

6. Trends and Challenges

Economic changes can impact the freight system positively or negatively depending on the efficiency and adaptability of the transportation network. This section summarizes the internal and external economic trends and challenges related to the movement of goods on Kentucky's freight network.

6.1. Internal Trends and Challenges

Until the 20th century, agriculture was Kentucky's main economic activity. While agriculture remains a key element in the commonwealth's economy, manufacturing grew in importance after the 1930's and took precedence, largely due to an abundance of coal and hydroelectric power. In 2019, Kentucky's leading economic activity was manufacturing, followed by transportation. The energy, automotive, and agriculture trends and challenges in Kentucky and how they affect freight transportation are discussed below.

6.1.1. Energy

According to the U.S. Energy Information Administration (EIA), Kentucky is a major coal-producing state, ranking 7th in 2020 with an output of 24 million short tons of coal, accounting for 4.5 percent of the total U.S. coal production. Approximately 82 percent of Kentucky's coal comes from underground mines in Kentucky's eastern Appalachian counties and in western Kentucky. The rest of the coal comes from surface mines. For electricity generation, coal-burning plants produce approximately 69 percent of Kentucky's electric power. Many coal-fired generation plants on the Ohio River have already or plan to convert to natural gas in the coming years. Natural gas produces 22.6% of the electric power, followed by hydroelectric utilities such as the Barkley and Kentucky dams at 7.9%.

Significant coal production shifts, geographically or by volume, continue to have a dramatic impact on the Kentucky Freight Network. For example, roads that currently serve coal mining operations could continue to see heavy truck traffic, or if projections are correct, the same roads could see a dramatic decrease in heavy-haul traffic. Similarly, the inland waterway system carries a significant amount of Kentucky coal to customers throughout the Mississippi and Ohio River valleys. This excess capacity could provide opportunities to innovate and explore container-on-barge shipping opportunities in the Midwest.

6.1.1.1 Coal Production Shifts

Historically, Kentucky is a net exporter of energy; however, with decreasing coal production and stagnant energy demand, Kentucky's position as an energy exporter has been declining since 1990.

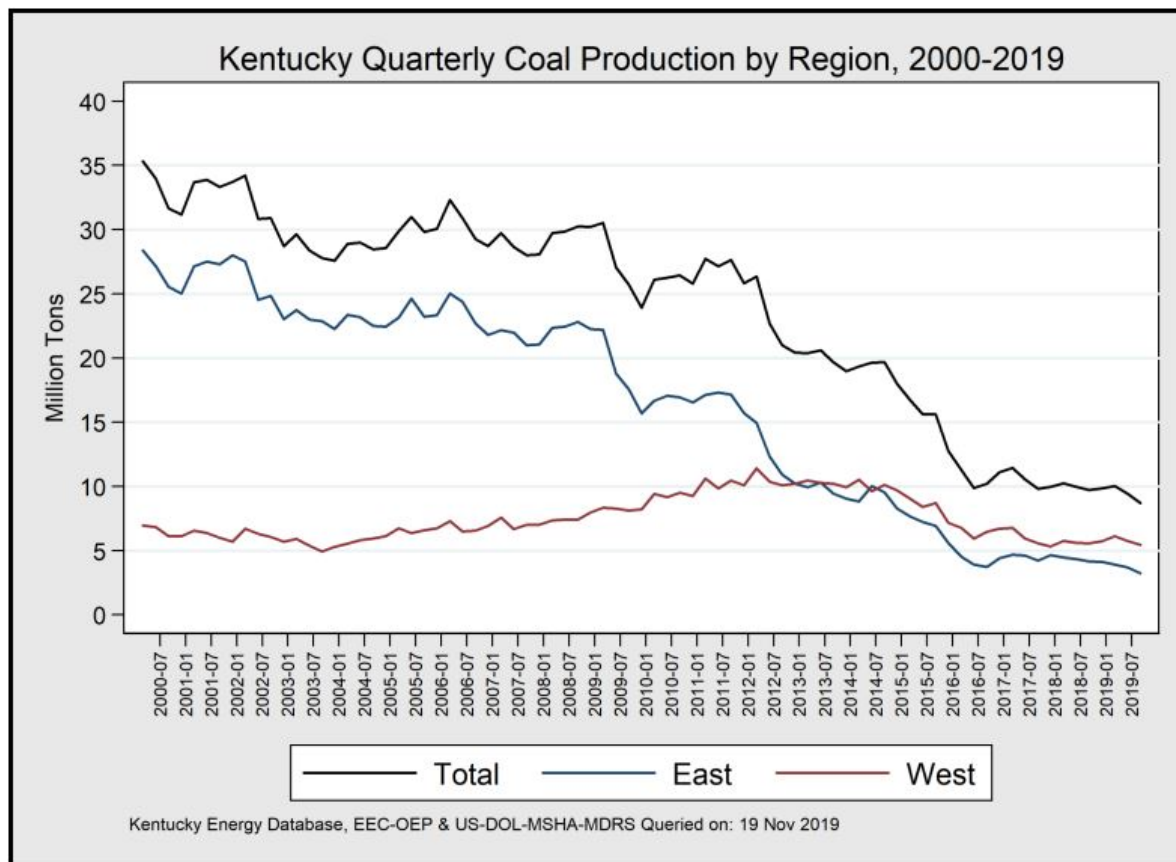
Kentucky has been one of the largest coal-producing state for many years, with about one-fifth of all operating U.S. coal mines, more than all but two other states.⁵⁰ Kentucky is the only coal exporting state with two distinct geologic basins: the Central Appalachian Basin of eastern Kentucky and the Illinois Basin of western Kentucky. Coal mining of some form has existed in these basins for at least 220 years,

⁵⁰ U.S. Energy Information Administration (EIA), Kentucky State Energy Profile Analysis, <https://www.eia.gov/beta/states/states/ky/analysis>, Accessed November 2021

with more than 8.36 billion tons of coal produced from both geologic basins during that period.⁵¹ Historically, eastern Kentucky has been the primary coal producing region, but in recent years the two regions have been trending in opposite directions. Eastern Kentucky coal has a higher heat content and lower sulfur content, so it burns hotter and cleaner than western Kentucky coal. However, western Kentucky coal is now relatively less expensive by delivered price. The difference is a result of several factors, including transportation costs, ease of access, and mining techniques employed.

