4. PLANNING CONSIDERATIONS

4.1 Funding | 4.2 Supply chain and economics | 4.3 Network efficiency
4.4 Energy and environmental | 4.5 Considerations specific to modes

Proactively identifying and understanding key trends and issues impacting the freight transportation system is critical to implementing the most appropriate strategies and investments.

All trends and issues are subject to varying degrees of change and uncertainty. There are a number of things that have the potential to significantly disrupt current supply chains and freight corridors, including:

- Funding availability,
- Shifting reliance on global supply chains,
- Continuous growth of e-commerce,
- Acceleration of automation and emerging technologies,
- Increasing frequency and intensity of severe weather events,
- Global pandemics, and
- Sustained focus on infrastructure and supply chain resiliency.

Although uncertainty exists, it is necessary to attempt to forecast what should be considered and possibly addressed in the near- and long-term. Iowa Freight Advisory Council (FAC) members were asked to identify and prioritize trends and issues impacting the freight industry that should be considered when making planning and programming decisions. Those items identified are categorized and summarized in this chapter, with specific items identified by the FAC in bold text. As noted in Figure 4.1, items ranked 1-13 are considered high priority, 14-23 medium priority, and 24-34 low priority.

Figure 4.1: Iowa Freight Advisory Council priority considerations

High priority	1	Funding	Low priority	24	Land use
	2	Agriculture		25	Energy
	3	Lock and dams		26	Sourcing
	4	Trade		27	Automated trucking
	5	Multimodal		28	Economics
	6	Safety		29	Panama Canal
	7	Resiliency		30	Missouri River cargo
	8	Truck cargo		31	Fuel
	9	Highway design		32	Aviation trends
	10	Regulations		33	Air cargo
	11	Intermodal		34	Coal decline
	12	Trucking issues	Other considerations		Rural infrastructure
	13	Industry			Interstate Highways
Medium priority	14	Human trafficking			Rail crossing safety
	15	Mississippi River cargo			Sustainable investment
	16	Manufacturing			Container availability
	17	Rail network			Pipelines
	18	E-commerce			Labor shortages
	19	Rail cargo			
	20	First mile/last mile			
	21	Automation			
	22	Oversize/overweight			
	23	Biorenewables			

Source: Iowa Freight Advisory Council

4.1 Funding

Key issues: infrastructure funding

The state of Iowa is fortunate to have a strong multimodal freight transportation system that facilitates the safe and efficient movement of goods. This system allows our industries to move commodities more quickly and efficiently than those in most other nations, lowering the costs to domestic consumers and improving the economic competitiveness of freight industries.

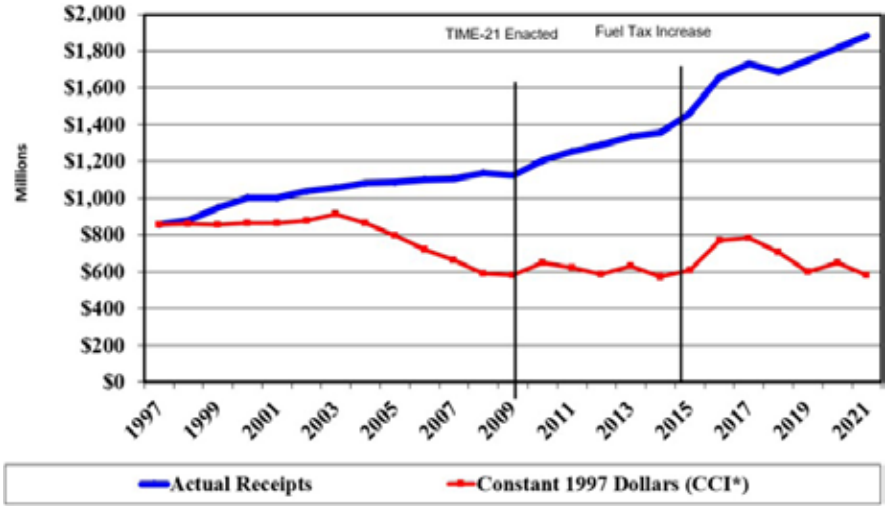
With this success comes the challenge to maintain and improve the multimodal system in the face of deteriorating conditions, diminishing buying power (see Figure 4.2), and growing demands. A well-maintained freight system reduces transportation costs and provides consistent and reliable services, all of which are factors critical in the evaluation companies undertake when deciding where to expand or how to disperse their goods and products. Without maintaining and improving our state's freight infrastructure, Iowa's economy will be weakened, and maintaining a competitive edge is critical to the Iowa and U.S. economies.

Infrastructure funding for all modes of transportation will continue to be a challenge in the future, requiring exploration of other sources. Public infrastructure funding at the federal, state, and local levels has decreased by eight percent since 2003 (National Freight Strategic Plan).

It is necessary to explore and/or create other funding sources to increase **sustainable investment** in the freight system. Difficult decisions must be made in dealing with Iowa's funding shortfall. Prioritizing projects, emphasizing stewardship, and achieving the right blend of modification, optimization, and transformation of the multimodal system will be critical to ensure limited dollars are spent in the most beneficial way. Asset management and rightsizing practices are necessary to help the system operate as efficiently as possible and to maximize the benefits of each dollar spent.

Targeted investments in bottlenecks and the Iowa Multimodal Freight Network (IMFN) should be prioritized.

