

2. Understanding Iowa

How will Iowa be different in 2045?

What are some of the key changes we will face?

How will future economic development opportunities be addressed?

How will Iowa's transportation system be impacted?

To answer these types of questions, we must have an understanding of where we have been, where we are, and where we are heading. This chapter looks at many of the key demographic, economic, passenger transportation, and freight transportation trends that have impacted Iowa in the past, how they are affecting us today, and how they are projected to affect us in the future. An understanding of the characteristics that make Iowa unique will help us in facing our future and planning ahead to meet these challenges.

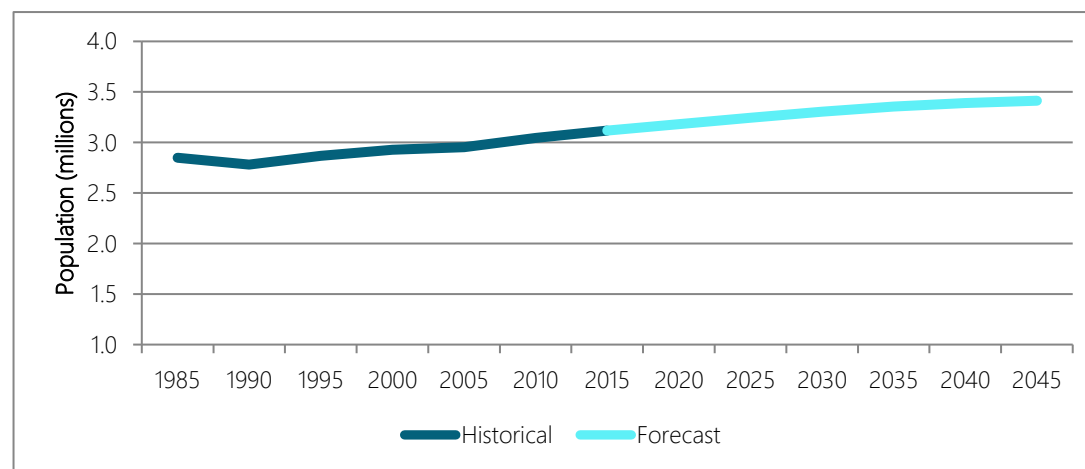
2.1 Demographic trends

Iowa's population is growing at a slow pace

Iowa's population has remained relatively stable since 1985, growing about 9.5 percent over the past 30 years. As of 2015, Iowa ranked 30th among all states when comparing total population. It is projected that Iowa's population will continue to increase at the same rate over the next three decades, growing from 3.12 million in 2015 to approximately 3.41 million in 2045 (see Figure 2.1).

Iowa's population growth from 2000 to 2010 was slower than the national growth rate, but was fairly consistent with the Midwest region (the Census Bureau defines this region as the states of Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota and Wisconsin). According to the 2010 Census, Iowa's population grew 4.1 percent from 2000 to 2010, compared to 3.9 percent in the Midwest region and 9.7 percent nationally. Since the 2010 decennial census, Iowa's population has maintained a similar growth rate, with 2015 U.S. Census Bureau population estimates showing a 2.5 percent increase from 2010-2015. This exceeds growth in the Midwest region overall, which is 1.5 percent since 2010, but is less than the growth seen across the nation as a whole, which is 4.1 percent since 2010.

Figure 2.1: Iowa population, 1980-2045



Sources: U.S. Census Bureau, Woods and Poole Economics Inc.

