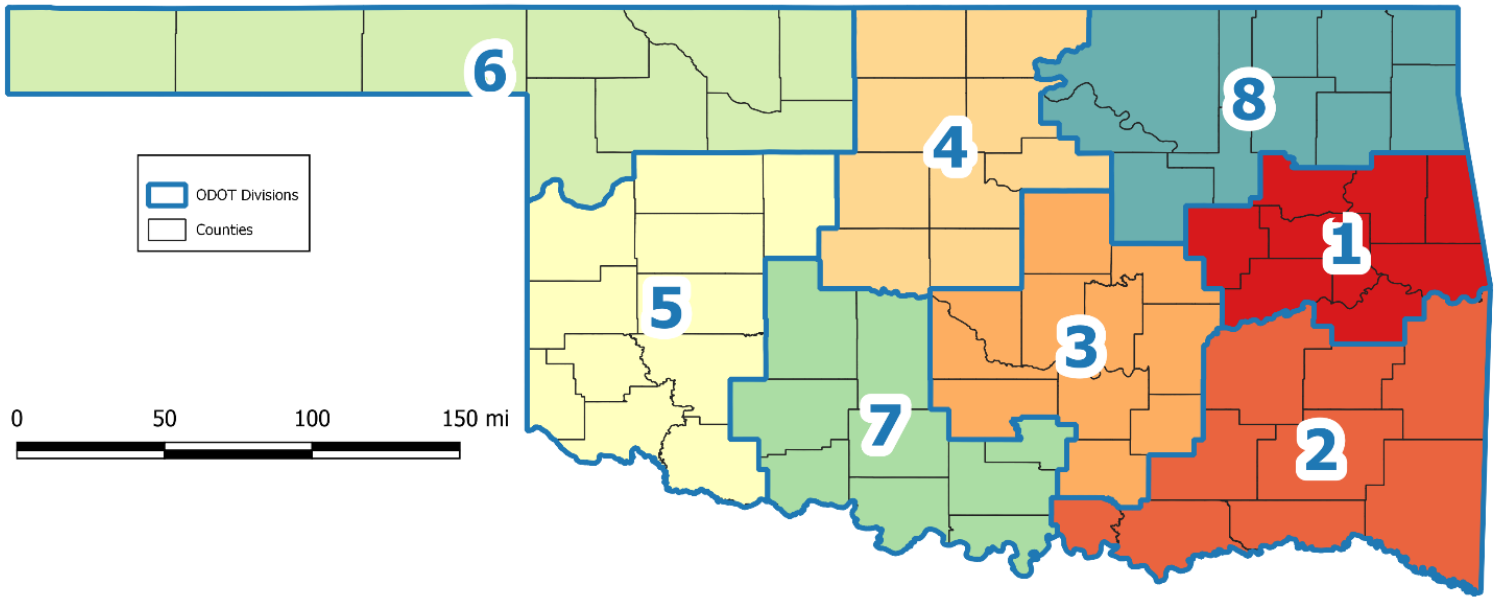
Oklahoma's transportation system should reflect the dynamic and evolving communities that it serves. This chapter identifies and examines the existing and emerging factors that will shape the future of Oklahoma's transportation system.

Oklahoma is organized into 77 counties and eight Oklahoma Department of Transportation (ODOT) field districts (**Table 1-1** and **Figure 1-1**). Demographic and socioeconomic characteristics, trends and analysis discussed throughout this section are organized into these geographic units.

Table 1-1. Oklahoma Counties by ODOT Districts

District	Counties
District 1	Adair, Cherokee, Haskell, McIntosh, Muskogee, Okmulgee, Sequoyah, Wagoner
District 2	Atoka, Bryan, Choctaw, Latimer, Le Flore, McCurtain, Marshall, Pittsburgh, Pushmataha
District 3	Cleveland, Coal, Garvin, Hughes, Johnston, Lincoln, McClain, Okfuskee, Pontotoc, Pottawatomie, Seminole
District 4	Canadian, Garfield, Grant, Kay, Kingfisher, Logan, Noble, Oklahoma, Payne
District 5	Beckham, Blaine, Custer, Dewey, Greer, Harmon, Jackson, Kiowa, Roger Mills, Tillman, Washita
District 6	Alfalfa, Beaver, Cimarron, Ellis, Harper, Major, Texas, Woods, Woodward
District 7	Caddo, Carter, Comanche, Cotton, Grady, Jefferson, Love, Murray, Stephens
District 8	Craig, Creek, Delaware, Mayes, Nowata, Osage, Ottawa, Pawnee, Rogers, Tulsa, Washington

Figure 1-1. ODOT Districts



2. DEMOGRAPHICS

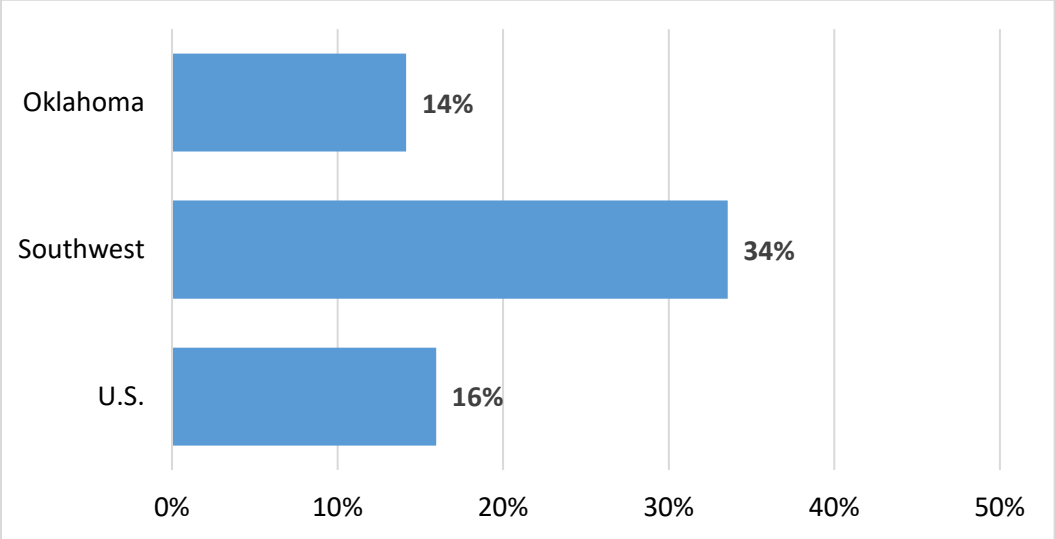
This section summarizes trends in Oklahoma's population and specific demographic trends that directly affect the demands on the statewide transportation system.

2.1. POPULATION TRENDS

According to the 2000 Census, Oklahoma had just over 3.45 million residents, a number that is estimated to have increased to just over 3.94 million in 2018. **Figure 2-1** shows this 14 percent growth rate for population, a rate which is slightly less than for the U.S. as a whole and less than half of the overall growth rate for the Southwest region, which includes Arizona, New Mexico, Oklahoma, and Texas. The Federal Reserve Bank of Kansas City found that the primary factor for the state's lag in population growth has been a combination of decreased domestic migration to the State and a downturn in the economy following a 2014-2015 drop in oil prices. Oklahoma maintains its ranking as the 28th most populous state in the nation, which it has maintained since the 1990 decennial census.