Figure 4.2: Historic trend in Road Use Tax Fund buying power



Iowa Construction Cost Index, which reflects the inflation of roadway costs in Iowa and corresponding loss in buying power

Source: Iowa DOT

4.2 Supply chain and economics

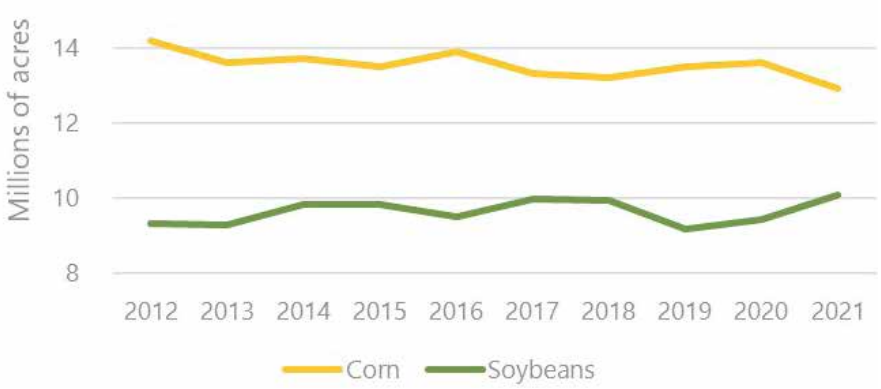
Key issues: agriculture, trade, resiliency, industry, manufacturing, and e-commerce

Iowa's exports are dominated by agriculture products. In recent decades, the landscape of Iowa agriculture has shifted as small farms continue to be consolidated into fewer larger farms that are more corporate in nature and produce more products that need to be shipped. With consistent acreage planted, the state has been fortunate to experience record corn and soybean harvests in recent years (see Figures 4.3 and 4.4), as well as a boom in ethanol and biodiesel production. The latter is significant as the majority of Iowa corn now stays in the state to be used for products such as biofuels and livestock feed rather than being exported outside of the state.

For the agricultural products that are exported, Iowa producers rely on the highway system to transport goods to major consolidation points like elevators and barge terminals, the inland waterways to ship to gulf coast ports via barges, and railroads to ship to west coast ports via unit trains. This trend is shifting, however. Producers (i.e., farmers and/or farming corporations) can achieve transportation economies of scale by transporting their own products using their own or for-hire truck equipment. Iowa farmers are now starting to ship more outputs directly via truck with less focus on moves to local consolidation points and rail terminals.

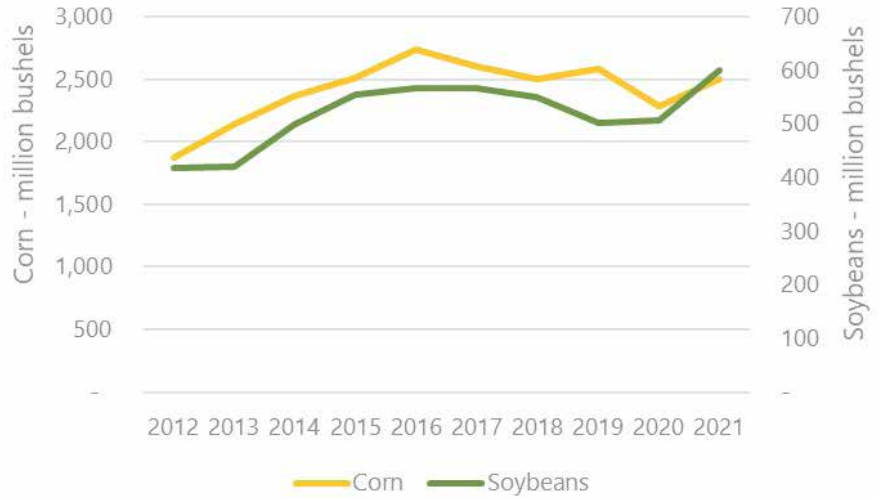
Producers and shippers continue to look for ways to achieve transportation economies of scale by adjusting shipping practices. This could lead to reanalyzing the freight transportation network as it relates to farm products, including the Farm-to-Market System and other rural infrastructure that serve as first mile/last mile connections for the agricultural industry. Overall optimization of the freight network will minimize costs and travel time and improve supply chain efficiency.

Figure 4.3: Iowa planted acres, 2012-2021



Source: U.S. Department of Agriculture

Figure 4.4: Iowa agricultural production, 2012-2021



Source: U.S. Department of Agriculture

Iowa industries, such as agriculture (although a growing share of goods are staying in state for value-added production) and manufacturing, rely on exports. Forecasted growth in **trade** and future trade negotiations will have impacts on these and other industries, as well as the associated supply chains.

Imports and exports are forecasted to be a greater share of freight moving in the country as international trade continues to grow with supply chains becoming increasingly global, resulting in increased freight movement and demand for containerized intermodal cargo. It will be important to monitor international trade deals and negotiations to better understand implications to freight transportation in Iowa. For example, the United States-Mexico-Canada Agreement (USMCA) was signed in 2019 as a modernized version of its predecessor, the North American Free Trade Agreement. USMCA will support mutually beneficial trade leading to increased efficiencies and robust economic growth for the U.S. and its two largest trading partners.

Potential challenges to growing international trade include existing bottlenecks on the freight system, growing congestion at U.S. trade gateways and border crossings, and infrastructure limitations at ocean ports. Multimodal bottlenecks exist throughout the transportation system and are exasperated by increased freight movement, there is consistent congestion at trade gateways due to inspections and security, and some U.S. ports lack the capacity to dock, unload, and load larger megaships that are now able to transit the Panama Canal to access gulf and east coast ports. Those ports that can handle these larger ships have experienced significant growth but the surge of cargo coming off megaships can strain connecting landside infrastructure and operations.

See Chapter 3, Industries and commodities (Section 3.2, Commodity movement), for Iowa domestic and international trade trends.

Infrastructure and supply chain **resiliency** are critical topics for both public and private stakeholders. A resilient freight transportation system is responsive and able to provide reliable services when it encounters small disruptions and returns to service quickly after large disruptions.

Increasing freight traffic is having a large impact on already aging infrastructure with limited capacity, reducing the overall resiliency of those corridors. Aging and deteriorating infrastructure is being further stressed by increases in extreme weather events such as flooding. Major events, such as the Missouri River floods of 2011 and 2019 in western Iowa, can disrupt or shut down critical infrastructure for days, weeks, or even months costing billions of dollars.

Infrastructure and supply chains must be resilient to smaller disruptions such as traffic crashes and larger events such as cyberattacks and global pandemics. The COVID-19 pandemic exposed vulnerable links in global supply chains that perhaps haven't been considered before, such as the implications of rapidly changing supply and demand situations in global supply chains and the importance of maintaining the health and safety of the freight labor force.

It is critical for infrastructure owners and operators to employ strategies and make necessary improvements to reduce the vulnerability of the infrastructure to extreme weather and other major disruptions. Without improvements, shippers will reassess their reliance on vulnerable freight gateways and corridors.

