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<td>Kansas Transportation Background</td>
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About the Factbook

• The following issues and trends were compiled from a variety of sources.

• Some information presented includes expert projections of what they believe will happen in the future based on current trends. However, experts have been wrong before.

• KDOT does not “endorse” any of these projections; rather this information was utilized to develop plausible future scenarios.

• And it may be helpful for you to review this information as you complete the scenario planning exercise.
A modern transportation system

Moves

People
Freight
Technology
Issues overlap
Topics assigned to one section to avoid repetitiveness

Ex: New Markets
Ex: Telemedicine
Ex: Autonomous Vehicles
Ex: Drone Delivery
People
Our Plan Horizon is 2045
31% of Kansans in 2045 have not been born yet

Source: Wichita State University, Center for Economic Development and Business Research
Because transportation investments are designed to serve generations, the State’s changing demographics raise the following kinds of questions:

• How will changes in population impact demands on infrastructure?

• How will changes in population impact revenues available to support & maintain infrastructure?

• How will mobility needs vary by age group?
  • E.g. What will an increasing elderly population mean for transit service?
Seniors will be an increasingly significant fraction of total population

Source: Kansas Health Institute and the Center for Economic Development and Business Research at Wichita State University
Particularly in rural areas

### Kansas Population Projections by Age: Eastern & Western Rural Region

<table>
<thead>
<tr>
<th>Age Group</th>
<th>2016</th>
<th>2066</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age 14 and under</td>
<td>77</td>
<td>82</td>
</tr>
<tr>
<td>Age 15 to 24</td>
<td>48</td>
<td>191</td>
</tr>
<tr>
<td>Age 25 to 64</td>
<td>36</td>
<td>89</td>
</tr>
<tr>
<td>Age 65 and over</td>
<td>47</td>
<td>129</td>
</tr>
</tbody>
</table>

Source: Kansas Health Institute and the Center for Economic Development and Business Research at Wichita State University

### Eastern & Western Rural Region Population Percentage Change 2016-2066

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Percentage Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age 14 and under</td>
<td>-39%</td>
</tr>
<tr>
<td>Age 15 to 24</td>
<td>-26%</td>
</tr>
<tr>
<td>Age 25 to 64</td>
<td>-33%</td>
</tr>
<tr>
<td>Age 65 and over</td>
<td>9%</td>
</tr>
</tbody>
</table>
In 2044, almost half of Kansans are expected to live in Sedgwick or Johnson Counties.

### Projected Population

<table>
<thead>
<tr>
<th>Population Range</th>
<th>Number of Counties</th>
<th>Projected Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>584 - 1,500</td>
<td>14</td>
<td></td>
</tr>
<tr>
<td>1,501 - 5,000</td>
<td>13</td>
<td></td>
</tr>
<tr>
<td>5,001 - 10,000</td>
<td>21</td>
<td></td>
</tr>
<tr>
<td>10,001 - 50,000</td>
<td>13</td>
<td></td>
</tr>
<tr>
<td>50,001 - 100,000</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>100,001 - 904,305</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

**State: 3,240,702**

*Source: Institute for Policy & Social Research, The University of Kansas*
Projections show Kansas growing by 11.6% or about 329,000 people by 2044.
Population projections can be wrong

From 2010 to 2017, the number of 20 to 39-year-olds grew by 4% in rural Kansas, defying previous projections.

Source: Sanderson & Hill, Anthropology and Social Work, Kansas State University January 2019 testimony to the Rural Revitalization Committee
Rural areas need housing that’s affordable

Potential loss of affordable rental units and properties in rural America

Projects & units by anticipated year of affordable subsidy expiration

Source: Housing Assistance Council
Freight
UPS could receive FAA approval to conduct drone delivery nationwide by end of year according to news reports.

Source: Yahoo Finance
Medical delivery drones used in developing countries could soon help rural Americans

- California-based company specialized in **medical deliveries**
- Has made **over 17,000 deliveries** from operations in Africa
- Drones can carry up to 4 lbs. and travel at **68 miles per hour**
- Recently **secured FAA permission** to make deliveries in North Carolina

"[This program] is an important first step towards bringing Zipline’s lifesaving drone delivery technology to the United States."