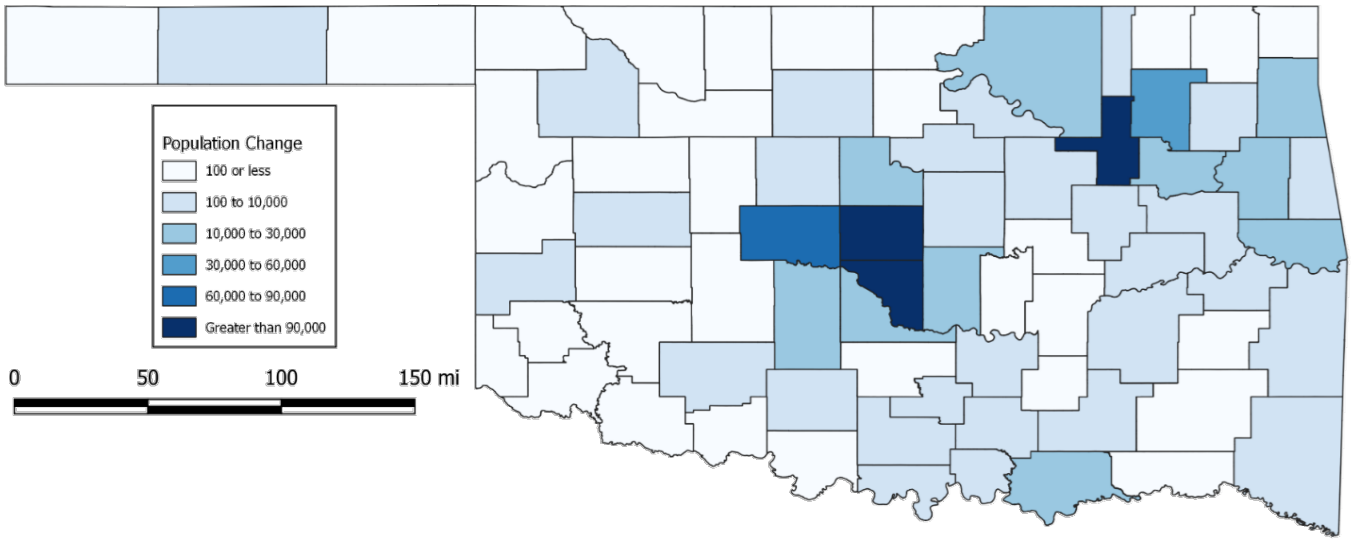
By 2045, the population in Oklahoma is projected to increase by 20 percent, remaining behind regional and national population growth averages. However, there is much variability between projected population growth by Oklahoma counties as shown in **Figure 2-2**. The majority of future population growth is expected to occur in the urban areas of Oklahoma City and Tulsa (ODOT Districts 4 and 8). Counties surrounding and containing these urban areas, including Canadian, Oklahoma, Cleveland, Tulsa, and Rogers Counties are projected to experience population changes of greater than 30,000 people.

Figure 2-1. Overall Population Growth, 2000-2018



Source: U.S. Census Bureau

Figure 2-2. Projected Population Change by County, 2018-2045



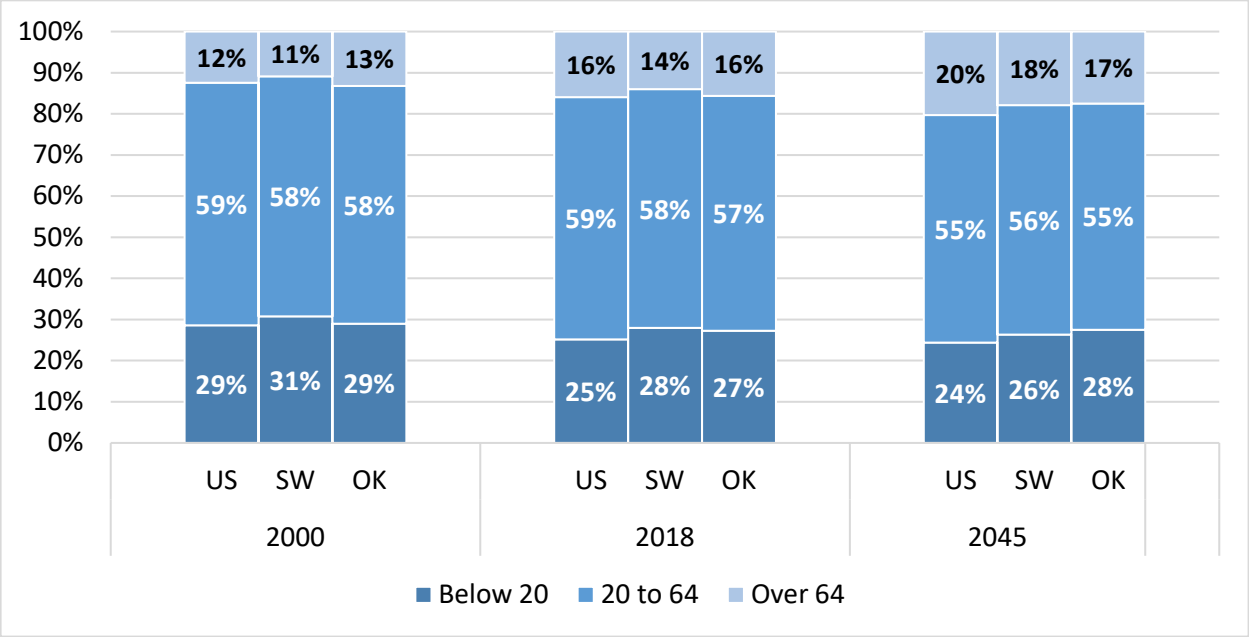
Source: Woods & Poole Economics, Inc. Washington, D.C. Copyright 2018.

2.1.2. AGE DISTRIBUTION

Oklahoma's population is gradually aging—a trend shared with the U.S. and the Southwest region (**Figure 2-3**). While this upward trend is expected to increase, Oklahoma is projected in 2045 to have a lower percentage than the Southwest region or the U.S. as a whole of those 64 years and older. This demographic change has significant implications for the delivery of state transportation services, as the overall travel and commuting patterns of senior populations (those aged 65+) is often different than those of younger populations.