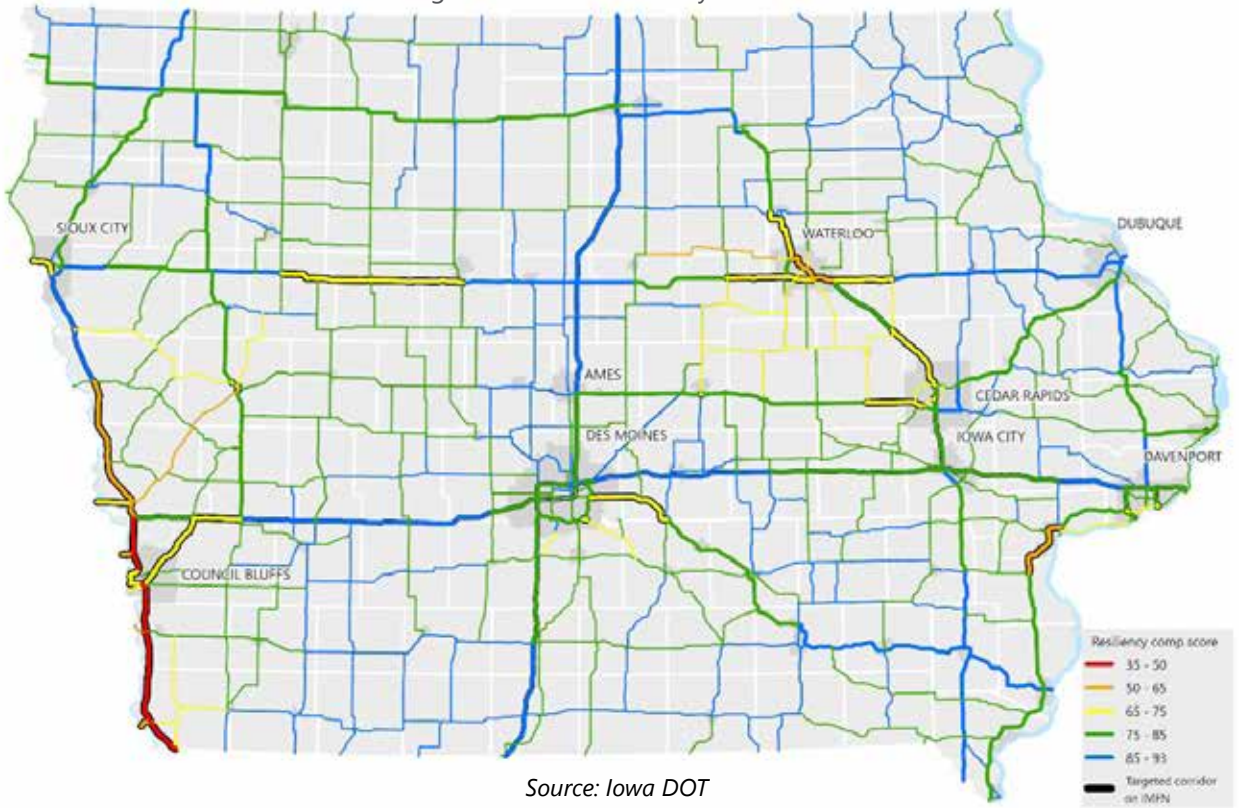
Consideration of resiliency in traffic operations and the overall project planning and programming process is critical for states to be prepared to address major disruptions and mitigate the impacts to freight industries. A resilient and reliable freight transportation system could ultimately lead to additional industries locating in the area.

Iowa Infrastructure Resiliency Efforts

Over the last couple of decades, Iowa has been increasingly impacted by natural disasters, including historic flooding, snowstorms, and tornadoes. This trend is likely to increase as climate data shows strong trends towards increasing temperatures, precipitation, stream flows and flooding. Awareness of human-induced disruptions has amplified as vigilance of potential terrorism and cyberattacks has increased.

The Resiliency Working Group was formed to provide guidance, support, and coordination of resiliency efforts within Iowa DOT, with the primary goal of developing and maintaining a transportation system that is resilient to disruptions that are caused by either natural or man-made disasters, and to reduce the vulnerability or risk to the general public and Iowa's transportation system. This group recently completed a statewide network screening to identify locations vulnerable to a 100-year flood event by analyzing highway segments by robustness, redundancy, and criticality. Results of this analysis are shown in Figure 4.5.

Figure 4.5: Iowa resiliency corridors



Source: Iowa DOT

Iowa's primary freight-dependent industries, such as agriculture, trade, transportation, and **manufacturing** rely on the freight transportation system for moving materials and goods. See Chapter 3, Industries and commodities (Section 3.1, Freight-dependent industries). The network will need to adapt for the current and future needs of these industries to support continued economic growth in the state.

National trends could impact Iowa's industries. Changes in location, **sourcing**, and density of economic activity will likely change supply chains and business models. Supply chains increasingly rely on materials, technology, labor, production facilities, and consumers located abroad, but issues brought to light by the COVID-19 pandemic may change overall reliance on global supply chains. Domestic sourcing could drastically impact demand for port utilization. U.S. industries may explore bringing manufacturing or production sites back to the U.S. (reshoring) or moving to nearby countries (nearshoring) to avoid longer transportation routes and congested ocean ports.

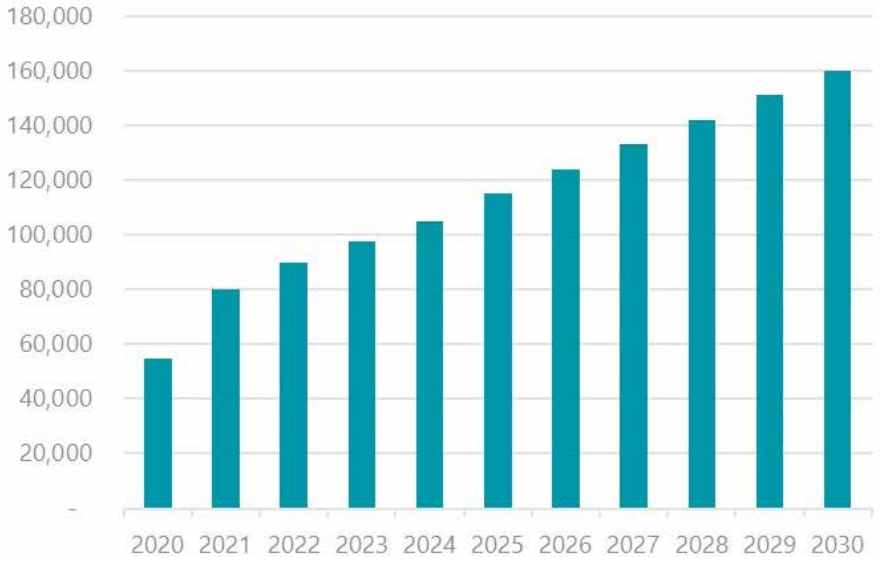
Industries may also revisit reliance on the just-in-time delivery model where companies minimize inventory costs by ordering products when they're ordered by consumers and then rely on quicker delivery schedules.