Figure 6-1 illustrates the change in total statewide coal production alongside subtotals for eastern and western Kentucky from 2000 to 2019. In 2013, western Kentucky overtook eastern Kentucky in total coal production, generating 51 percent of Kentucky's 80.6 million tons of coal. In 2019, western Kentucky mines accounted for 61 percent of Kentucky coal production, while eastern Kentucky accounted for 39 percent.

Figure 6-1. Kentucky Coal Production, 2000-2019.



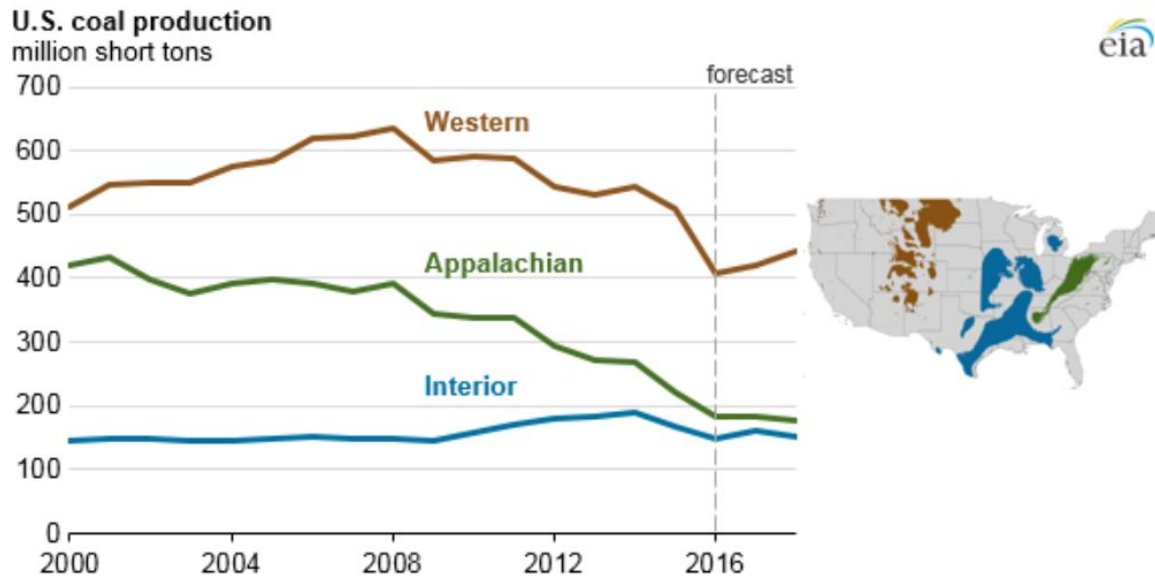
Source: Kentucky Energy and Environment Cabinet⁵², 2019.

⁵¹ University of Kentucky, Kentucky Geological Survey, <https://www.uky.edu/KGS/coal/coal-ky-info-coal-production.php>, Accessed November 2021.

⁵² Kentucky Energy and Environment Cabinet, Kentucky Quarterly Coal Report, <https://eec.ky.gov/Energy/News-Publications/Quarterly%20Coal%20Reports/2019-Q3.pdf>, Accessed November 2021.

The decline in eastern Kentucky coal production is representative of the larger decline in Appalachian Basin coal. **Figure 6-2** depicts this decline in comparison to competing coal reserves as a percentage of total U.S. coal production.

Figure 6-2. Historic Coal Production by Geologic Basin



Source: U.S. Energy Information Administration (EIA)⁵³, 2017.

As shown in the figure above, eastern Kentucky is included in the Appalachian Basin line (green), while western Kentucky is included in the Interior line (blue). Kentucky's decline in coal production coincides with the rise of Powder River Basin coal from Montana and Wyoming (brown). Western coal has seen recent export growth.

As the remaining coal in eastern Kentucky becomes more expensive to mine, coal companies are competing against cheaper fuels including western Kentucky coal, natural gas, and some renewable sources. In 2020, Central Appalachian coal production followed the U.S. coal production trend by falling to its lowest level since 1965. This was largely the result less U.S. electric power sector demand for coal. Kentucky witnessed a decline of 32.7 percent in coal production from 2019 to 2020.⁵⁴ According to the United States Geological Survey (USGS) Coal Resource Assessment, annual coal production from the Appalachian Basin will enter a period of irreversible decline over the next several decades.

In 2020, approximately 69% of electricity produced in Kentucky was coal-generated, a larger share than all but three other states. Coal has historically been the cheapest and most stable energy source, since it can easily be stockpiled and used when needed, unlike natural gas and renewables. The cost of natural

⁵³ U.S. Energy Information Administration (EIA), Today in Energy, *U.S. coal production and coal-fired electricity generation expected to rise in near term*, February 8, 2017, <https://www.eia.gov/todayinenergy/detail.php?id=29872>, Accessed August 2022.