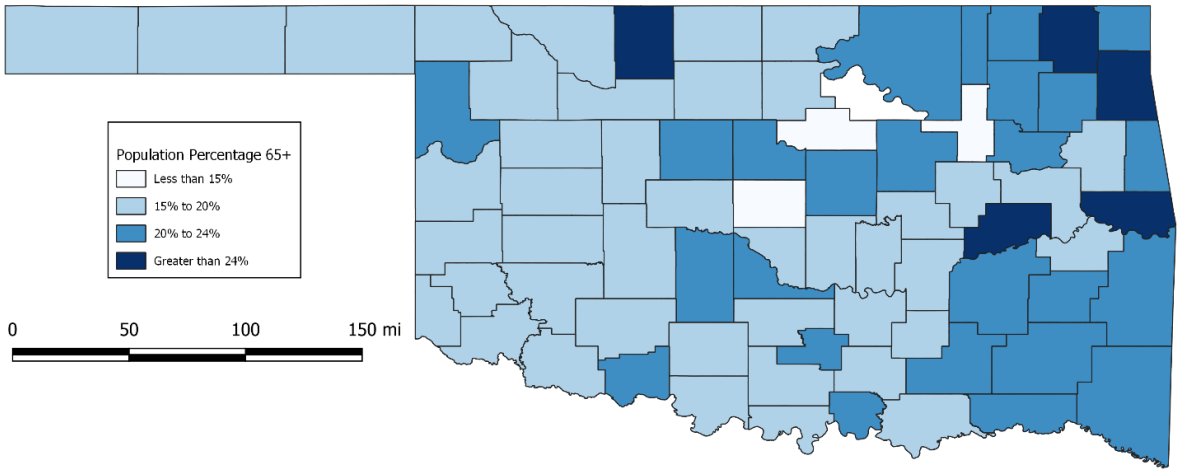
The state's senior population is expected to grow variably across Oklahoma's counties, from 16 percent in 2018 to approximately 17 percent in 2045. Those aged 65 years and older represent less than 15 percent of the population in Oklahoma's most urbanized areas, but account for over 24 percent in other more rural parts of the state (**Figure 2-4**).

Figure 2-3. Population by Age Group



Source: U.S. Census Bureau and Woods & Poole Economics, Inc. Washington, D.C. Copyright 2018.

Figure 2-4. Oklahoma Projected Population Percentage Aged 65+ by County, 2045

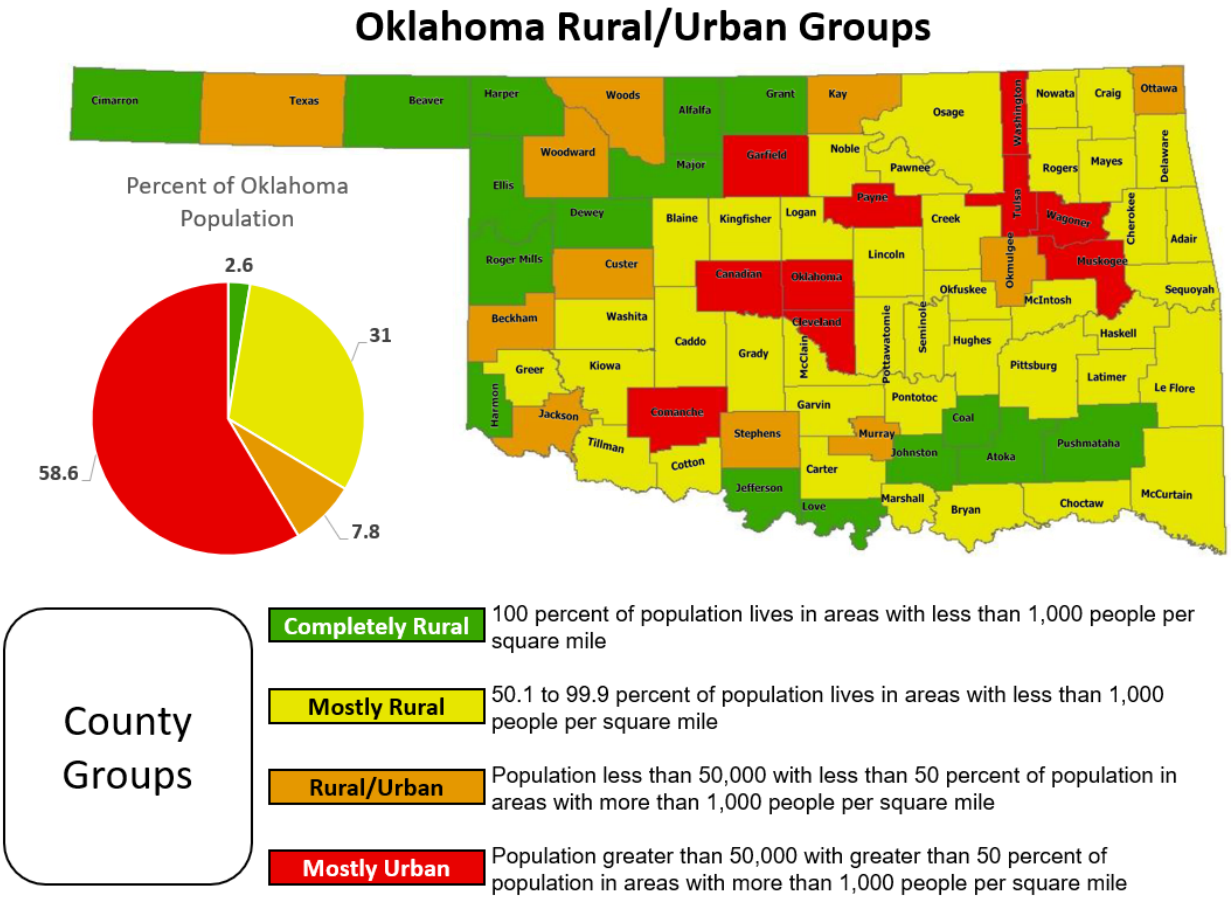


Source: Woods & Poole Economics, Inc. Washington, D.C. Copyright 2018.

2.1.3. URBAN VS. RURAL POPULATIONS

Examining the differences in projected population trends between urban and rural areas is important in sustaining a cohesive transportation system. **Figure 2-3** and **Figure 2-4** illustrate population growth centered around Oklahoma's urban areas and a greater percentage of older adults residing in rural areas. This urban/rural population is not a new phenomenon and is acutely apparent when looking at population density throughout the state. **Figure 2-5** shows that almost 60 percent of Oklahoma residents live in counties whose total land area accounts for less than 11 percent of the state's geographic area.

Figure 2-5. Rural and Urban Populations in Oklahoma, 2010



Source: U.S. Census for Oklahoma Rural Development Conference and Workshop (2017)