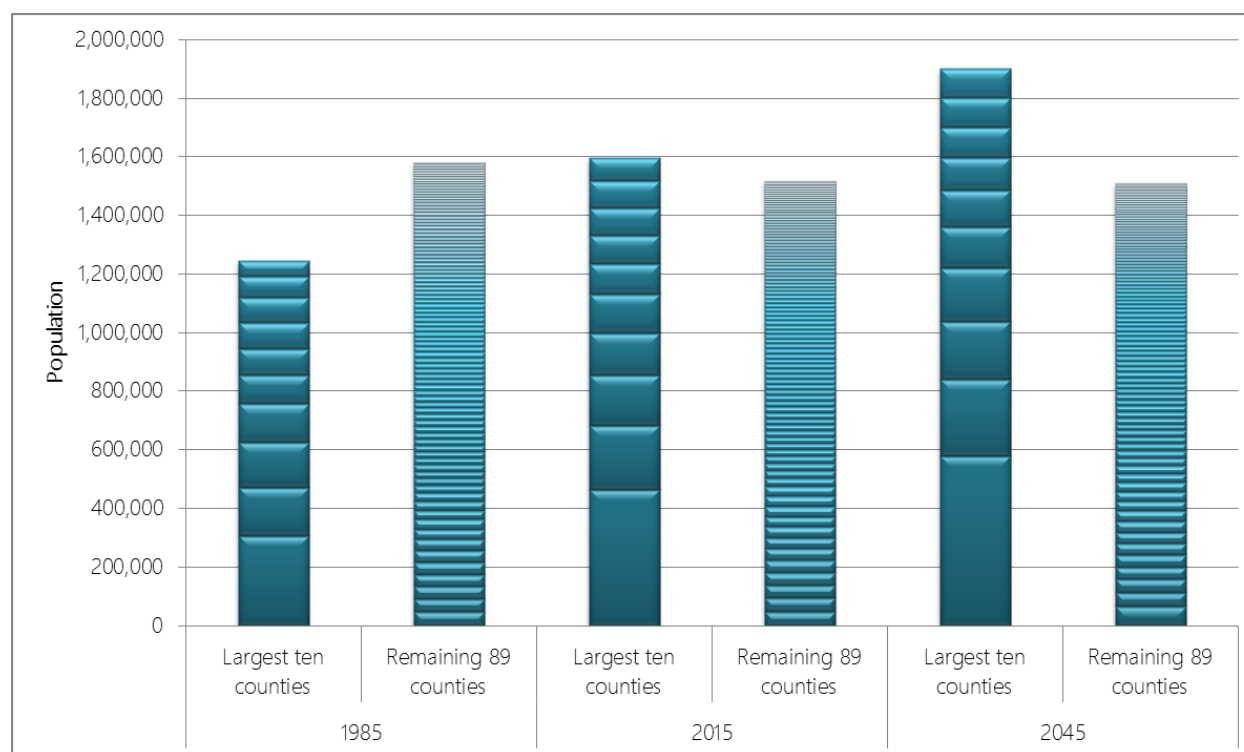
Figure 2.2: County population change, 2000-2015



Iowa's population is urbanizing

As mentioned previously, Iowa's population is continuing to migrate toward the state's nine metropolitan areas, which have an urban core of at least 50,000 people. Historically, the majority of Iowa's population has resided in nonmetropolitan areas, yet most of the population growth in recent decades has been in counties that contain or are adjacent to metropolitan areas. This trend is reflected in data comparing the population for Iowa's ten most populous counties with the remaining 89 counties. In 1985, the ten largest counties accounted for 44 percent of Iowa's population, with the remaining 89 counties accounting for 56 percent. Projections for 2045 suggest a reversal of that trend, with the ten largest counties accounting for 56 percent of the population, and the remaining counties of the state accounting for 44 percent of the population (see Figure 2.3). Although Iowa's population as a whole is growing at a slow pace, the shift in population from rural to urban communities has impacts on the transportation system. Increased population in metropolitan areas can create urban congestion and capacity issues, while local jurisdictions with decreasing population will be facing less funding for deteriorating roadways.

Figure 2.3: Comparison of Iowa's estimated county populations, 1985, 2015, and 2045



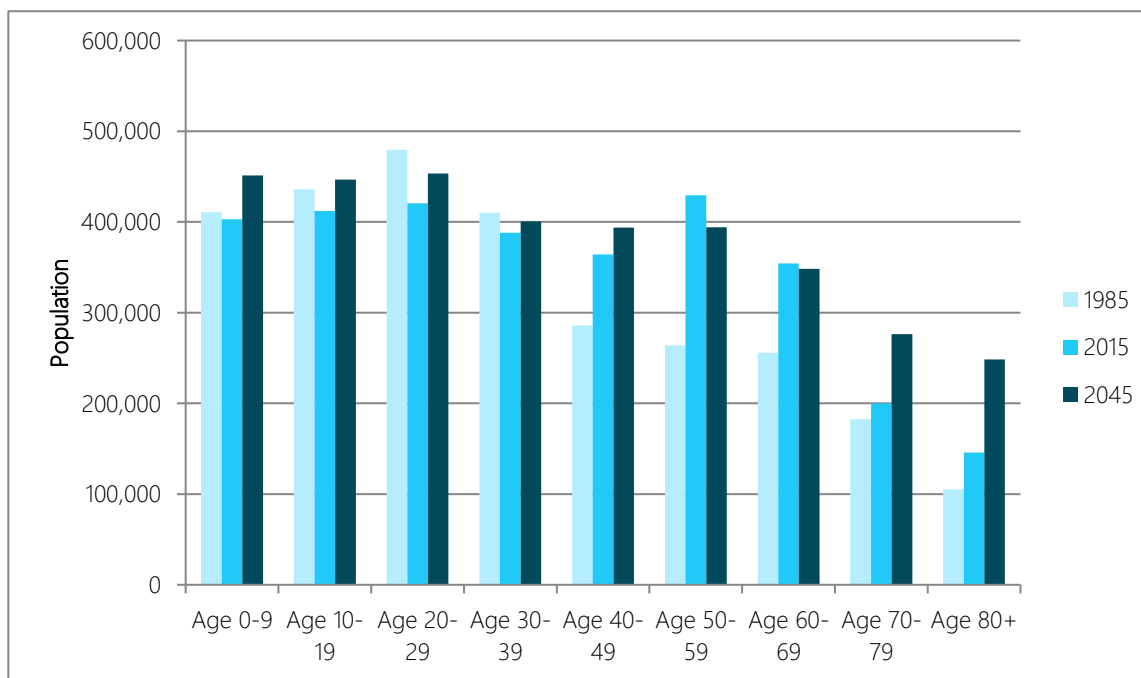
Source: Woods and Poole Economics Inc.