⁵⁴ U.S. Energy Information Administration (EIA), Today in Energy, *In 2020, U.S. coal production fell to its lowest level since 1965*, July 15, 2021, <https://www.eia.gov/todayinenergy/detail.php?id=48696>, Accessed August 2022.

gas has decreased significantly in recent years but is still more expensive than coal. Despite its decline, coal is expected to remain a major component of Kentucky's energy profile for the foreseeable future.⁵⁵

6.1.1.2 Power Plant Conversions – Coal to Natural Gas

Across the U.S., approximately 102 gigawatts of coal-fired power plant capacity retired between 2010 and the first quarter of 2019. According to the EIA, another 17 gigawatts of coal-fired capacity is set to be retired by 2025. Two of the largest coal-fired power plant retirements in the U.S took place in Kentucky in 2020.⁵⁶

Factors influencing this trend of retiring older, less efficient coal-fired power generators include slowing growth in electricity demand, shifts in relative fuel prices, increasing availability of high-efficiency natural gas combined-cycle power plants, and environmental compliance costs.⁵⁷ Most coal generators in Kentucky were constructed between the mid-1950s and 2010, and several have been retrofitted with environmental controls to meet air quality emissions standards. However, many others need further upgrades, as standards have become more stringent.

Since coal has encompassed a large percentage of commodities being moved across Kentucky, the trend of power plant conversions has significant implications on the way freight moves throughout Kentucky's freight system.

6.1.1.3 Kentucky Coal Movement Out of State

Foreign coal remains a small part of total U.S. coal consumption, but Central Appalachian coal is especially vulnerable to the competition as it loses market share to natural gas and coal from elsewhere in the U.S.

In 2020, 30 percent of Kentucky coal stayed in state, while 69 percent was exported out of state. The remaining 1 percent was shipped overseas. Eastern Kentucky coal was sold mostly to southeastern U.S. states (Georgia being the largest consumer), while western Kentucky coal (59 percent) was mostly used in state. Kentucky remains the single largest user of Kentucky coal, increasing its consumption as other states decreased consumption.

⁵⁵ Kentucky Energy and Environment Cabinet, Energy News Publications, Coal Facts, <https://eec.ky.gov/Energy/News-Publications/Pages/Coal-Facts.aspx>, Accessed November 2021.

⁵⁶ U.S. Energy Information Administration (EIA), Today in Energy, *More U.S. coal-fired power plants are decommissioning as retirements continue*, <https://www.eia.gov/todayinenergy/detail.php?id=40212>, Accessed November 2021.

⁵⁷ U.S. Energy Information Administration (EIA), Today in Energy, *27 gigawatts of coal-fired capacity to retire over next five years*, <http://www.eia.gov/todayinenergy/detail.cfm?id=7290>, Accessed November 2021.

Table 6-1 provides 2017 freight transportation statistics for coal in Kentucky.

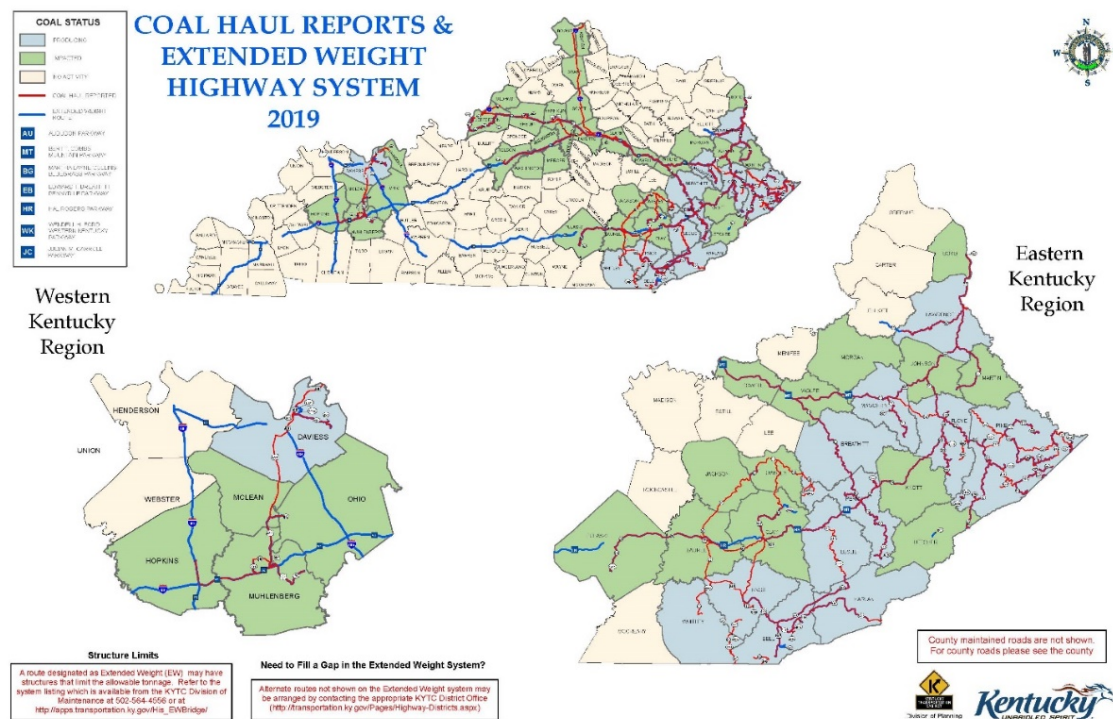
Table 6-1: Freight Statistics – Coal

	Thousand Tons			Commodity Thousand Tons Share		Commodity Value Share	
Year	2012	2017	Change	2012	2017	2012	2017
Within Kentucky	41,165	17,635	-57%	25%	11%	2.0%	0.8%
From Kentucky	114,015	40,427	-65%	32%	24%	1.7%	0.8%
To Kentucky	62,198	11,862	-81%	20%	7%	0.8%	0.1%

Source: Freight Analysis Framework Summary Statistics, 2022.

In 2017, coal was the second ranked commodity transported from and within Kentucky, and third ranked commodity transported to Kentucky by tons. By commodity value, coal was ranked outside the top 10 commodities by value as a shipment to, from, and within Kentucky.⁵⁸ Due to the production of coal on the eastern and western portions of the state, significant volumes of coal are shipped on Kentucky's roadways. **Figure 6-3** illustrates the major coal producing counties in Kentucky, the highways on which coal is transported, and the counties included in the road transport of coal.