3. SOCIOECONOMIC FACTORS

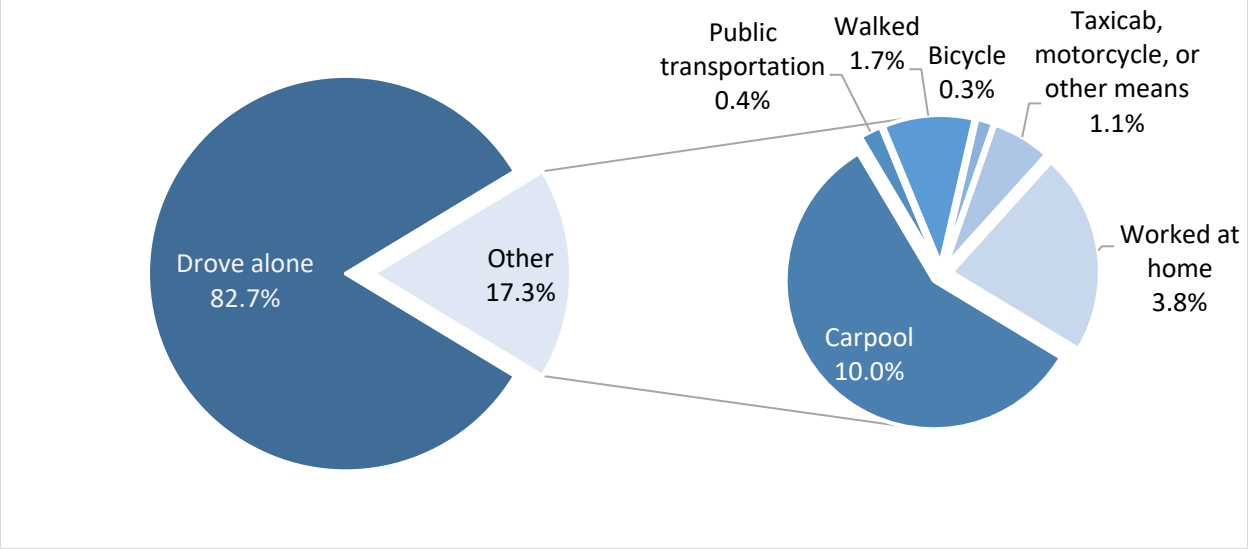
The following section provides an overview of the economic and social factors than can influence future demands on the transportation system.

3.1. COMMUTING PATTERNS

Nearly 83 percent of the state's population that commutes to work drives alone. Illustrated in **Figure 3-1**, carpooling was the second most common mode of transportation. Collectively, these two modes equate to over 92 percent of workers' commutes in Oklahoma.

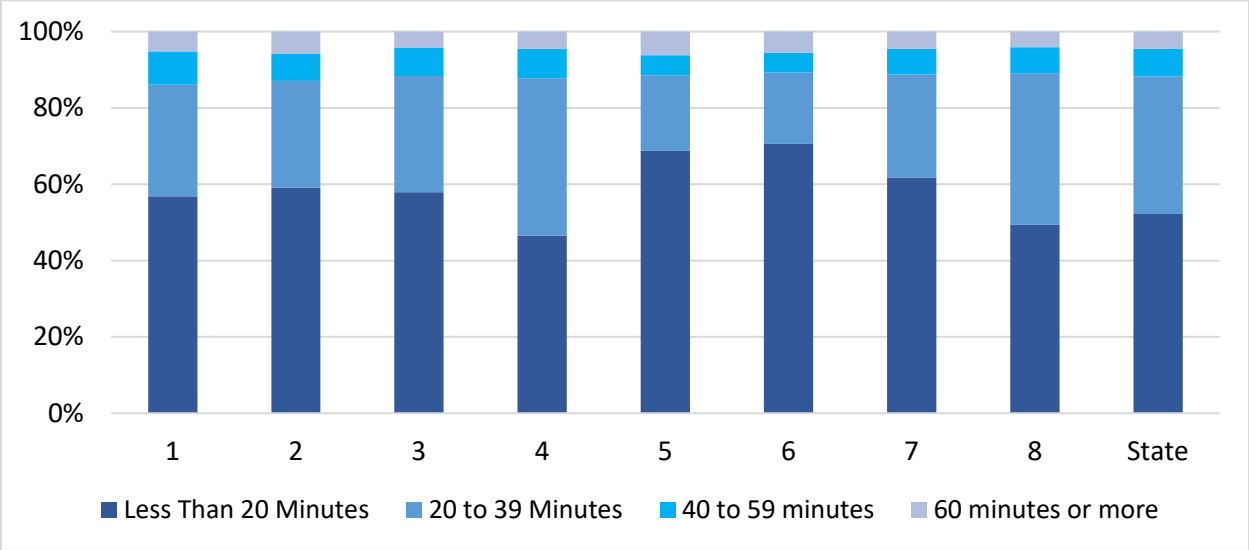
Over 17 percent of commuters used an alternative mode of transportation to get to work including carpooling, public transit, walking, biking, telecommuting or other means. The average travel time to work for Oklahoma workers is 21 minutes (**Figure 3-2**). Except for the metropolitan areas of Oklahoma City and Tulsa, more than half of Oklahoma's total working population have travel times of less than 20 minutes.

Figure 3-1. Oklahoma Commute by Mode, 2017



Source: U.S. Census Bureau, 2013-2017 ACS 5-Year Estimates

Figure 3-2. Travel Times to Work by Oklahoma DOT District, 2017



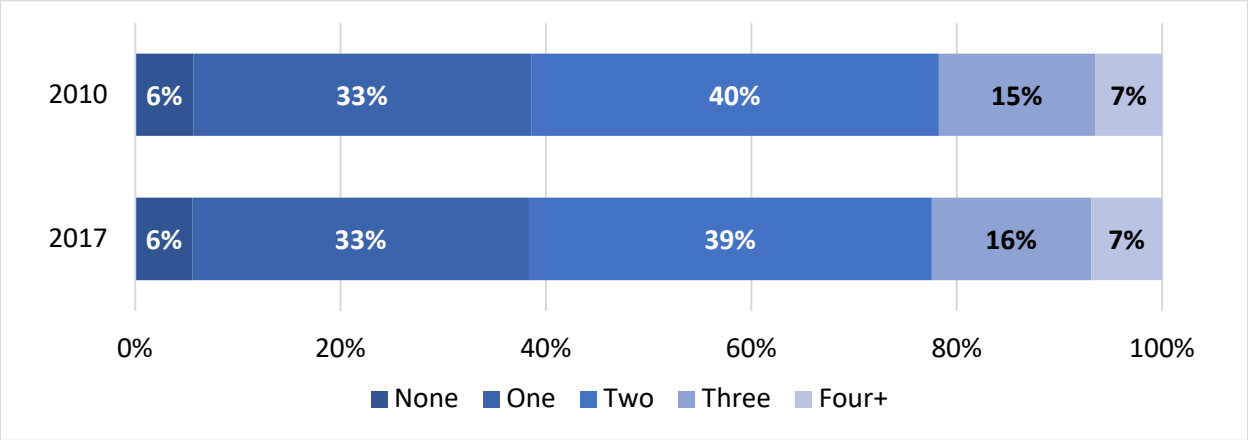
Source: U.S. Census Bureau, 2013-2017 ACS 5-Year Estimates

3.2. VEHICLE AVAILABILITY

Between 2010 and 2017, vehicle availability per household has remained relatively unchanged, though a slightly higher percentage of households now have three vehicles available as opposed to two (**Figure 3-3**). In 2018, Oklahoma registered approximately 3.1 million vehicles (Oklahoma Tax Commission Motor Vehicle Division, 2018), or approximately 2.13 vehicles per household. [1]

[1] Based on U.S. Census Bureau's American Community Survey (ACS) 5-Year estimate of 1,468,971 households in Oklahoma.