Iowa's population is undergoing generational shifts

Iowa's median age has increased from 30 years old in 1980 to 38 years old in 2015, and 15.3 percent of Iowa's population is older than the age of 65 – the eighth-highest percent in the United States. This number is expected to continue to grow as more of the “Baby Boomer” generation reaches this milestone in the coming years. At the same time, 40 percent of the population forecasted to live in Iowa in 2045 will be less than 30 years old – in other words, this segment of the population has not yet been born. Figure 2.4 shows Iowa's estimated population by age for 1985, 2015, and 2045.

Millennials (born between 1981 and 2000) currently account for the majority of Iowa's population, followed by Baby Boomers (born between 1946 and 1965). Planning for the entire population, which includes these and other distinct generational groups, requires a holistic approach. The importance of the generational change is significant given the shift in how younger generations work, where they live, and the mode of travel they prefer. Based on research and surveys conducted in NCHRP Project 20-24(89), *Role and Value of Transportation for U.S. Industries and Sectors*, it is anticipated that by 2020 nearly half of the US workforce (46 percent) will be Millennials. According to a 2012 American Public Transportation Association (APTA) report, Millennials are attracted to communities with a multitude of transportation choices. Millennials are also more likely to prefer to live in cities where a car is not needed.

Figure 2.4: Historical and forecasted population by age for Iowa



Source: Woods and Poole Economics Inc.

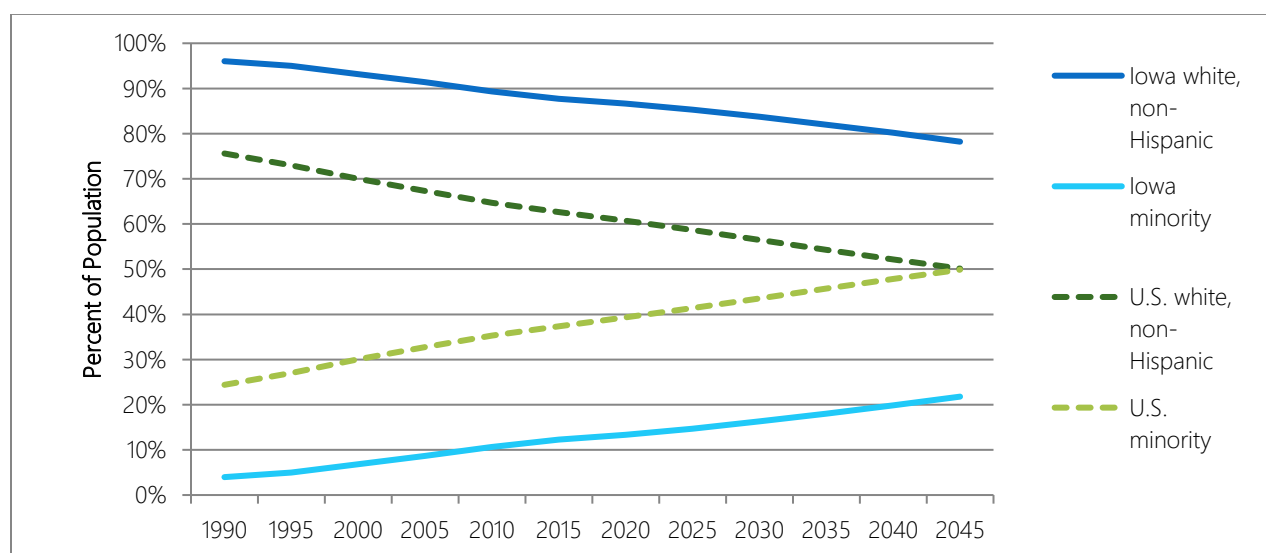
Iowa's older generations have specific transportation needs that differ from younger generations. As Iowans continue to drive and live independently longer, improving the roadway and driving environment and expanding transportation options are necessary to help meet the needs of older citizens. Some examples of ways to enhance roadway safety and transportation for all ages, particularly older citizens, include:

- Larger print on signs
- Safer turning movements at intersections
- More visible pavement markings
- Better roadway lighting
- Well-connected pedestrian facilities
- Improved transit options and coordination between transit providers and human service agencies

Iowa's minority population continues to grow

Iowa continues to become more diverse, with an increasing racial and ethnic minority population. Minorities¹ accounted for 12 percent of Iowa's 2015 population, compared to less than 4 percent in 1990. By 2045, racial and ethnic minorities in Iowa are projected to account for almost 22 percent of the state's total population. However, this is far less diversity than in the nation as a whole. Figure 2.5 shows the actual and forecasted minority population in the United States and Iowa from 1990 to 2045. As shown, the minority population of the U.S. is projected to equal the white, non-Hispanic population by 2045.