Figure 6-3. Kentucky Coal Haul Highway System (2019)⁵⁹



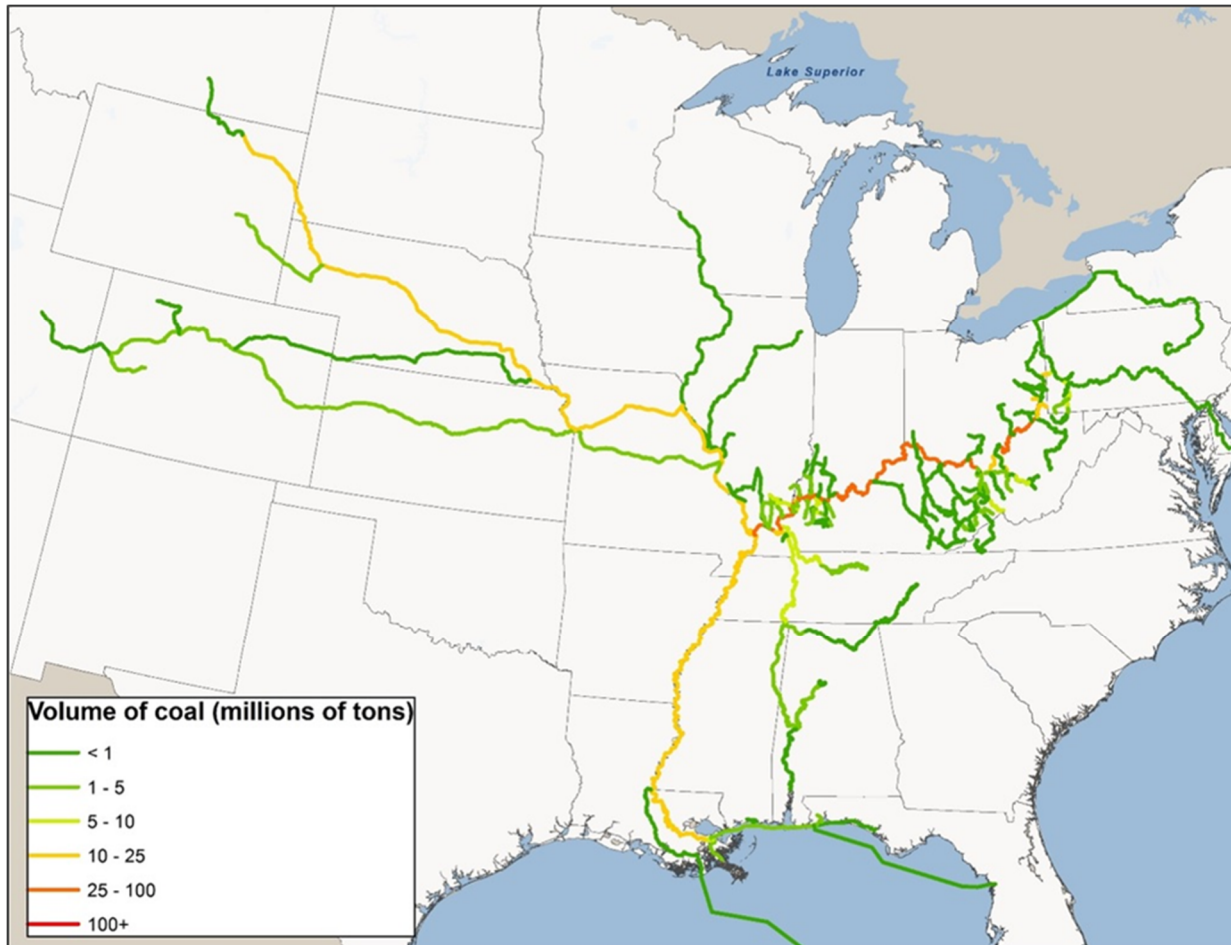
Source: Kentucky Transportation Cabinet, 2019.

⁵⁸ Freight Analysis Framework, FAF5.2, Summary Statistics, <https://faf.ornl.gov/faf5/SummaryTable.aspx>

⁵⁹ Kentucky Transportation Cabinet, Coal Haul Highway System, 2019, <https://transportation.ky.gov/Planning/Pages/Coal-Haul-Highway-System.aspx>.

In terms of tonnage, commodity transport consists largely of coal on the Ohio River and the Tennessee-Tombigbee Waterway. Railroads are also integral for the delivery of coal from mines to power plants. **Figure 6-4** illustrates the full intermodal routes of coal shipments on the Ohio River.

Figure 6-4. Full Intermodal Routes of Coal Shipped on the Ohio River



Source: Kentucky Transportation Center and the University of Kentucky.