Figure 3-3. Percentage of Oklahoma Households by Vehicles Available

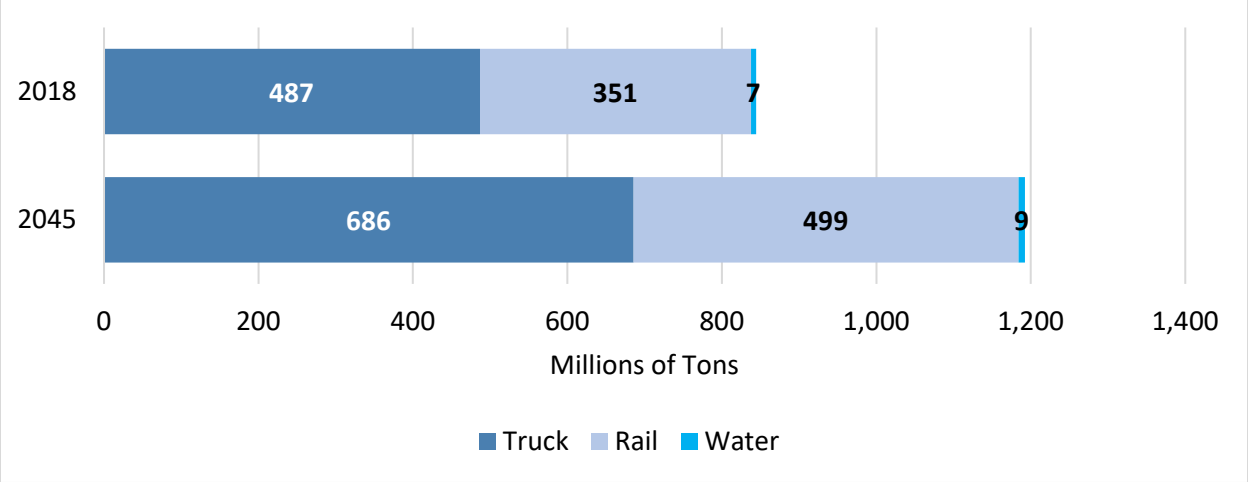


Source: U.S. Census Bureau, 2006-2010 ACS and 2013-2017 ACS 5-Year Estimates

3.3. FREIGHT

Oklahoma's multimodal freight transportation system consists of freight rail, highways, ports and waterways, and airports. The most dominant modes of freight transportation in Oklahoma are truck (58 percent), followed by rail (41 percent) and water (1 percent). Between 2018 and 2045, truck and rail freight tonnage are projected to grow by over 40 percent (**Figure 3-4**). Water freight tonnage is expected to experience a similar amount of growth at just over 30 percent.

Figure 3-4. Projected Oklahoma Freight Tonnage by Mode



Source: Oklahoma Freight Transportation Plan 2018-2022 (2017)

3.4. E-COMMERCE

Electronic commerce, or 'e-commerce,' is a modern approach to business that addresses the needs of business organizations, vendors, and customers to reduce cost, improve the quality of goods and services, and increase the speed of delivery. Oklahoma continues to see a surge in e-commerce retail sales, which is aligned with national trends. The number of distribution centers across the state is projected to rise as companies seek to place their goods closer to cities, or the points of greatest consumption.

4. EMERGING TRENDS

This section focuses on trends that are still evolving, particularly related to technology, that are highly likely to have significant impacts in the future of transportation. The topics discussed in this section include electric vehicles (EV), compressed natural gas (CNG) vehicles, Oklahoma's alternative fuel corridors, connected and autonomous vehicles (CAVs), truck platooning, and mobility as a service (MaaS).

4.1. ELECTRIC VEHICLES (EV)

EV adoption varies significantly across the country and the world. While international adoption does not directly affect Oklahoma's local transportation systems, increasing global investments are improving the technology and reducing its price. In 2018, EVs accounted for 0.35 percent of the 2,683 vehicles sold in Oklahoma. Since the first year of EV sales, a total of less than 5,000 EVs have been sold in Oklahoma, placing the state 28th in the country for total EV sales. **Table 5-2** lists the sales of EVs in 2018 in number of units, as well as percentage of light-duty vehicles sold.

EVs are an emerging technology that is highly dependent on state and federal policies, disruptions in supply chains, as well as changes in social behavior. Between 2017 and 2018, Oklahoma experienced the largest percent increase in sales of EVs of any state in the country, with sales increasing by 250 percent. However, EV sales were still less than half a percent of all vehicle sales in the state. Reductions in emissions are a key selling point for EVs. In terms of emissions produced, driving an EV in Oklahoma is equivalent to driving a 49 mpg gasoline-run vehicle.

There are currently a variety of incentives and programs available from both state and federal sources regarding EVs and EV infrastructure. The following is a list of some of the more prominent programs, which are described in more detail in **Appendix B**:

- Federal EV tax credit2
- Oklahoma tax credit for alternative fueling infrastructure3
- Oklahoma owned/operated alternative fueling infrastructure4
- CLEAN AIR Grants for public fleets
- ChargeOK Electric Vehicle Supply Equipment Grants

In addition to these incentives, Oklahoma offers a simplified EV charging business model, allowing companies to sell electricity for EV charging without regulations from the framework that governs utilities.

As EV sales continue to surge in Oklahoma, there will be a growing need for EV infrastructure. The current lack of available charging stations is considered a significant hindrance to the future adoption of EVs. Oklahoma currently has 236 publicly available charging stations. The charging stations are primarily concentrated in Oklahoma City, Tulsa and along I-40 and I-44, however the network has been expanded to serve nearly all regions of the state including the panhandle (**Figure 4-1**). These stations feature primarily level 2 chargers, or standard fast-charging, with a small number of level 3, or DC fast-chargers, along the interstates. Oklahoma Gas and Electric (OG&E) has partnered with OnCue to develop a pilot installation of a level 3 charging station at their Yukon location.

To offset a potential reduction in gas tax revenue, the state is considering the two following EV funding methods: (1) adopting a flat vehicle registration fee for EVs, and (2) a road use charge (RUC). These methods are common techniques to help alleviate concern that EVs will reduce revenues dependent on the gas tax. A RUC, also known as a mileage-based user fee (MBUF), determines taxes owed based on miles driven. A growing number of states have enacted EV fees, including Oklahoma. However, Oklahoma's fee was ultimately ruled unconstitutional by the Oklahoma State Supreme Court.