Figure 2.5: United States and Iowa white, non-Hispanic and minority population, 1990-2045



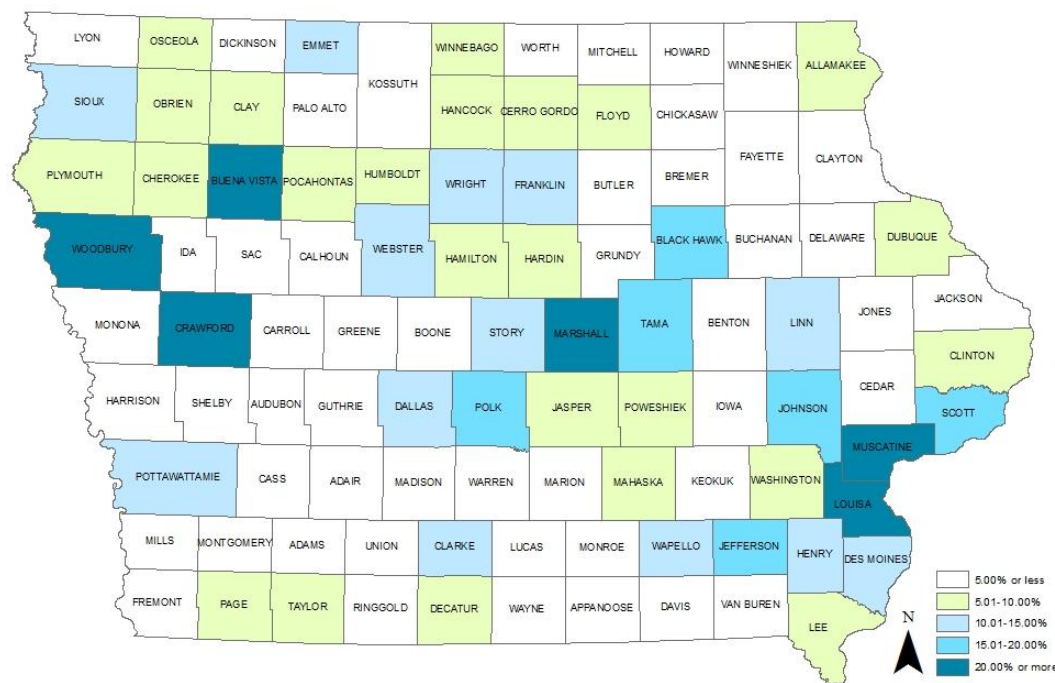
Source: Woods and Poole Economics, Inc.

While most of the minority population in Iowa resides in the state's most populated counties, some of the areas with the highest percentage of minority populations are located in counties outside metropolitan areas (see Figure 2.6). It is important to

¹ For the context of this Plan, "minority" is referencing the portion of the population that is non-white and/or Hispanic. In other words, this includes all population groups except white, non-Hispanic.

understand the transportation needs of the minority population in Iowa. Minority groups in Iowa are more likely to have a lower median household income and take a mode other than a personal automobile to work than nonminority populations. As Iowa's minority population increases, so will the need to accommodate persons with limited English proficiency (LEP) on the state's transportation system. Currently, approximately 3 percent of the state's population "speaks English less than 'very well'", while 92 percent of the state's population speaks only English. The language most often spoken in Iowa other than English is Spanish, and this will likely continue as the Hispanic population is projected to grow faster than any other population group over the next 30 years. It is important that Iowa's LEP population is accommodated on Iowa's multimodal transportation system in ways such as translating maps and transit schedules, and by offering interpretation services at public meetings.

Figure 2.6: Percent minority population by county, 2015



Source: Woods and Poole Economics Inc.