Labor shortages across supply chains continue to plague freight and transportation industries for a variety of reasons, many of which were compounded by the COVID-19 pandemic. Retaining and recruiting qualified workers (e.g., commercial drivers) has always been a challenge for certain industries but the issue of filling existing and future vacancies to address overall growth and an aging workforce is crucial. Challenges include barriers to entry into the professions (e.g., license and/or certification requirements), commercial drivers license age requirements, rapidly evolving technologies changing the nature of the jobs, and changing expectations among the workforce (such as the desire to be home every night).

U.S. industries may explore bringing manufacturing or production sites back to the U.S. (reshoring) or moving to nearby countries (nearshoring) to avoid longer transportation routes and congested ocean ports. Benefits of reshoring and nearshoring are:

- Shorter lead times,
- Increased production control,
- Improved time to consumers,
- Streamlined distribution of products, and
- Avoidance of taxes and tariffs.

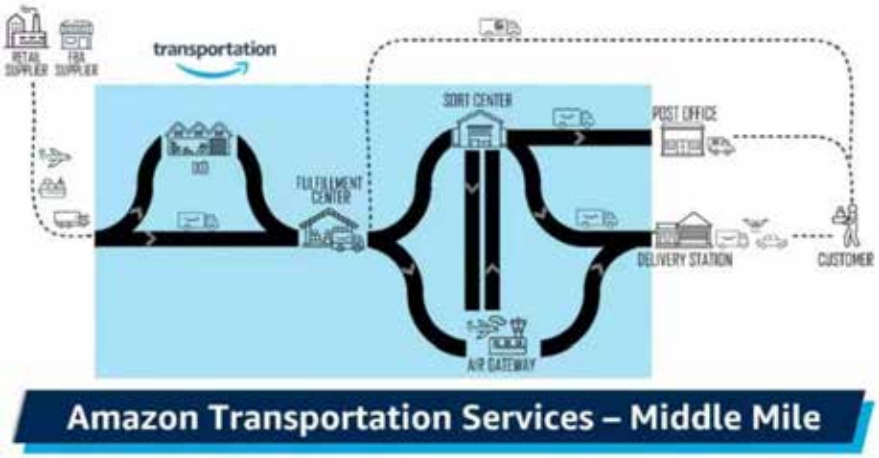
Figure 4.6: Commercial driver shortage projections, 2020-2030



Graph shows the number of needed drivers, in addition to the current workforce.

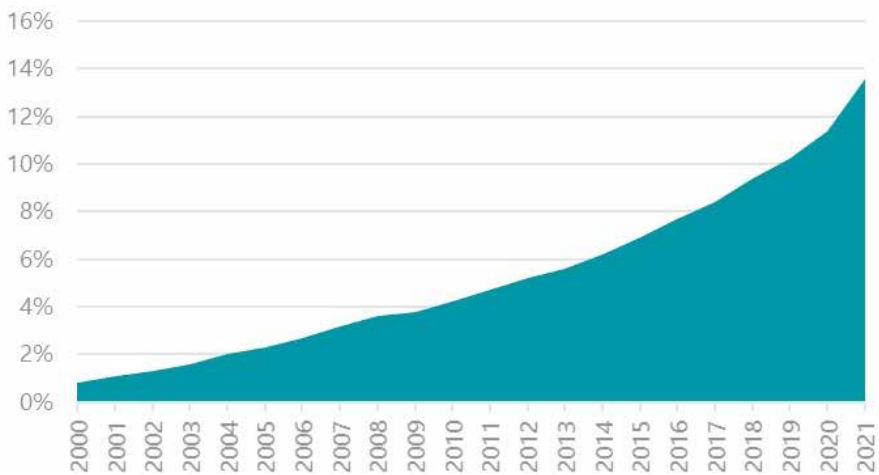
Source: American Trucking Associations

Figure 4.7: Amazon supply chain model



Source: Amazon DSM5

Figure 4.8: E-commerce percent of total retail, 2000-2021



Source: U.S. Department of Commerce

E-commerce is growing significantly and impacting market trends and freight movement, with even more rapid growth experienced over the last two years resulting from the COVID-19 pandemic. This trend is projected to continue in years to come.

This new model of buying and selling has changed the way retailers and consumers interact with each other as purchasing goods online typically means bypassing traditional brick-and-mortar stores and traveling directly from a warehouse or distribution center to consumers' homes, or vice versa when product returns are necessary. Some of this shift represents the last mile trip for consumer goods now being made by a delivery truck rather than store-to-home trips by consumers.

Online sales of most products, from clothing to perishable items like groceries, are experiencing growth. This means an increased emphasis on the reliability and timeliness of truck transportation, changing truck delivery patterns, an increase in shorter trips, and a greater strain on local infrastructure. Other related impacts include an increased demand for air cargo and efficient terminals and changing land use and development patterns such as locating inventory and distribution closer to population centers.

Population and **economic** growth are contributing to increased freight movement. The population is also becoming more concentrated in urban areas while most freight corridors and production areas are in rural areas. These trends will impact **land use** considerations.

The completed expansion of the **Panama Canal** allows larger ships to move through which has been beneficial to Iowa. More opportunities exist, but taking advantage depends heavily on the reliability of the inland waterway system.