[2] Reference Public Law 112-240, Section 403; and 26 US Code 30D

[3] Oklahoma Statutes 68-2537.22

[4] Oklahoma Statutes 74-78 and 74-130.2

Table 4-1. Electric Vehicle Sales 2018

Location / Vehicle Type	Oklahoma		United States		Global	
	Sales	Percent of Sales	Sales	Percent of Sales	Sales (mil)	Percent of Sales
Battery Electric Vehicle	2,402	0.31%	203,625	1.21%	1.45	1.5%
Plug-in Hybrid Electric Vehicle	281	0.04%	124,493	0.74%	0.65	0.7%
Total	**2,683**	**0.35%**	**328,118**	**1.95%**	**2.1**	**2.2%**

Sources: Auto Alliance 2019, EV-volumes.com 2019

Figure 4-1. Public EV Charging Stations in Oklahoma

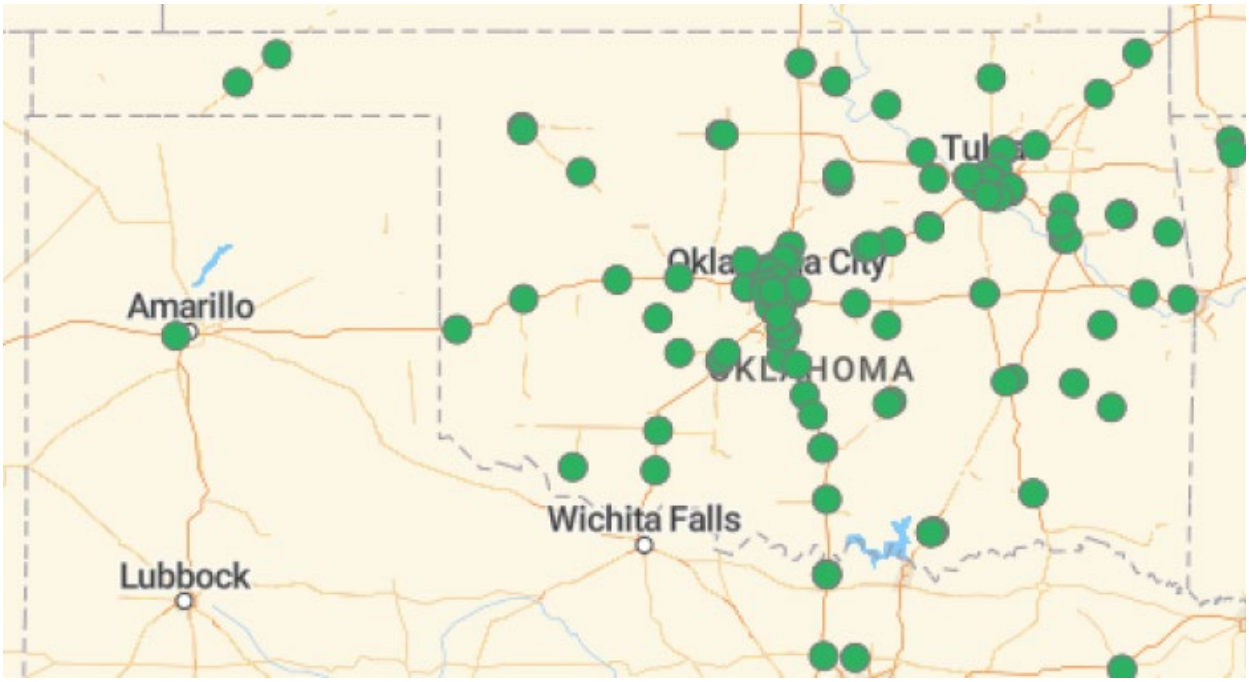


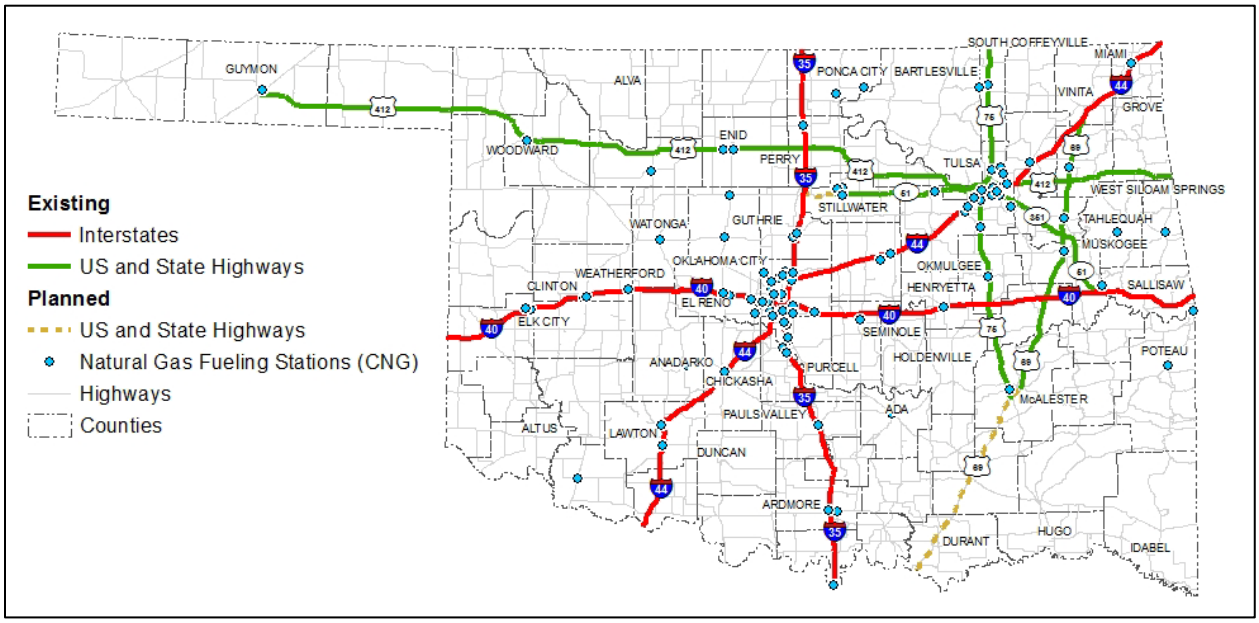
Image Source: Alternative Fuels Data Center (2020)

4.2. COMPRESSED NATURAL GAS (CNG) VEHICLES

Oklahoma ranks third nationally in natural gas production and second for the number of CNG stations. Considered a low-carbon and cleaner-burning fuel than petroleum, natural gas has the potential to reduce greenhouse (GHG) emissions. As such, the state may adopt an increasing number of CNG fleet vehicles as an alternative to gasoline or diesel-powered vehicles. Limited market attention on CNG vehicles has made it difficult to project future adoption by private individuals. However, the 2019 adoption of House Bill 2095 provides a tax credit to private individuals who convert their current vehicles to run on CNG or purchase vehicles that already run on this alternative fuel. These tax credits will be available from 2020 to 2027. **Figure 4-2** illustrates current CNG corridors in Oklahoma.

Increased availability and use of CNG vehicles\ are largely reliant on the availability of CNG fueling stations, which have a high upfront cost and a continued need for public demand to offset these costs. **Figure 4-3** shows the location of the CNG fueling stations and the CNG alternative fuel corridors, which includes I-35, I-40, I-44, SR-51, SR-351, US-69, US-75, US-412.