Implications for transportation – demographic trends

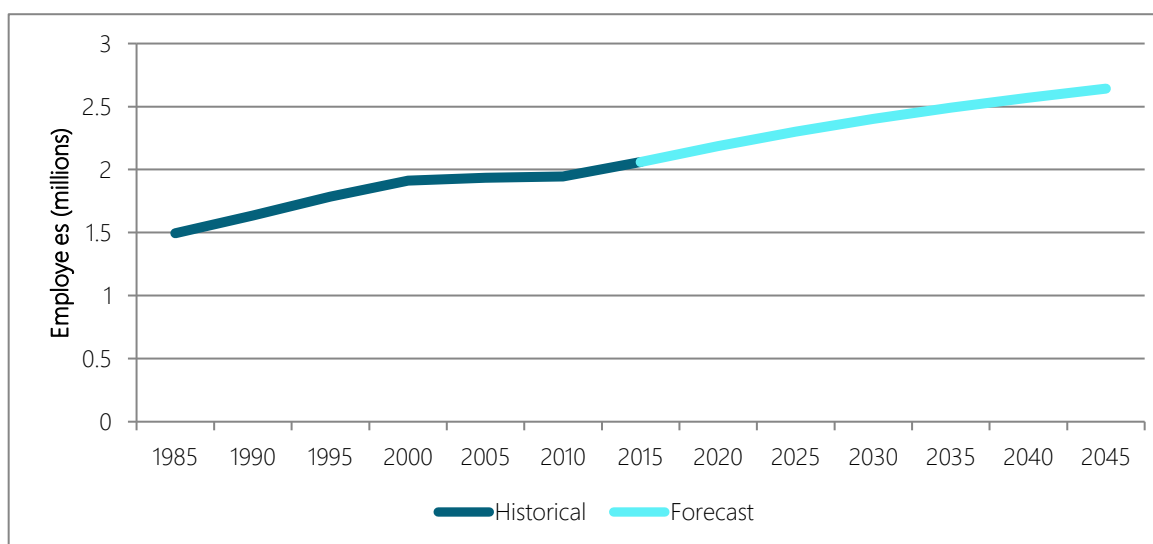
- Increased population in and around metropolitan areas may create congestion and capacity issues.
- Local jurisdictions with decreasing population will experience additional strain on already tight road budgets.
- Improving the roadway and driving environment and expanding transportation options are necessary to help meet the mobility needs of older residents.
- Transportation planning will need to account for varied work and life preferences across generations and consider how future generations will live, work, and travel.
- It is important that all Iowans, including minority, low-income, and disabled populations, have access to employment and services in both metropolitan and nonmetropolitan areas.

2.2 Economic trends

Total employment in Iowa is expected to increase slowly

In the past 30 years, total employment in Iowa has increased slowly, growing an average of 1.2 percent per year from 1985 to 2015. Iowa's employment is expected to continue steady growth, increasing by another 28 percent between 2015 and 2045. Figure 2.7 charts the actual and projected total employment in Iowa from 1985-2045.

Figure 2.7: Iowa employment, 1985-2045

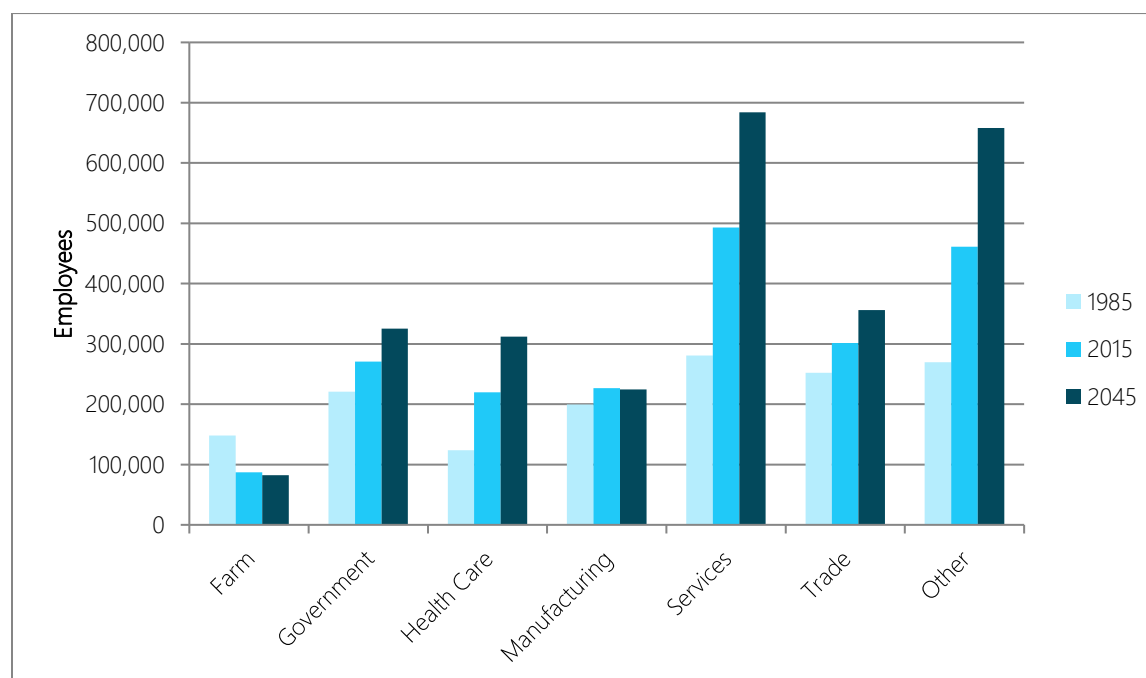


Source: Woods and Poole Economics Inc.