6.1.2. Automotive

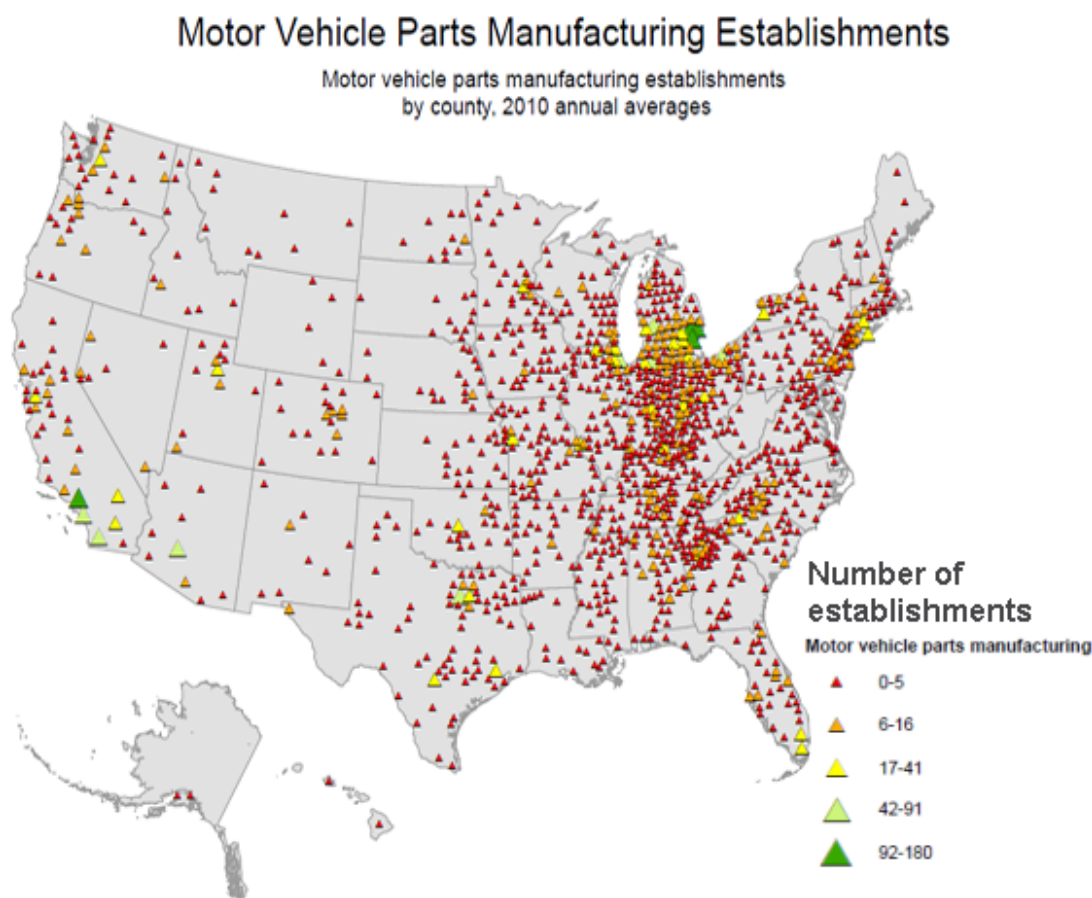
Kentucky is the top-ranking producer state of cars, light trucks, and SUVs per capita. Also, ranking third in the U.S. (behind Michigan and Ohio) in auto production by state, accounting for 11.2 percent of total U.S. auto production. There are more than 520 automotive-related companies in the state, employing over 100,000 people, as well as four assembly plants and over 490 parts suppliers located in state. In 2019, Kentucky automotive-related exports totaled \$4.8 billion.⁶⁰

⁶⁰ Kentucky Cabinet for Economic Development, Automotive Industry, https://ced.ky.gov/Existing_Industries/Automotive.

Automotive-related industries in Kentucky contribute nearly \$14.3 billion to the state's GDP, representing approximately 7.8 percent.⁶¹ The success of Kentucky's automobile industry can be primarily attributed to its geographic location along the north-south rail and highway distribution corridors, which are tapped into United States-Mexico-Canada Agreement (USMCA) flows.

Nationally, a concentration of automotive manufacturing exists along a multistate north-south corridor, roughly following the paths of I-65 and I-75, both of which transect Kentucky and parallel NS and CSXT rail lines. The northern half of auto manufacturing largely consists of domestic manufacturers (Ford, GM, and Chrysler), while the southern half consists of foreign manufacturers (Nissan, Toyota, BMW, Mercedes-Benz, and Volkswagen). Scattered throughout the U.S. are thousands of parts suppliers and manufacturers who are integrated into the automotive supply chain that extends from Canada to Mexico. **Figure 6-5** is a map of motor vehicle-related firms throughout the U.S.

Figure 6-5. Automotive Industry in the U.S.



Source: U.S. Bureau of Labor Statistics, 2010.

Louisville is home to two Ford assembly plants: the Kentucky Truck Plant (KTP) and the Louisville Assembly Plant (LAP). The KTP assembles Ford F-Series Super Duty pick-up trucks, the Ford Expedition, and the Lincoln Navigator. The Louisville Assembly Plant assembles the Ford Escape and Lincoln

⁶¹ Kentucky Automotive industry Association, *Economic Impact of the Automotive Industry in Kentucky*, https://kyautoindustry.com/wp-content/uploads/2015/07/Regional_Forum_Presentation.pdf.

Corsair, but also has the capability to simultaneously produce the company's Focus, Fiesta, and Fusion models to meet demand. In October 2021, Ford announced its new plan of building the largest electric battery plant in the U.S. next to I-65 in Hardin County. This project will break economic development records in the state and will set the bar globally for battery production, with a capital investment nearing \$6 billion.⁶² Most recently, Envision AESC announced a \$2 billion investment to build a lithium-ion battery plant in Bowling Green, Warren County, Kentucky.⁶³

Toyota opened its first assembly plant outside of Japan in 1986 in Georgetown, Kentucky, and has since then produced more than 13 million vehicles and nearly 14 million powertrain units.⁶⁴ Today, Toyota Motor Manufacturing Kentucky (TMMK) is the company's largest vehicle manufacturing plant in the world. TMMK has two vehicle production lines and a powertrain, engine, and axle facility, and has a production capacity of 550,000 vehicles and more than 600,000 engines annually.⁶⁵ Starting in 2023, TMMK will begin assembling integrated dual fuel cell (FC) modules destined for use in hydrogen-powered, heavy-duty commercial trucks.

Lastly, Bowling Green has been the exclusive production home of Chevrolet's high-performance Corvette since 1981, with more than 1 million manufactured to date.⁶⁶

Figure 6-6 illustrates the automotive-related plants and suppliers in Kentucky.