Figure 4-2. CNG Corridors in Oklahoma



Source: FHWA Alternative Fuels Corridors, 2016-2018

Figure 4-3. CNG Fueling Stations in Oklahoma

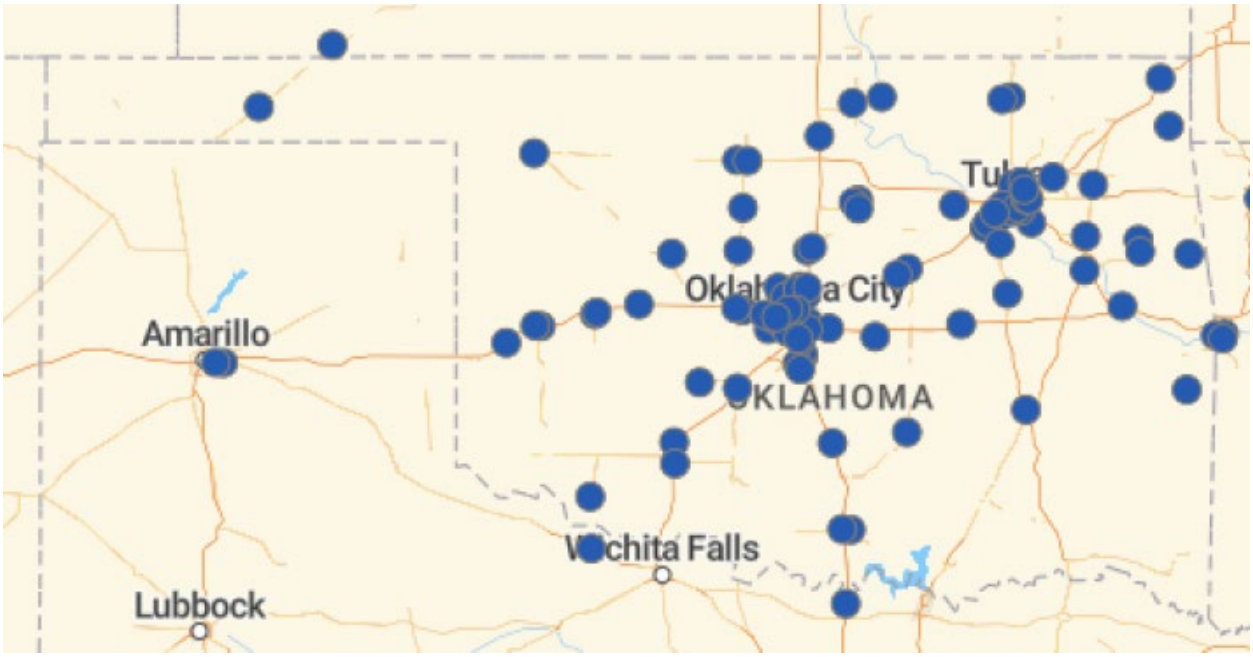


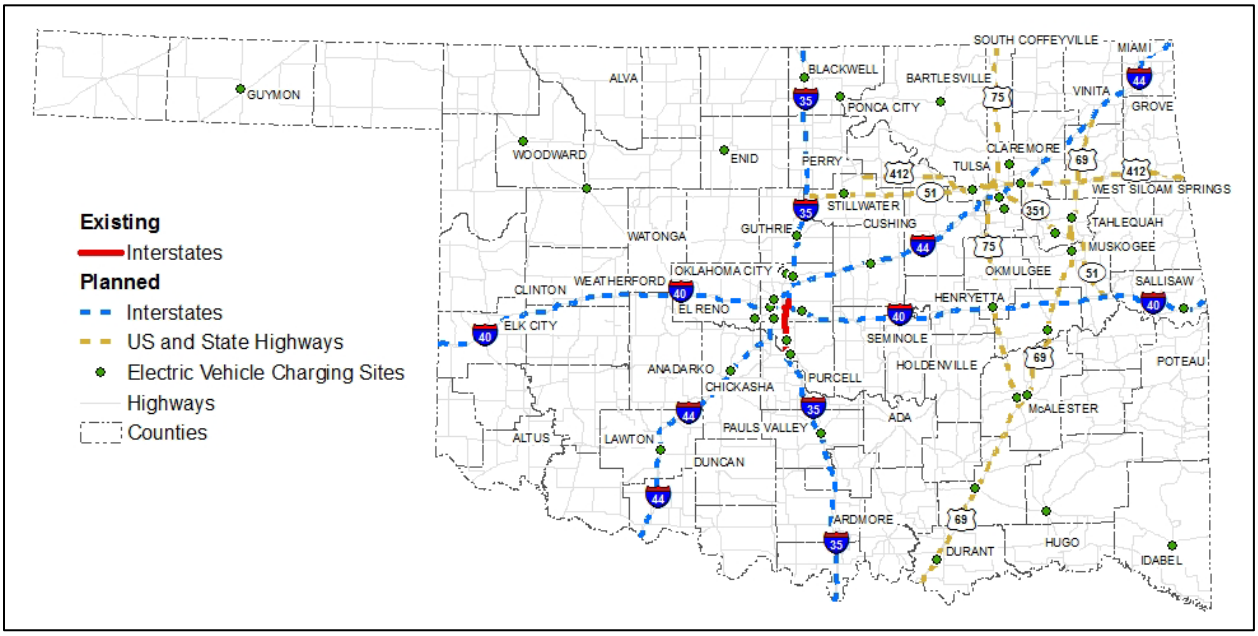
Image Source: Alternative Fuels Data Center (2020)

4.3. ALTERNATIVE FUEL CORRIDORS

The U.S. Department of Transportation has designated national plug-in electric vehicle charging and hydrogen, propane, and natural gas fueling corridors to improve alternative fuel vehicle mobility. The U.S. Department of Transportation solicited nominations from state and local officials and worked with industry stakeholders to designate corridors. Within five years of the establishment of the alternative fuel corridors, and every five years thereafter, U.S. Department of Transportation will update and redesignate the corridors.

With an extensive network of EV and CNG fueling stations, Oklahoma is working to designate multiple roadways as alternative fuel corridors. According to the U.S. Department of Transportation, alternative fuel corridor designations currently cover over 135,000 miles of the National Highway System (NHS) network. **Figure 4-4** illustrates Oklahoma's current EV network, which includes I-35, I-40, I-44, SR-51, SR-351, US-69, US-75, US-412

Figure 4-4. Alternative Fuel Corridors in Oklahoma



4.4. CONNECTED AND AUTOMATED VEHICLES

Vehicle connection and vehicle automation each have individual benefits and challenges but elicit the most benefit when combined. While the technologies that will allow for broad adoption of CAVs are still being developed, the pace of adoption in Oklahoma will depend largely on the speed of technological advancement within the state and across the country. Cities across the state and the U.S. are taking the lead on implementing CAV technologies. The City of Tulsa has created an Urban Mobility Innovation Team to advise business and government leaders on policy and technical issues related to adoption of CAVs. The team will inform the city's Strategic Mobility Plan.

Autonomous vehicles (AVs) are currently being deployed in various pilot programs across the country. **Figure 4-5** illustrates the Society of Automotive Engineers' (SAE) five levels of autonomy. Level 1 and 2 driver-assist features are becoming standard options on many new vehicles and include adaptive cruise control, lane keep assist, and parking assist systems. Levels 3 through 5 include fully autonomous vehicles that can drive on their own. These levels differ in the duration for which they can fully drive the vehicle, referred to as their 'operational domain.'

Compared to AVs, connected vehicle (CV) technology is a much broader set of technologies. Route navigation, as well as cellular or satellite connection, all fall into this category. Vehicle-to-everything (V2X) technology is commonly considered when discussing CVs. V2X includes communication between vehicles and any entity that may affect the vehicle, such as other vehicles, pedestrians, and infrastructure. This

technology can provide vehicles with the information needed to make automated tactical driving decisions such as lane changing, accelerating, braking, and turning.