Iowa's traditional employment sectors have changed

Traditionally, farming and manufacturing have been two of the primary employment sectors in Iowa. Technological advancements and economic diversification have changed this in recent years. Since 1985, the farm sector has decreased by over 60,000 jobs, which represents a decline of 40 percent in total farm employment in Iowa. This trend is projected to continue, though flatten out, with this sector losing an additional 4,600 jobs through 2045. The number of jobs in the service sector (professional, educational, administrative, arts, etc.) is expected to grow the most over the next 30 years. Currently, there are 493,000 service jobs, which are forecasted to grow to almost 684,000 jobs in 2045. The largest growth in the "other" category shown on Figure 2.8 is in the finance and insurance category, which is expected to add over 65,000 jobs between 2015 and 2045.

Figure 2.8: Iowa employment, 1985-2045



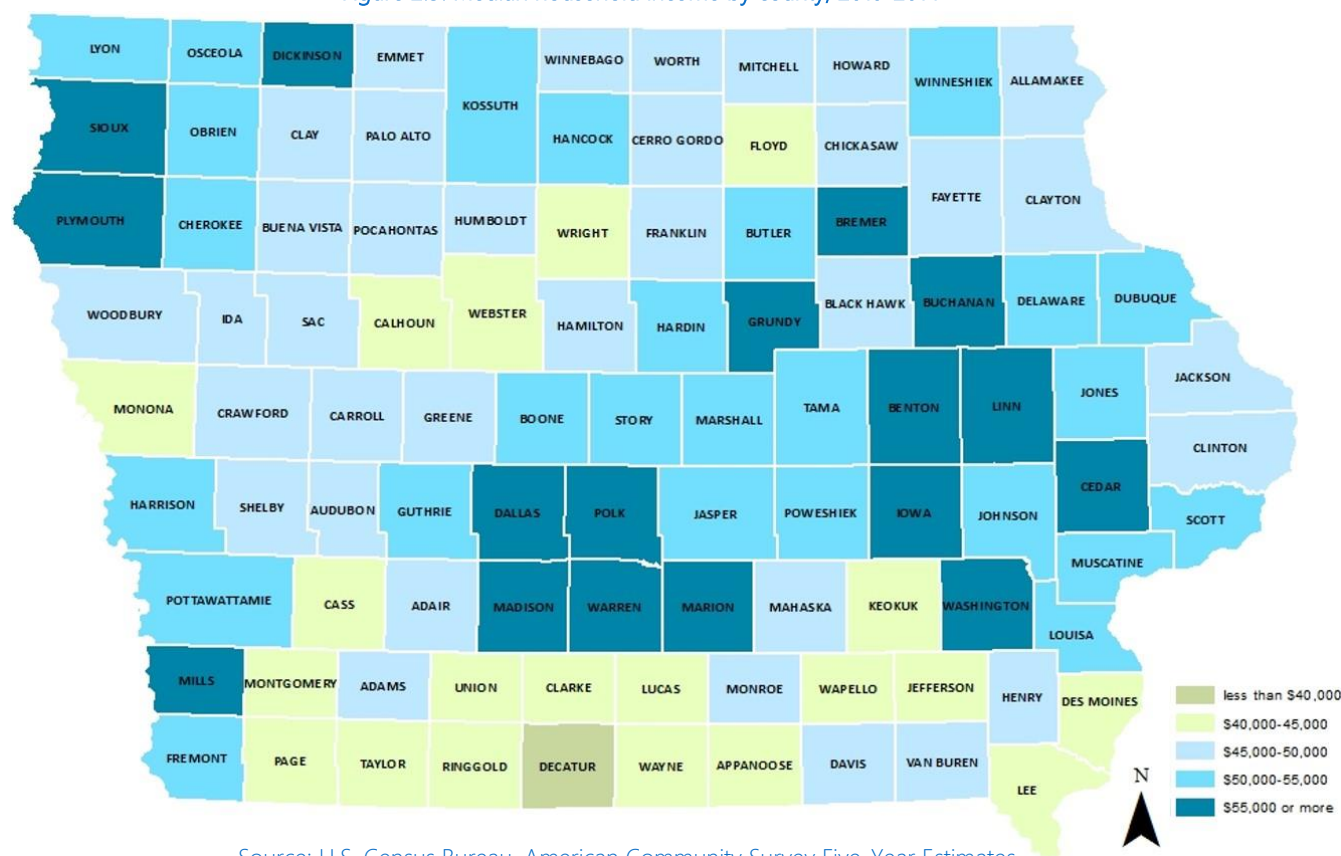
Source: Woods and Poole Economics Inc.