4.3 Network efficiency

Key issues: multimodal, intermodal, safety, regulations, and automation

There is a continuous need for **multimodal** coordination and **intermodal** connections to address freight demand. The terms "multimodal" and "intermodal" are often used interchangeably, yet they can have entirely different meanings. Multimodal focuses on the different modal options that could be utilized to move goods from one place to another. Intermodal focuses on how two or more of these modes can connect at what typically amounts to a transfer point, such as an intermodal container facility or transload location. To put it another way, multimodal options provide the links in the transportation system, while intermodal connections are the nodes.

These connections or facilities are an integral part of the freight transportation network. Each provides the opportunity for seamless transitions from one mode to another, allowing shippers to take advantage of the cost, speed, and capabilities of more than one mode. Limiting these connections increases the costs of Iowa export goods, inhibits economic development, and impairs the state's position in both foreign and domestic markets.

There continues to be an increase in international trade resulting in more containerization and containerized freight, creating opportunities for Iowa industries. Containerization specifically uses intermodal containers that fit on the axles or decks of multiple modes and can be transferred from one to another relatively quickly. Transport using intermodal containers works for many different commodities and minimizes the handling of the freight itself, which improves security and reduces loss.

However, **container imbalance** and container shortages create challenges. Iowa produces more products shipped via container than it receives causing a large imbalance of containers. This creates added transportation costs due to the need to haul empty containers into Iowa, that is, when they can be obtained. Demand for containers has increased significantly making it more economical for international shipping companies to transport empty containers back overseas and to other production areas rather than waiting for the containers to be refilled in the U.S.


Intermodal container transfer facility in Iowa. (Source: Iowa DOT)

Safety is always a top priority for freight industries across all modes of transportation, but with increased freight movement comes increased safety risks. As freight traffic has increased, the number of related crashes and fatalities has also increased. See Chapter 2, System inventory and performance (Section 2.3, Inventory and performance by mode) for Iowa freight-related safety statistics.

Highway safety is important as truck traffic increases, creating more opportunities for freight vs. passenger incidents. Additionally, truck parking is insufficient throughout most of the country leading to trucks parking at locations that are unsafe to both the driver and the traveling public. Driver performance has been a greater focus as companies try address driver fatigue. New hours of service regulations have also been implemented in an attempt to mitigate this issue. See Section 4.5, Considerations specific to modes, for more on related trucking issues.

Rail crossing safety at grade crossings is also a major focus. Collisions at highway-railroad grade crossings have decreased but remain a priority in states like Iowa. The Iowa DOT regularly updates the Highway-Railroad Grade Crossing Safety Action Plan, which focuses on crossings with multiple crashes or those that are "at risk" and identifies specific solutions, including closure and consolidation of at-grade crossings. It also focuses attention on trespasser hotspots.

Another aspect of safety relates to the transport of hazardous materials, or hazmat, which has increased in the U.S. Without proper classification, packaging, and transport, these materials pose a threat to the labor force, public, and environment. Human performance errors and operational issues remain concerns, but related incidents have decreased overall thanks to advances in technology and more stringent safety standards.

Iowa Highway Helper vehicle and Motor Vehicle Enforcement vehicle. (Source: Iowa DOT)

Regulatory Barriers Commonly Cited by Industry

Truck size and weight standards are a blend of federal and state regulations controlling the maximum gross vehicle weights and axle loads on the highway system. Federal law controls loads on the Interstate Highway System and state law controls loads on non-Interstate highways, leading to inconsistent regulations by state.

Hours of service (HOS) requirements refer to the maximum amount of time commercial drivers are permitted to be on duty, including driving time, and specifies number and length of rest periods to help ensure that drivers stay awake and alert.

An **Electronic logging device (ELD)** is technology that automatically records a driver's driving time and other HOS data. The ELD mandate applies to most motor carriers and drivers required to keep records of duty status.

Positive Train Control (PTC) is a system that uses global positioning systems and radio communication to prevent collisions or derailments caused by human error. Congress mandated in 2008 that PTC be adopted and implemented on Class I railroad main lines over which certain hazmat are transported and lines with regularly scheduled passenger rail.

The **Jones Act** is a federal law that regulates maritime commerce, requiring that goods shipped between U.S. ports must be transported on ships that are built, owned, and operated by Americans or permanent residents.

To ensure the safe movement of freight, a wide array of **regulations** at all levels (federal, state, and local) has been put into place. These regulations affect, firsthand, those doing business in Iowa. A better understanding of these regulations and their impacts will assist the state in recognizing ways to better coordinate with those agencies responsible for the various elements that make up freight regulations.

Better coordination, education, and streamlining of freight-related regulations is needed. Although regulations (e.g., safety, environmental, economic, etc.) are developed with good intentions, some can be impediments to freight efficiency. Barriers commonly cited by the industry include truck size and weight limitations, routing restrictions, HOS rules, fuel and emissions standards, and customs and border security rules.

One of the primary obstacles is the fragmented nature of federal and state authorities. Regulations and policies are developed across modes, sectors, and jurisdictions typically leading to misalignment. Insufficient coordination between these authorities contributes to inefficiencies and bottlenecks, and efforts should be made to streamline and align freight-related regulations and minimize unintended consequences to shippers, industries, etc.

Many shippers in Iowa are currently encountering regulatory obstacles that hinder the movement of freight among all modes of transportation. If not addressed, these issues may lead to delayed freight movement, increased congestion, a decrease in safe travel operations, and an unwanted drag on the economy.

Advances in **automation** and automated technologies relating to information and communications (e.g., blockchain and internet of things), robotics, artificial intelligence, sensors, batteries, and alternative delivery methods (e.g., crowdsourcing, personal delivery devices, drones, 3D printing, and teleoperation) are allowing for the development of autonomous vehicles and automated rail yards, marine terminals, and warehouses. These developments have the potential to transform freight-related industries by increasing safety and efficiency and altering supply chains. Industries are integrating automated technologies as a response to consumer expectations, increased competition, and rising labor costs.

Example of Amazon autonomous delivery vehicle.
(Source: Waterloo-Cedar Falls Courier)

Blockchain is a series of nodes where all involved parties have identical copies of every transaction ever made, updated in real time. This can help overcome existing issues in intra-business information sharing, assist with supply chain finance, and improve operations management.