⁶² Commonwealth Journal, Kentucky leading the automotive industry of the future, October 8, 2021, https://www.somerset-kentucky.com/opinion/columns/kentucky-leading-the-automotive-industry-of-the-future/article_427054b5-bd48-5011-8627-aafcd3da1e9a.html

⁶³ Kentucky Cabinet for Economic Development, Gov. Beshear: Envision AESC's Investment in 30GWh Kentucky Gigafactory Creates 2,000 New Jobs and Solidifies the Commonwealth as New Electric Vehicle Battery Capital, April 13, 2022, https://ced.ky.gov/Newsroom/NewsPage/20220413_EnvisionAESC.

⁶⁴ Toyota Newsroom, Toyota's Largest Plant in the World Finds a Home in Kentucky, September 16, 2021, <https://pressroom.toyota.com/toyotas-largest-plant-in-the-world-finds-a-home-in-kentucky/>.

⁶⁵ Toyota Newsroom, Toyota Motor Manufacturing Kentucky (TMMK), March 30, 2022, <https://pressroom.toyota.com/facility/toyota-motor-manufacturing-kentucky-tmmk/>.

⁶⁶ Toyota Newsroom, Toyota to Assemble Fuel Cell Modules at Kentucky Plant in 2023, August 25, 2021, <https://pressroom.toyota.com/toyota-to-assemble-fuel-cell-modules-at-kentucky-plant-in-2023/>.

Motor Vehicle-Related Plants and Suppliers

Total full-time employment as of 6/28/2019: 100,959*

- 1 - 2
- 3 - 5
- 6 - 15
- 16 - 76
- 77+



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Source: Kentucky Cabinet for Economic Development, 2019.

Motor vehicles are transported by truck on car carrier trailers, by rail on ‘autorack’ rail cars, or by sea on car carrier ships. Autoracks have two or three decks and can carry up to 20 vehicles, but the average is around 12 vehicles. Domestically assembled vehicles are transported from assembly plant to dealership either by truck or a combination of truck and rail depending on distance to destination. Costs rise substantially for car carrier truck routes that are more than a few hundred miles. Generally, after vehicles are transported by rail, trucks carry the vehicles for the final leg from the railhead to the dealership, which is typically up to 75 miles. The average rail journey for a new car in the U.S. is approximately 1,300 miles. Automakers, which generate 8 to 9 percent of total rail freight, have little leverage with railroads, since there are no cost-effective alternatives to shipping vehicles via rail. Vehicles assembled overseas arrive into coastal ports and are accepted into the existing domestic transport system.

From Kentucky, motor vehicle rail shipments are typically transported from the assembly plant to an onsite rail yard, where the rail cars are organized and shipped out to a railhead near their destination market. Toyota in Georgetown and Ford’s two Louisville plants are major drivers of rail freight in Kentucky. **Table 6-2** provides freight transportation statistics for motorized vehicles in Kentucky in 2017.

Table 6-2. Freight Statistics – Motorized Vehicles

	Thousand Tons			Commodity Thousand Tons Share		Commodity Value Share	
Year	2012	2017	Change	2012	2017	2012	2017
Within Kentucky	2,968	7,468	152%	2%	2%	25%	13%
From Kentucky	9,308	14,213	53%	3%	3%	21%	19%
To Kentucky	6,807	13,431	97%	2%	2%	14%	10%

Source: Freight Analysis Framework Summary Statistics, 2017.

In 2020, motorized vehicles were the fifth ranked commodity transported from and to Kentucky, and the ninth ranked commodity shipped within Kentucky by tons. By commodity value, motorized vehicles are the top-ranking commodity transported from and within Kentucky, and third ranked commodity transported to Kentucky.⁶⁷

While commodity ton-miles decreased from 2017 to 2020, new automotive investment and lighter vehicles held the commodities value share relatively stable. As this industry continues to grow it will put increased pressure on the freight transportation system in Kentucky, particularly on the rail and highway systems, which bear the brunt of movement of motor vehicles.

6.1.3. Agriculture

Most agriculture is geographically dispersed due to its reliance on land. It cannot simply locate near its customers, especially since more and more of those customers are global. Agricultural production depends on a complete transportation system that includes all major modes of transportation (truck,

⁶⁷ Federal Highway Administration, Freight Analysis Framework Version 5.2, <https://faf.ornl.gov/faf5/>.

rail, barge, aircraft, and ocean vessel), with their complementary and competitive roles in transporting farm goods. Due to its cyclical nature during annual periods of growth in volume, agriculture, in turn, puts pressure on the transportation system. Many agricultural commodities are perishable, seasonal, and of relatively low value, making efficient and appropriate transportation challenging but critical.

Kentucky remains one of the nation's major agricultural states. Kentucky ranks second among states, after North Carolina, in the production of tobacco. The Commonwealth's other major cash crops are corn, soybeans, and hay. Kentucky's farmers also raise livestock, mostly cattle and horses. The breeding and selling of thoroughbred horses are Kentucky's most valuable source of livestock income. Most of the thoroughbred horses come from pastures located in the state's bluegrass region, which includes Lexington.

Agricultural trends in Kentucky are consistent with the trend of population migration out of rural areas and into more urban and suburban settings. Kentucky's rural population share decreased from 69 percent in 1930 to 41 percent in 2010. Increased agricultural efficiency and automation have resulted in increased output that, when coupled with advancements in transportation technology, have enabled population growth to occur far from food production. Many businesses in Eastern Kentucky are adopting high-tech greenhouses to improve the productivity, economic efficiency, and environmental friendliness of the state's agriculture sector.⁶⁸

Between 1950 and 2010, the average farm size in the U.S. increased from 213 acres to 418 acres, while Kentucky's average farm size increased from 86 acres to 163 acres (or by 90 percent) over the same period. Kentucky has 63 percent fewer farms and 29 percent fewer total farm acres in 2010 versus 1950, but over the same period, production volume increased by 283 percent.⁶⁹

Kentucky's agricultural producers rely heavily on rural infrastructure to transport farm products, as crops are moved from production regions by truck, rail, or barge to elevators and processing facilities. As with most commodities, trucks are often the first and last mode in the transport of agricultural products.