Many states have begun establishing legislation in anticipation of the arrival of CAVs, including Oklahoma. Oklahoma's current legislation sets requirements for AV testing and removes following distance requirements to allow for truck platooning.

Figure 4-5. SAE Levels of Driving Automation

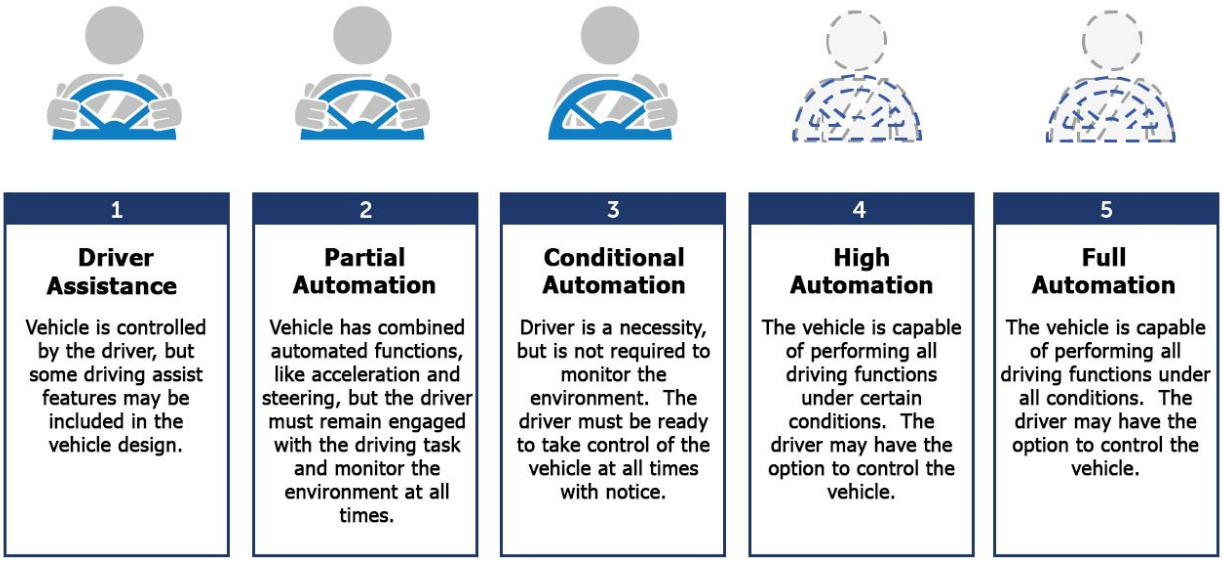


Image Source: SAE International, National Highway Traffic Safety Administration

4.5. MOBILITY AS A SERVICE

The use of MaaS is not a new concept. Transit and ride-sharing services have been a staple in transportation offerings but can become limited by location or specific use. MaaS looks to achieve a comprehensive transportation offering across a variety of technology platforms, including mobile applications that allow users to plan and pay for transportation services, Global Positioning System (GPS) to track both users and vehicles, and ultimately CAVs to offer travel through vehicles without having to pay for the cost of drivers. The framework to deliver MaaS is illustrated in **Figure 4-6**. Adoption of MaaS in Oklahoma and across the country could have significant implications on future transportation offerings, including rural mobility options and dedicated areas for MaaS users.

Figure 4-6. MaaS Framework

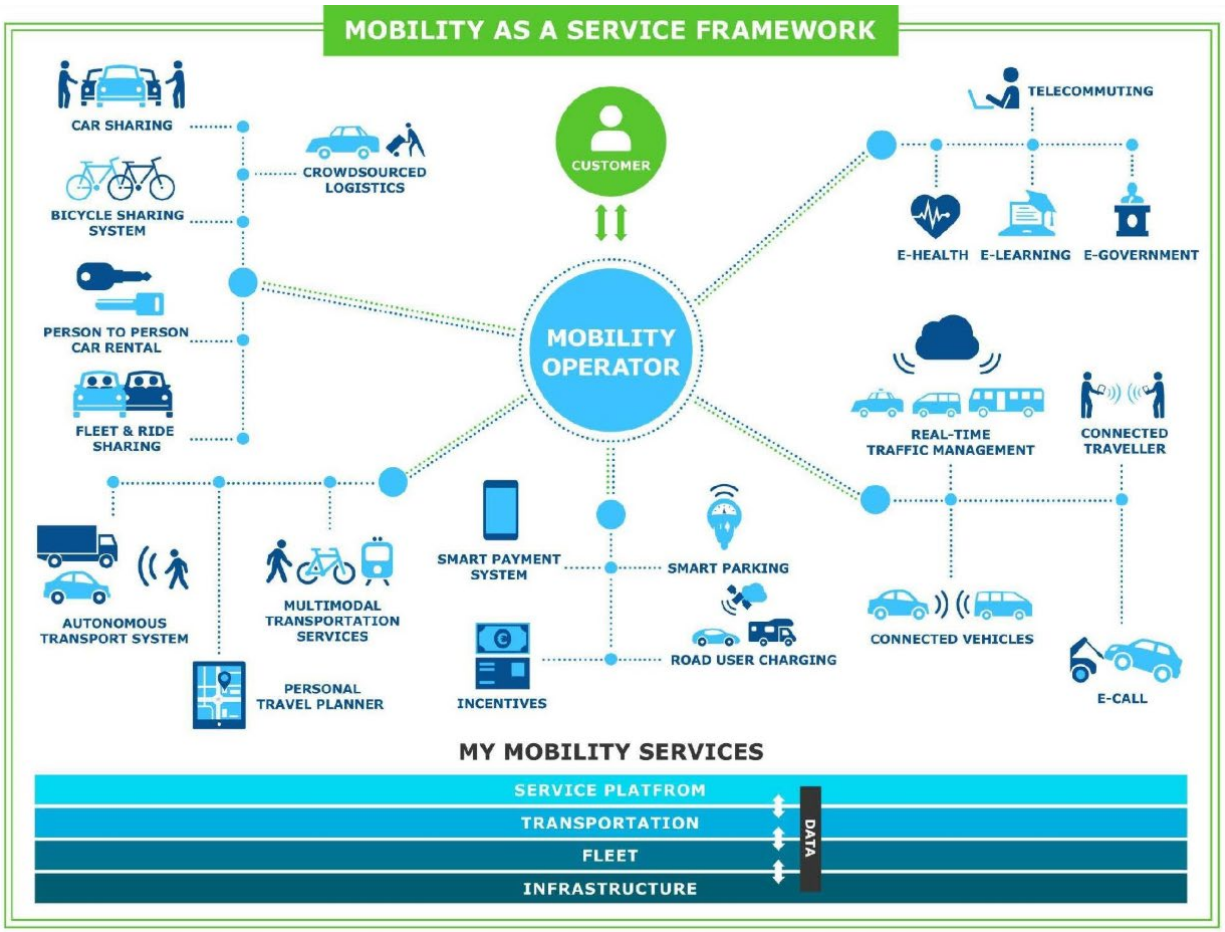


Image Source: TelematicsWire.Net