Internet of Things refers to the network of physical objects that are embedded with sensors, software, and other technologies for the purpose of connecting and exchanging data with other devices via the internet. Freight stakeholders can utilize the real-time information produced by this technology to improve efficiencies, pricing, and inventory strategies.

Artificial intelligence is technology that allows for machines or programs to learn from experience, adjust to new inputs, and perform tasks. Firms are looking to apply advances in artificial intelligence and machine learning to improve the performance of freight movement and delivery networks.

3D printing, also known as additive manufacturing, uses Computer Aided Drafting to create 3D models that are ultimately sent to a 3D printer to be created. Material categories include plastics, metal (powder bed, powder feed, or wire extrusion), ceramics, food, stem cells, and others. Industrial-scale 3D printing could alter supply chains as businesses wouldn't need to ship inventory but rather the raw materials to be used to print inventory.

Teleoperation, also known as remote operation, uses computer and telecommunication systems to allow for the operation of freight modes. For trucking, this could support automation activities for primary operation or a fallback measure without a person in the vehicle.

4.4 Energy and environmental

Key issues: biorenewables

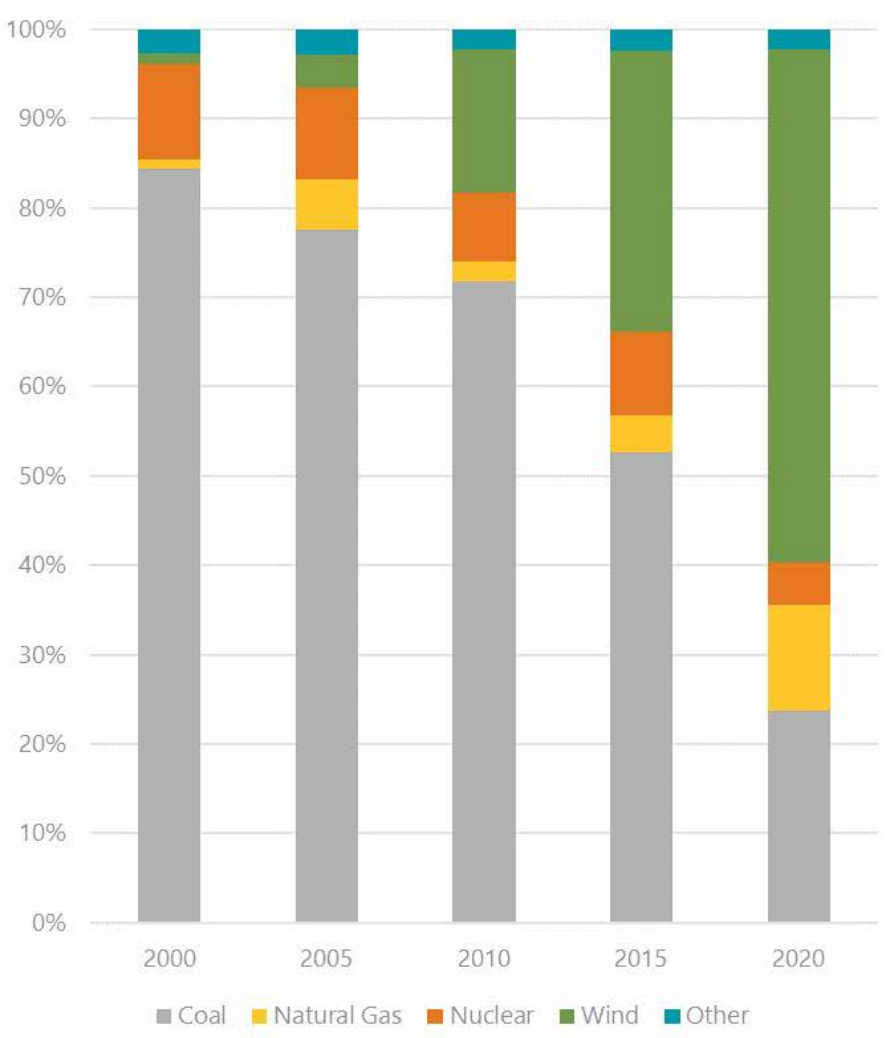
The **biorenewable** chemical industry is undergoing rapid transformation and growth. Due to Iowa's abundance of feedstock, technical workforce, and biorenewable and plant genetic research, the state has an opportunity to be a major player in this growth industry.

Energy production in the United States has grown significantly with one of the largest growing sectors being hydraulic fracturing of rock or "fracking." This process allows for the recovery of deep sources of gas and petroleum products and has resulted in large amounts of gas and oil being extracted and transported elsewhere in the U.S. and abroad. The development of wind farms has also changed energy production and consumption in the U.S. Most of Iowa's electricity is now generated by wind power, and the construction and maintenance of the wind farms means wind turbine components are regularly being moved on the freight network.

Alternative transportation **fuels** are being widely utilized, mainly ethanol and biodiesel in Iowa. Natural gas comes in the form of either compressed natural gas (CNG) or liquefied natural gas (LNG), both of which are being explored and adopted by transportation industries. Other fuel sources such as propane and renewable diesel are also being explored. Each of these alternative fuel sources produce lower emissions than gas/diesel traditionally used by freight vehicles. Adopting these would contribute to reduced air pollution.