- Keller Rinaudo, CEO of Zipline

*Source: We Talk UAV, Zipline, and CNBC*
Technology is re-shaping engines of growth

**Chart of the Week**

**THE LARGEST COMPANIES BY MARKET CAP**
The oil barons have been replaced by the whiz kids of Silicon Valley

Top 5 Publicly Traded Companies (by Market Cap): Tech vs. Other

<table>
<thead>
<tr>
<th>Year</th>
<th>#1</th>
<th>#2</th>
<th>#3</th>
<th>#4</th>
<th>#5</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001</td>
<td>GE</td>
<td>Microsoft</td>
<td>EXXON</td>
<td>Citi</td>
<td>Walmart</td>
</tr>
<tr>
<td>2006</td>
<td>EXXON</td>
<td>Google</td>
<td>Royal Dutch</td>
<td>Microsoft</td>
<td>Citi</td>
</tr>
<tr>
<td>2011</td>
<td>EXXON</td>
<td>Apple</td>
<td>Alibaba</td>
<td>Dell</td>
<td>IBM</td>
</tr>
<tr>
<td>2016</td>
<td>Apple</td>
<td>Alphabet</td>
<td>Microsoft</td>
<td>Amazon</td>
<td>Facebook</td>
</tr>
</tbody>
</table>

*Image source: Visual Capitalist*

**Growth in E-Commerce**

<table>
<thead>
<tr>
<th>Year</th>
<th>Billions</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>$0.73 T</td>
</tr>
</tbody>
</table>

*Source: US Census Bureau E-Commerce Report*

**3D Printing Growth Forecast**

*Source: Wohlers Report 2019*
Because we are seeing more frequent extreme weather events, making our transportation system more resilient raises the following questions:

• How will changes in frequency of severe weather impact planning for development of infrastructure?

• How can we design and maintain infrastructure to handle extreme weather events, such as extreme heat and flooding?
Higher temperatures are leading to drier soils and a depletion of water sources.

Rising temperatures in the last century

Percent depletion of ground water in the High Plains Aquifer, 1950-2013

Source: US Environmental Protection Agency
The High Plains/Ogallala Aquifer serves as a major source of water for Western Kansas.

Once considered a limitless “underground ocean”, there is actually much variability with some areas showing less than 25 years of water availability.

Map and info source:
http://www.kgs.ku.edu/Publications/pic18/index.html
Frequency of billion-dollar disasters in U.S. is growing

Billion-Dollar Disaster Event Types by Year (CPI-Adjusted)

Source: National Oceanic and Atmospheric Administration (NOAA)
“U.S. may face $19 billion in extra paving costs by 2040 if engineering standards of practice for asphalt are not updated to reflect warmer average temperatures.”

Source: B. Shane Underwood, Zack Guido, Padmini Gudipudi, Yarden Feinberg

Flooding along KS Turnpike in Sumner County

Widespread heavy rainfall caused Slate Creek to flood over onto Interstate 35 washing out concrete barriers and forcing a shut down in both directions.


Photo credit: https://www.kansas.com/news/weather/article230187749.html

Weeks of flooding in May/June 2019 left over 100 miles of Kansas roads and highways under water for days. Understanding the extent of the damage and subsequent costs can take years.

Technology
PACE OF CHANGE IS ACCELERATING

Years until technology was used by one-quarter of Americans

- **ELECTRICITY**: 46 years
- **TELEPHONE**: 35 years
- **RADIO**: 31 years
- **TELEVISION**: 26 years
- **PC**: 16 years
- **WORLD WIDE WEB**: 7 years

**WHAT'S NEXT?**
- **MOBILE PHONE**: 13 years

**faster adoption**
Broadband usage continues to increase which raises the following questions:

- How much additional broadband expansion needed to support transportation innovations?
- How will broadband influence the health of communities?
- Will community health affect the transportation needs of the region?
Current areas with broadband access

Source: Connected Nation, Kansas Broadband Map
Broadband is an enabling technology for fully connected transportation.

Source: Qorvo
Lack of Broadband access can create a “double burden” for counties in Kansas.

**Counties where less than 50% have broadband access & more than 10% of adults have diabetes.**

Source: Federal Communications Commission - Connect2Health
Creating and sustaining a healthy economy in the future raises the following questions:

• What might be technology’s impact on the economy?

• What might technology’s impact be on where people choose to live and work?

• What is the future of Kansas’ aviation sector, which has historically been a strong performer?