Iowa's per capita personal income and median household income are increasing but remain below the national average

Per capita personal income – which includes total wages and salaries, transfer payments, dividends, interest, and rental income; divided by the total population – is used as a measure of the wealth of an area's population, as well as an indicator of the economic health of that region. According to data from the Bureau of Economic Analysis, Iowa's per capita personal income has grown 15.9 percent from 2010 to 2015, compared to 18.1 percent in the United States. While Iowa's per capita personal income is currently 94 percent of the national average, this reflects an improvement from 2000, when Iowans earned 90 percent of the national average.

Among Iowa's households, the median income is currently \$52,716, slightly less than the national average of \$53,482. In general, the counties with the highest median household income are typically in or within close proximity to the state's metropolitan areas. Figure 2.9 shows the 2010-2014 estimated median household income across Iowa's 99 counties.

Figure 2.9: Median household income by county, 2010-2014



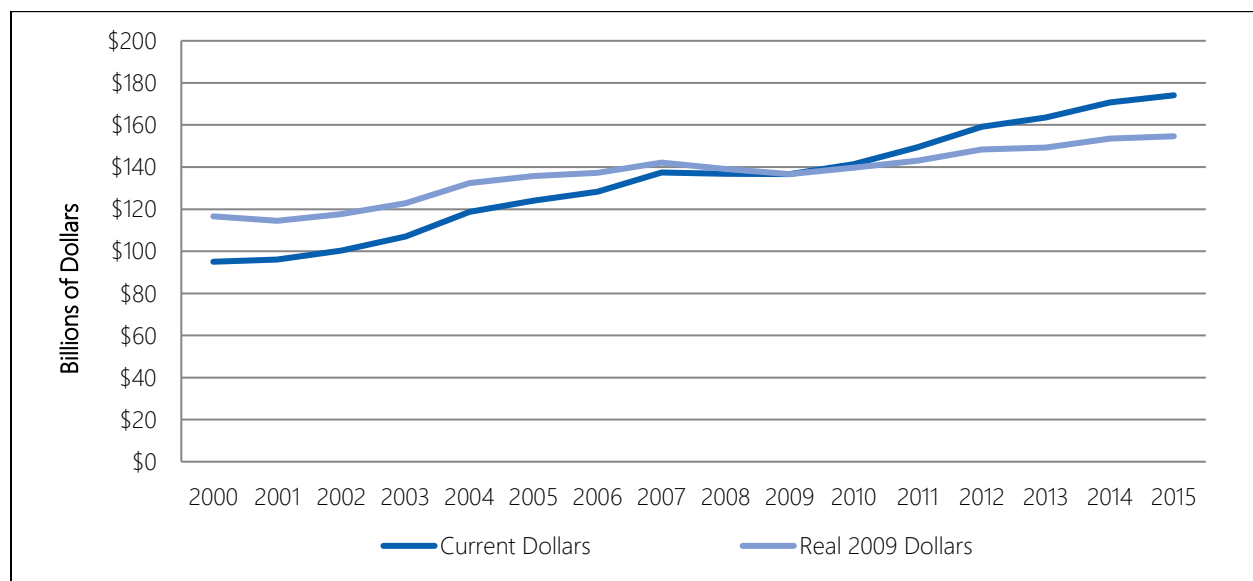
Source: U.S. Census Bureau, American Community Survey Five-Year Estimates

Iowa's gross domestic product is increasing

Gross domestic product (GDP) is the total market value of all goods and services produced in the economy. It is calculated in current dollars as well as real dollars. The word "real" refers to the adjusted total, which serves to remove the effects of inflation by using constant 2009 dollars. Since 2000, Iowa's current and real GDP have continued to grow, as shown in Figure 2.10.

In 2000, Iowa's GDP in current dollars equaled \$95 billion. By 2015, Iowa's current-dollar GDP had grown by 83 percent to \$174 billion and ranked 30th in the United States. Iowa's real GDP (in constant 2009 dollars) in 2015 totaled \$155 billion compared to \$117 billion in 2000, a 32.5 percent increase. During this same time period, the U.S. economy increased by 26.9 percent in real GDP. Growth in Iowa's GDP has been fueled by increases in several sectors, as shown in Table 2.1. In particular, agriculture and natural resources, professional and business services, construction, and mining have all increased by over 100 percent from 2000 to 2015.