Table 6-3 provides freight transportation statistics for all agriculture-related commodities in Kentucky in 2017. The table combines data from the following commodities: live animals/fish, cereal grains, other farm goods, animal feed, meat/seafood, milled grain products, and tobacco products.

⁶⁸ Forbes, *High-Tech Greenhouse Could Be The Future of Agriculture*, <https://www.forbes.com/sites/jordanstrickler/2020/08/28/high-tech-greenhouses-could-be-the-future-of-agriculture/?sh=1b93d5f1380f>, Accessed April 2022.

⁶⁹ Soy Transportation Coalition, *Rural Infrastructure: A More Productive Path Forward*, <http://www.soytransportation.org/RuralInfrastructure/KentuckyProfile.pdf>, Accessed November 2021.

Table 6-3. Freight Statistics – Agriculture (All Farm Goods)

Year	Thousand Tons			Commodity Thousand Tons Share		Commodity Value Share	
	2012	2017	Change	2012	2017	2012	2017
Within Kentucky	12,150	18,262	50%	7%	11%	6%	7%
From Kentucky	22,032	31,140	41%	6%	10%	7%	5%
To Kentucky	21,586	28,057	30%	7%	9%	5%	4%

Source: Freight Analysis Framework Summary Statistics, 2017.

Of all agricultural freight in Kentucky, cereal grains comprise most shipments by tonnage. To provide additional perspective, **Table 6-4** outlines the freight transportation statistics for cereal grains in 2017.

Table 6-4. Freight Statistics – Agriculture (Cereal Grains)

Year	Thousand Tons			Commodity Thousand Tons Share		Commodity Value Share	
	2012	2017	Change	2012	2017	2012	2017
Within Kentucky	5,511	9,977	81%	3%	6%	0.7%	1%
From Kentucky	8,190	13,868	69%	2%	4%	0.3%	0.5%
To Kentucky	7,284	11,557	59%	2%	4%	0.3%	0.4%

Source: Freight Analysis Framework Summary Statistics, 2017.

6.2. External Trends and Challenges

6.2.1. Panama Canal

The Panama Canal, completed in 1914, created one of the most important trade routes in the world, linking the Atlantic and Pacific oceans. The \$2.5 billion expansion project of the Panama Canal began in September 2007 and was completed and fully operational in June 2016. The new larger locks allow the passage of neo-Panamax vessels with a throughput capacity of up to 15,000 twenty-foot-equivalent units (TEUs), compared to vessels with a throughput capacity of 4,500 TEUs prior to the expansion. Since then, the segment has experienced steady growth, and the amount of goods passing through has dramatically increased with the new locks now being able to accommodate roughly 79 percent of all cargo-carrying vessels.

Approximately 70 percent of all cargo that passes through the Panama Canal either originated from, or is headed towards the U.S. The long-term effects as well as the scale of the impacts on Kentucky freight flows will not be clear for some time, but some change in the demands on transportation networks, service, and operations is probably bound to happen. These impacts may result in needed improvements to ports, railroads, and interstate highways in western Kentucky.

6.2.2. Near-shoring

Some of the world's largest companies have joined a steady stream of smaller companies in a concept known as near-shoring—returning operations to nearby countries. More U.S. businesses are opting to return manufacturing processes to North America from overseas in response to reduced cost advantages of manufacturing in low-cost countries as well as changes in supply chains. In 2022, these advantages were multiplied considering the logistical challenges posed by the COVID-19 pandemic and rising costs of transportation due to inflation.

An expectation of faster and more direct delivery of goods by the consumer and supply chains becoming more complex—with too many individuals and components—are driving U.S. businesses to start strategizing for near-shoring. Near-shoring allows businesses to streamline their distribution processes so that they are leaner, more efficient, and more collaborative. However, increased investment in freight transportation infrastructure in the U.S., as well as Kentucky, will be needed to improve these supply chains.

6.2.3. New Technology

6.2.3.1 Dedicated Freight Infrastructure

As freight volumes have increased across the U.S. during the past several decades, concepts for dedicated freight infrastructure—like autonomous freight vehicles and dedicated truck lanes — have increasingly entered freight transportation discussions.

Dedicated truck lanes physically separate commercial vehicles from passenger vehicles or mixed traffic flows. In recent years, states including California, Florida, Georgia, Indiana, Missouri, Ohio, and Texas have examined dedicated truck lane concepts. Separating vehicle streams introduces a new level of complexity in highway design (e.g., on-/off-ramps) and operations (dealing with incidents or breakdowns). To date, there are no dedicated truck lanes in Kentucky, and those that do exist elsewhere tend to be relatively short routes serving ports or key border crossings. Benefits associated with dedicated truck lanes include significant safety gains, the potential of adopting high productivity vehicle (HPV) configurations, and the possibility of advanced technologies such as Intelligent Vehicle Initiatives (IVI) and the autonomous truck or self-driving truck.

The KYTC Division of Planning closely monitors proposed changes in overweight / over dimension specifications. KYTC regularly reviews the National Network and implements updates as needed to reflect the movement of freight by overweight / over dimension vehicles. Routes with substantial deterioration because of freight movement will be identified during that process and addressed in partnership with the districts.

6.2.3.2 E-Commerce and Drone Delivery

Electronic commerce (e-commerce) is the use of electronic devices and technologies to conduct commerce, or trade, including buying products on the internet and electronic banking. E-commerce has increased from 5.1 percent of total retail activity in 2012 to 13.3 percent in the second quarter of 2021.⁷⁰

⁷⁰ U.S. Census Bureau, Quarterly Retail E-Commerce Sales Second Quarter 2021, http://www.census.gov/retail/mrts/www/data/pdf/ec_current.pdf, Accessed November 2021.