• How will technology impact the agriculture industry’s transportation needs?
Aviation sector is a key contributor to Kansas’ economy

Over 67% of the world’s embedded aviation fleet was manufactured in Kansas

70% of FAA composites research is conducted in Kansas

Source: National Association of Manufacturers
Source: Kansas Dept. of Commerce
Kansas’ aviation sector continues to advance... but it needs workers

<table>
<thead>
<tr>
<th>Kansas is the first state to initiate an unmanned traffic management (UTM) system.¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spirit AeroSystems is planning an expansion that will add 2,400 jobs.²</td>
</tr>
<tr>
<td>Projected to be a 10% shortage of aircraft mechanics by 2028.³</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Initiatives to address workforce shortage:⁴</th>
</tr>
</thead>
<tbody>
<tr>
<td>• WSU building an innovation campus that includes Airbus local HQ</td>
</tr>
<tr>
<td>• Wichita investing in amenities such as parks, bike-share program, and residential developments</td>
</tr>
<tr>
<td>• Tuition incentives to help train and supply workers</td>
</tr>
</tbody>
</table>

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¹: Kansas DOT press release. August 8, 2017
²: Spirit AeroSystems press release. December 19, 2018
³: Wichita Eagle. March 28, 2018. If things don’t change, there may not be enough of them to keep planes flying
Agriculture’s reliance on transportation systems remains critical, but new trends may impact how

Beef, the largest sector in Kansas agriculture, relies **solely on trucks** and highways.\(^1\)

Other products rely much on **network connectivity** including improved access to ports and new transload facilities.\(^1\)

Cotton is becoming a viable **alternative to wheat**, though there is **limited access** to cotton harvesters and gins.\(^2\)

**Drones** will assist in implementing precision technologies into the management practices of farmers and ranchers.\(^1\)

---

1: Kansas Department of Agriculture. 2019  
2: Reuters. May 29, 2018. Cotton makes a comeback in U.S. Plains as farmers sour on wheat
Agriculture sector could benefit much from broadband access

Broadband allows farmers and ranchers to better utilize drone technology.

Broadband allows producers to expand their business through the use of internet video auction services and other online business services.

Source: Kansas Department of Agriculture. 2019
Rural downtowns can be tomorrow’s tech hubs

Participants in the 2019 Rural Innovation Initiative are:

- Codefi and the Marquette Tech District Foundation, Cape Girardeau, Missouri
- Emporia, Kansas
- Grinnell, Iowa
- Independence, Oregon
- Go Forward, Pine Bluff, Arkansas
- Block22, Pittsburg, Kansas
- Red Wing Ignite, Red Wing, Minnesota
- 20Fathoms, Traverse City, Michigan
- City of Wilson, North Carolina

“‘There are over 8.5 million rural Americans with access to gigabit internet, nearly equivalent to the workforce of New York City,” says Dunne.”
The increase in electric vehicles (EVs) on our roadways raises the following questions:

• Will EVs sales eventually outpace sales of gas/diesel vehicles?

• How will EVs impact motor fuel taxes, which currently provide a majority of transportation revenues?

• How will EV chargers, particularly fast chargers, impact the electric grid?
Global EV sales are expected to surpass traditional vehicle sales by 2038

Overtaking Lane
Electric vehicle sales will surpass internal combustion engine sales by 2038

- Electric vehicles
- Internal combustion engine

Source: Bloomberg New Energy Finance
Motor fuel taxes are the primary funding sources for Kansas transportation costs

KDOT Revenue, FY 2011 - FY 2018

Motor Fuel Taxes, 31%

Federal Funding, 31%

Bond Proceeds, 14%

Local Funding, 2%

Sales Taxes (after transfers), 5%

Registration, License, Permit, and Other Fees, 17%

Federal Highway Trust Fund

Diesel Tax, 24%

Gasoline Tax, 63%

Vehicle Tax, 3%

Truck and Trailer Sales Tax, 9%

Truck and Tire Tax, 1%

Source: KDOT and Congressional Budget Office
Some states are considering alternatives to motor fuel taxes

States are passing EV fees as a way to more equitably generate transportation funding

Plans are in place to explore Road Uses Charges which charge based on miles driven as opposed to gas consumed

Kansas established an EV fee, effective 2020

Source: National Conference of State Legislatures, March 2019

Source: Mileage Based User Fee Alliance
Fast EV chargers will put pressure on electric grid

- 80% charge in 20-30 minutes
- 3-5 miles of range per hour charging
- 10-20 miles of range per hour charging
Kansas has EV stations available and more on the way

186 charging stations with 797 charging outlets

Source: Alternative Fuels Data Center, 2019

Source: Hutchinson News
Because Connected & Autonomous Vehicles (CAVs) will revolutionize the way we travel, it raises the following questions:

- What types of new needs will CAVs create?
- How important is broadband access in supporting CAV safety features?
- What will be the safety implications of CAVs for pedestrians?
CAVs usage is expected to grow substantially in the next 25 years
CAVs could disrupt many aspects of our lives

• The number of vehicles on the road
• Vehicle distance traveled
• Average travel time
• Carbon Dioxide emissions
• Parking space needed

Source: BCG and MIT Media Lab analysis for World Economic Forum
Some states are trying to get in front of CAV technology with legislation

Source: National Conference of State Legislatures
Because Mobility as a Service (MaaS) changes how people travel, it raises the following questions:

• How many people will own personal vehicles in the future?