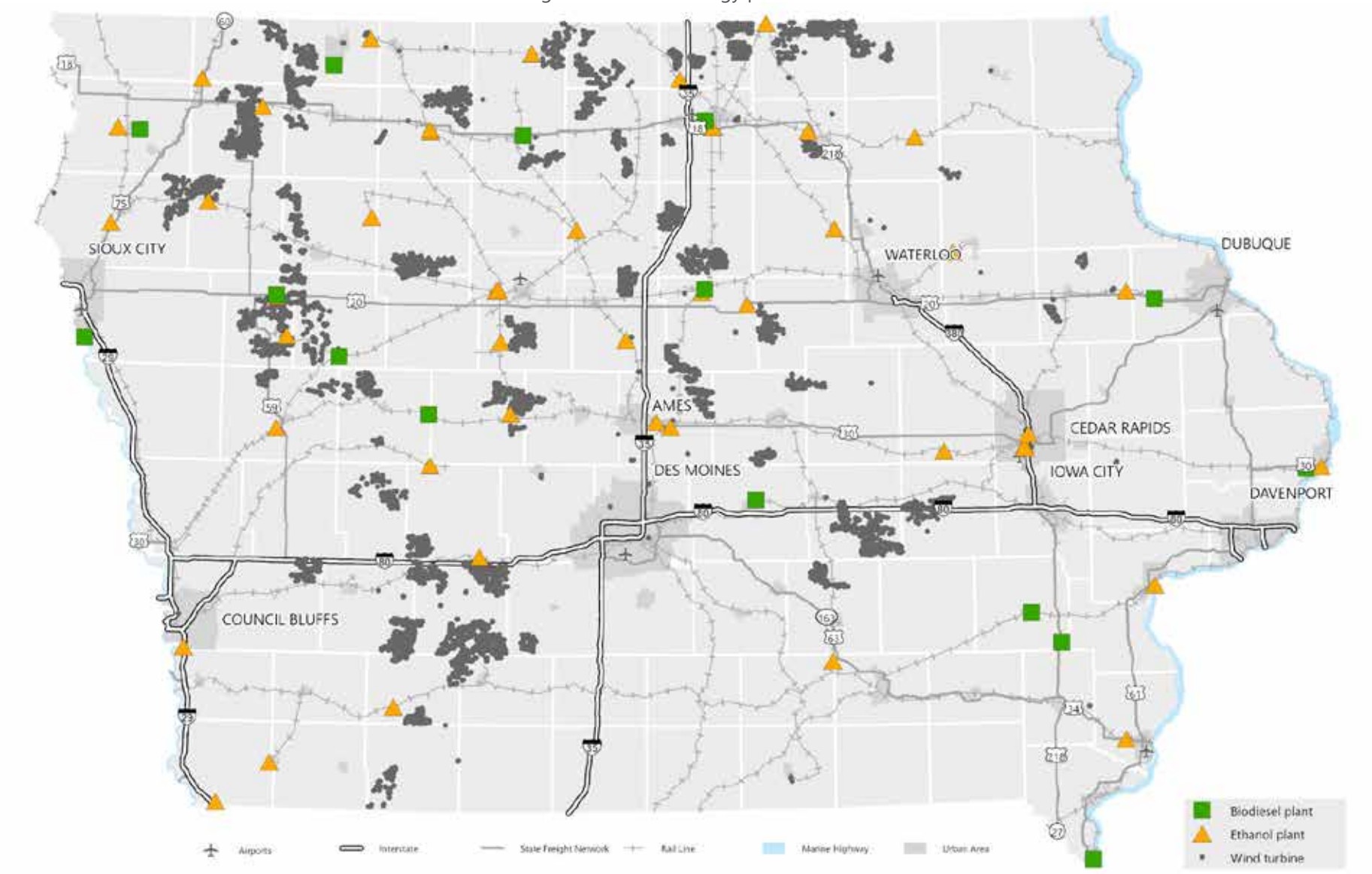
Coal use is declining significantly with the increased use of renewable energy (e.g., wind). This has impacted rail and barge tonnages as coal once represented a significant portion of tonnages being moved by each mode.

Figure 4.9: Iowa utility generation by source, 2000-2020



Source: U.S. Energy Information Administration

Figure 4.10: Iowa energy production



Source: Iowa Renewable Fuels Association and U.S. Wind Turbine Database

4.5 Considerations specific to modes

Aviation

Developing **aviation trends** related to the economy, new technologies, and security may impact the industry. Most notable is the emergence of unmanned aircraft systems, or drones, for different applications.

Air cargo has been variable over the last decade, but future cargo totals could be significantly impacted by increases in e-commerce. UPS recently expanded a facility at the Eastern Iowa Airport and FedEx recently built a new facility at the Des Moines International Airport (DSM). Additionally, Amazon Cargo established a new air gateway at DSM which is expected to change the air freight landscape in Iowa and nationally.

Inaugural Amazon Air aircraft being unloaded and reloaded at Des Moines International Airport on Tuesday, November 9, 2021. (Sources: Des Moines Register and Des Moines International Airport)

Highway

Key issues: truck cargo, oversize/overweight (OSOW), first mile/last mile, highway design, trucking issues, and human trafficking

Trucks are the dominant mode for freight movement in the state as **truck cargo** and truck traffic continue to steadily increase at a rate faster than other modes. Increased truck traffic leads to more congestion, which leads to lost economic productivity and wasted fuel. See Chapter 2, System inventory and performance (Section 2.3, Inventory and performance by mode) for tonnage figures.

Iowa's highway network also handles increasing numbers and evolving types of **OSOW** loads due primarily to geography and affordable permits. Some of the major OSOW loads are products of the expanded wind energy sector in the state. Wind turbine components are transported throughout Iowa for wind farm construction and maintenance.

Commodity movement by truck (including OSOW) is heavily concentrated on the Primary Highway System, more specifically the IMFN, which includes much of the **Interstate Highway System**. The IMFN represents the most critical freight corridors in the state based on overall utilization and the safety, efficiency, reliability, and resilience of these routes is critical to the freight industry. Targeted investment in operational and physical improvements on this network should be prioritized.

First mile/last mile connections from the IMFN to freight generating facilities and final customers should also be considered. Distribution centers and other intermodal/multimodal facilities are even more important with the continuous growth of e-commerce, manufacturing, and agricultural production.

Figure 4.11: Mileage and Vehicle Miles Traveled, 2019

Source: Iowa DOT

Rural infrastructure serves as the first mile/last mile connections for the agricultural industry. Rural highways and bridges are in poor condition, and these routes are critical for getting inputs to the field and outputs to market. Farmers are now using larger, heavier field equipment and shipping more commodities via truck directly to processors or export terminals increasing the importance of rural routes. As changing urban-rural dynamics continue, more population and resources are in urban areas while more production areas and actual freight corridors are in rural areas, further exasperating rural infrastructure funding issues.

Developing freight-specific **highway design** considerations will help protect and enhance the IMFN and related first mile/last mile connections. Investments targeted for facilities that handle significant freight traffic, including OSOW vehicles, should incorporate designs compatible with these types of freight movements, and avoid improvements that unintentionally create new obstructions to freight movement in urban and rural areas. See Chapter 5, Action plan (Section 5.1, Implementation strategies), for Iowa DOT freight design considerations.