It is important to note that e-commerce reached almost 16 percent of total retail activity during the second quarter of 2020 because of the COVID 19 pandemic, an abrupt increase of approximately 40 percent from the first quarter of 2020. To compete, traditional retailers such as Walmart, Target, Lowes, and Home Depot have implemented new strategies like ‘buy on-line, pick up in store’ and have established more local distribution centers to create expedited supply chains. E-retailers like Amazon and Kroger have constructed a series of centralized distribution centers. This rapid e-commerce requires fast, on-time delivery, which is sensitive to distance and congestion, among other factors. A result of this trend is a higher number of delivery vehicles entering into residential neighborhoods. As residential deliveries increase, a potential concern is an increase in related congestion and wear and tear to the local road network.

One emerging potential alternative strategy for home delivery uses unmanned aircraft, also known as drones. A drone is defined as an unmanned aircraft or ship guided autonomously or by remote control. Particularly, drones may become a preferred transportation mode in the coming years for last-mile time-sensitive deliveries such as pharma products, especially into hard-to-reach areas with a concentration of healthcare facilities.⁷¹ While drones help relieve congestion and traffic on the local road network caused by e-commerce delivery vehicles, they present their own set of challenges, particularly in how their use is governed and in avoiding over-crowded air space. In February 2015, the FAA released proposed rules governing the use of drones for commercial purposes.

6.2.3.3 Electric Vehicles and Alternative Fuel Corridors

KYTC in coordination with the Energy and Environment Cabinet (EEC), the Public Service Commission (PSC), the Federal Highway Administration (FHWA), and several other State Cabinets developed [Kentucky's Electric Vehicle \(EV\) Infrastructure Deployment Plan](#). The planned public Direct Current Fast Charger (DCFC) network infrastructure in the study is not intended for freight, but freight is a growing part of the EV discussion. Freight companies involved in local and short-distance shipping could develop dedicated charging infrastructure at depots. Long-distance freight could also be served by dedicated charging infrastructure, and would require substantially more power than what is needed at non-freight stations. As the IIJA programs and guidance are fully rolled out, Federal grant funding could become available to support the expansion EV freight shipping. KYTC expects to incorporate guidance related to freight into future EV Plan updates.

Kentucky is also exploring the potential for hydrogen truck refueling stations in the state along the Federally designated Hydrogen Alternative Fuel Corridors. These corridors include I-65, I-75, and I-64.

⁷¹ Aircargo News, *Drones used for last-mile delivery are “here to stay”*, <https://www.aircargonews.net/airlines/drones/drones-used-for-last-mile-delivery-are-here-to-stay/>, Accessed November 2021.

6.2.3.4 Intelligent Transportation Systems (ITS) and Connected / Automated Vehicles (CAV)

KYTC is continuing to build on the ITS framework in the state with several ongoing and new initiatives that could benefit freight. The Truck Parking Information Management System (TPIMS) program (see 7.4) is one freight related technology initiative that has been implemented and is being examined for possible expansion. The Traffic Response and Incident Management Assisting the River City (TRIMARC) (see 7.3) systems in Louisville and Northern Kentucky are the ITS systems in both cities and they include mainline and arterial dynamic message signs, cameras, communications equipment, a traffic operations center (in Louisville), and safety patrols. TRIMARC benefits freight by providing traveler information including comparative travel time information, queue warning messages, lane blockage messages, and other safety related messages. It also reduces crashes and congestion through the various strategies and deployments, which also benefits freight flows through these two regions.

Another substantial initiative is in the field of data analytics. KYTC collects, tracks, and analyzes approximately 20 data sets on a continuous basis. Some of the data, such as speed data, is processed every two minutes. The data covers topics such as weather, travel speeds, incidents, work zones, truck parking, snowplow activity, traffic management enter reports, and others. With this data KYTC is able to have a better understanding of system operations and what might be needed to improve operations, including freight related operations. For example, KYTC has detailed data on speeds related to key truck bottlenecks, which can be used to help identify projects and prioritize investments.

KYTC is examining the potential for additional ITS deployments in Northern Kentucky, Louisville, and Lexington. KYTC was recently awarded a federal grant to implement a wrong way driving and safety monitoring/notification system in Louisville and Lexington. The system is focused on identifying major safety issues, and wrong way driving in particular, and notifying drivers using dynamic message signs. KYTC is also looking at expanding the ITS infrastructure in Northern Kentucky, but that effort is in the early planning stages. One other project that is about to be initiated is a Connected and Autonomous vehicle study for I-64 between Louisville and Lexington. This study would likely examine freight as part of a larger look at how CAV technologies might be implemented in Kentucky.

6.2.3.5 Transportation System Management and Operations (TSMO)

KYTC is advancing TSMO strategies to address mobility, reliability, and safety issues across the Commonwealth. This includes the development of a TSMO Program Plan and the integration of TSMO strategies and concepts into planning, design, and construction projects. For example, in Northern Kentucky, queue warning technology has been deployed on I-71/I-75 a major north-south freight corridor. The queue warning technology was implemented both northbound to address recurring and non-recurring congestion approaching the Brent Spence Bridge and southbound for a major work zone. There are also other travel time and safety warning messages displayed in Northern Kentucky that can be helpful to truck drivers. In other parts of the state, KYTC uses Dynamic Message Signs (DMS) to convey important travel information to drivers including truck drivers and other commercial vehicle drivers. There are also safety patrols serving Louisville and Northern Kentucky.

KYTC also has extensive real-time data with processing capabilities that can be used to support current and future TSMO initiatives that benefit freight. KYTC is also completing projects that have a TSMO focus or have TSMO elements within a larger context in several parts of the state.