• How will revenue models, including parking, change in the future?

• How can transit services be better targeted in the future?

• How can MaaS be best configured in rural areas?

• What other shifts will impact how we travel in the future?
MaaS changes how we plan, pay for, and take trips

Image Source: TelematicsWire.Net
MaaS has grown considerably in popularity:
Number of Americans using ride-hailing services like Uber or Lyft doubled since 2015

Source: Pew Research Center
MaaS is not yet widely used in rural areas

Wide urban-rural gaps in ride-hailing among younger, more affluent adults

% of U.S. adults in each category who say they have ever used ride-hailing services like Uber or Lyft

<table>
<thead>
<tr>
<th>Category</th>
<th>Urban %</th>
<th>Rural %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ages 18-29</td>
<td>55</td>
<td>36</td>
</tr>
<tr>
<td>College grad+</td>
<td>70</td>
<td>32</td>
</tr>
<tr>
<td>Household income $75K+</td>
<td>71</td>
<td>32</td>
</tr>
</tbody>
</table>

Note: Respondents who did not give an answer or gave other responses are not shown.
Source: Pew Research Center
Accessing healthcare in the future raises the following questions:

• What will technology’s role be in healthcare access?

• What’s transportation’s role in providing better and more cost effective healthcare access?
Solutions to address access to health services will likely be driven by technology\(^1\)

1: Citris and the Banatao Institute
Moreover, many essential rural hospitals are at risk of closing.

29 rural hospitals at risk of closing, of which 25 are considered essential.

Source: Navigant
Kansas Transportation Background
Approximately $2 Billion Transferred Out of State Highway Fund since 2011
T-WORKS Proposed spending ranges for expansion & modernization projects
2011-2020 (in millions)

Total Available Statewide: $1,700
To develop ranges within each region, KDOT looked at a variety of factors in 2010

<table>
<thead>
<tr>
<th>Region</th>
<th>Northeast</th>
<th>North Central</th>
<th>Northwest</th>
<th>Southeast</th>
<th>South Central</th>
<th>Southwest</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population</td>
<td>46%</td>
<td>7%</td>
<td>3%</td>
<td>10%</td>
<td>28%</td>
<td>5%</td>
</tr>
<tr>
<td>Projected Population (2030)</td>
<td>53%</td>
<td>6%</td>
<td>2%</td>
<td>9%</td>
<td>26%</td>
<td>4%</td>
</tr>
<tr>
<td>State Highway Miles</td>
<td>19%</td>
<td>16%</td>
<td>16%</td>
<td>16%</td>
<td>19%</td>
<td>15%</td>
</tr>
<tr>
<td>Total Roadway Miles</td>
<td>17%</td>
<td>16%</td>
<td>17%</td>
<td>14%</td>
<td>22%</td>
<td>14%</td>
</tr>
<tr>
<td>Daily Miles Traveled on Highways</td>
<td>39%</td>
<td>11%</td>
<td>8%</td>
<td>12%</td>
<td>23%</td>
<td>6%</td>
</tr>
<tr>
<td>Daily Truck Miles Traveled on Highways</td>
<td>29%</td>
<td>17%</td>
<td>15%</td>
<td>11%</td>
<td>21%</td>
<td>7%</td>
</tr>
<tr>
<td>Daily Miles Traveled on all Roads</td>
<td>40%</td>
<td>10%</td>
<td>6%</td>
<td>11%</td>
<td>27%</td>
<td>6%</td>
</tr>
<tr>
<td>Employment by Place of Work</td>
<td>50%</td>
<td>7%</td>
<td>3%</td>
<td>8%</td>
<td>28%</td>
<td>4%</td>
</tr>
<tr>
<td>Employment by Place of Residence</td>
<td>46%</td>
<td>8%</td>
<td>4%</td>
<td>9%</td>
<td>28%</td>
<td>5%</td>
</tr>
</tbody>
</table>