In addition to rising truck traffic levels, **trucking Issues** such as commercial vehicle driver shortages and retention (see Section 4.2, Supply chain and economics), truck parking, and HOS (see Section 4.3, Network efficiency) continue to challenge the industry.

A freight truck parking study was conducted as part of the Iowa Rest Area Management Plan to assess the current system's needs for truck parking. Iowa's central geographic location and abundance of transportation options result in significant movement of freight throughout the state. Recent studies conducted by Iowa DOT document truck parking and OSOW parking availability as one of the top freight mobility issues in the state, particularly along cross-state Interstate routes (I-29, I-35 and I-80). See Chapter 5, Action plan (Section 5.1, Implementation strategies), for Iowa's latest commercial motor vehicle parking facilities assessment.

Another significant issue related to the trucking industry is **human trafficking.** Traffickers typically target professions deemed "transient in nature" as consumers and regularly travel across multiple states to places such as oil and gas fields, truck stops, hotels along highways, etc. The trucking industry is critical in helping to spot these types of activities. Law enforcement continues to reach out to the trucking industry and others for partnering opportunities in the fight against human trafficking.

Automated trucking concepts continue to be developed and tested, including truck platooning or automated following platooning (where the lead truck operates normally with driver assistance technology and the second truck operates at a higher level of automation. These emerging technologies have the potential to increase safety and efficiencies as well as hours of service (e.g., labor) and parking challenges by allowing drivers to rest in the truck while it's in operation and be on roadways for longer operations.

Pipeline

Iowa's **pipeline network** supplies commodities such as anhydrous ammonia, crude oil, liquefied petroleum gas, and natural gas for residential and industrial consumption. The importance of this network to the state's economy should continue to be considered moving forward.

Iowa ranks fourth in the nation in consumption of liquefied gas in the form of propane, due primarily to the use in drying corn after harvest and heating one in eight households. Iowa is also the only non-crude oil-producing state among the top five energy-consuming states on a per capita basis, mainly due to the state's relatively small population and its energy-intensive industrial sector (U.S. Energy Information Administration). Limitations in Iowa are typically related to propane terminals and storage areas during high-demand seasons.

The construction of carbon capture pipelines has been proposed in Iowa to move carbon dioxide to be sequestered underground, potentially cutting greenhouse gas emissions from ethanol, fertilizer, and other industrial ag plants.

Wind turbine components on a train in Iowa. (Source: Iowa DOT)

Railroad

Key issues: rail network, rail cargo

Over the past 30 years, Iowa's **rail network** has steadily decreased in miles but is being operated by roughly the same number of railroad companies. Railroad service continues to evolve as these companies seek to lower transportation costs and improve efficiencies. Growing demand and changes to the industry have led to larger rail cars and longer trains. Additional improvements are necessary to meet capacity needs as nearly 20 percent of Iowa's rail miles are not able to carry the industry-standard 286,000-pound cars.

Although today's rail network consists of less mileage, **rail cargo** handled annually has slowly increased with the exception of a few variable years. Railroads typically move bulk commodities and containerized freight to, from, and through the state. Top commodities originating and terminating in Iowa include farm, food, and chemical products with other cargo steadily becoming a larger portion of overall tonnage, such as intermodal containers. Coal is the primary commodity being shipped to Iowa, but tonnages continue to decrease annually as utility generation has transitioned to other energy sources. See Chapter 2, System inventory and performance (Section 2.3, Inventory and performance by mode) for tonnage figures.

A proposed merger between Canadian Pacific and Kansas City Southern has the potential to significantly impact both Iowa's rail network and overall rail cargo.

Waterway

Key issues: lock and dams, river cargo

The inland waterway system is critical to the U.S. continuing its competitive advantage over the rest of the world. Overall barge traffic in the U.S. and the Upper Midwest has increased over time, as have delays and inefficiencies primarily attributable to lagging infrastructure maintenance and improvements. **Lock and dam** infrastructure throughout the country has significantly surpassed the originally intended design life, resulting in infrastructure deterioration and poor performance of the system.

Contributing to the continual deterioration is the chronic underfunding of the inland waterway system. Operations and maintenance needs are significantly underfunded, rehabilitation projects are overdue, and small- and large-scale improvements to the system are behind due to lack of construction funds.

Aging infrastructure has led to significant delays for barge traffic and more unplanned closures to make necessary repairs. Lack of capacity at most Upper Mississippi River locks intensifies the negative impact to efficiency and reliability. Additional delays can also occur on river segments, with or without lock and dam infrastructure, during flooding or low water periods. Time lost due to delays and closures are costly to shippers and reliability is an important consideration in modal choice. The continued deterioration of this infrastructure inhibits the ability to fully realize reliability and environmental benefits (i.e., lower emissions compared to other surface transportation modes) of moving more cargo via barges on the inland waterways.

Failure of a single lock could be catastrophic for the region and have a crippling effect on the movement of bulk products.

Sufficient investment and completion of already authorized projects on the inland waterways will potentially open additional markets and commodity types to utilize the inland waterways.

Thanks to the efforts of the U.S. Army Corps of Engineers to keep the Upper Midwest locks functioning, **Mississippi River cargo** remains steady, primarily consisting of bulk materials. This includes grain going down the river to be exported and fertilizer, sand, and salt being brought up the river.

Missouri River cargo has declined but demand and momentum has picked up, especially on the lower river. A new terminal at Blencoe has increased accessibility to the river, and projections indicate increased barge traffic originating and terminating between Sioux City and Council Bluffs.

Table 4.1: Age of Upper Mississippi River locks bordering Iowa

Lock	Location	Year open	Age (years)
9	Harpers Ferry	1938	83
10	Guttenberg	1936	85
11	Dubuque	1937	84
12	Bellevue	1939	82
13	Clinton	1938	83
14	Le Claire	1922	99
14 (Aux)	Le Claire	1939	82
15 (Aux)	Rock Island (IL)	1934	87
15	Rock Island (IL)	1934	87
16	Muscatine	1937	84
17	New Boston (IL)	1939	82
18	Gladstone (IL)	1937	84
19	Keokuk	1957	64

Source: U.S. Army Corps of Engineers