Figure 2.10: Iowa gross domestic product, 2000-2015



Source: U.S. Bureau of Economic Analysis

Table 2.1: Iowa's gross domestic product by industry in 2015 and change from 2000 to 2015

	Growth in category from 2000-2015	Percent of Iowa's GDP in 2015
Finance, insurance, real estate, rental, and leasing	92.13%	21.36%
Manufacturing	56.21%	18.25%
Government	79.25%	11.39%
Educational services, health care, and social assistance	97.40%	7.71%
Professional and business services	131.16%	6.57%
Agriculture, forestry, fishing, and hunting	252.26%	5.91%
Wholesale trade	86.92%	5.84%
Retail trade	48.01%	5.63%
Construction	111.86%	4.46%
Transportation and warehousing	78.75%	3.36%
Arts, entertainment, recreation, accommodation, and food services	69.25%	2.91%
Information	59.46%	2.63%
Other services, except government	45.23%	2.14%
Utilities	42.47%	1.60%
Mining	107.57%	0.22%

Source: U.S. Bureau of Economic Analysis

Implications for transportation – economic trends

- Maintaining an accessible, reliable, and well-connected transportation system is an important factor in attracting and retaining employers.
- There will be changing demands on urban and rural transportation infrastructure to accommodate growing employment sectors.
- While the number of jobs tends to be increasing the most in service sectors, agriculture and other freight-intensive industries are experiencing large amounts of growth in terms of GDP. Both trends have significant implications with regard to commuting patterns and freight transportation.

2.3 Passenger trends

Iowans are traveling more, but passenger travel is not uniform across all modes of transportation

Since 1990, travel across all passenger modes (aviation, highway, passenger rail, and public transit) has increased 42 percent in Iowa (see Table 2.2) and 37.4² percent across the United States. However, growth in passenger travel over the past 25 years has not been uniform across modes. In terms of relative change in Iowa, passenger vehicle-miles traveled (VMT) and aviation enplanements grew the most between 1990 and 2000, passenger rail and public transit had the most significant increases in passenger travel between 2000 and 2010, and aviation enplanements increased the most between 2010 and 2015. Overall, passenger VMT experienced the largest relative increase between 1990 and 2015, growing by 42 percent. If trends from the past twenty-five years continue, all passenger travel modes will increase, but at varying rates. It should be noted that passenger travel trends are influenced in part by the cost of fuel, and fluctuations in these costs can create some uncertainty in forecasting future travel trends. Figure 2.11 shows the passenger transportation trends for each mode from 1990 to 2015.

Table 2.2: Iowa passenger transportation trends, 1990-2015

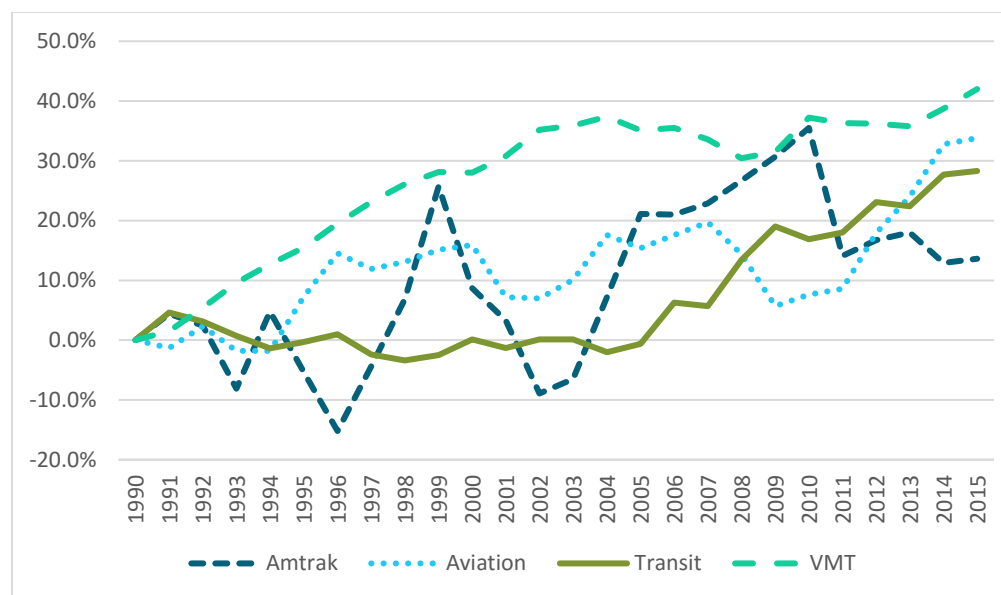
	1990	2000	2010	2015
Amtrak rides	50,719	55,146	68,744	57,611
Aviation enplanements	1,363,840	1,581,217	1,468,158	1,824,963
Passenger VMT*	20,418,000,000	26,128,000,000	28,004,000,000	28,986,000,000
Public transit	22,417,065	22,449,367	26,208,453	28,768,539

*Passenger VMT includes passenger cars, light trucks, vans, SUVs, motorcycles, and buses over all road systems

Source: Iowa DOT

² 2015 numbers have not been finalized for U.S. passenger VMT.

Figure 2.11: Iowa passenger travel trends by mode, 1990-2015



Source: Iowa DOT

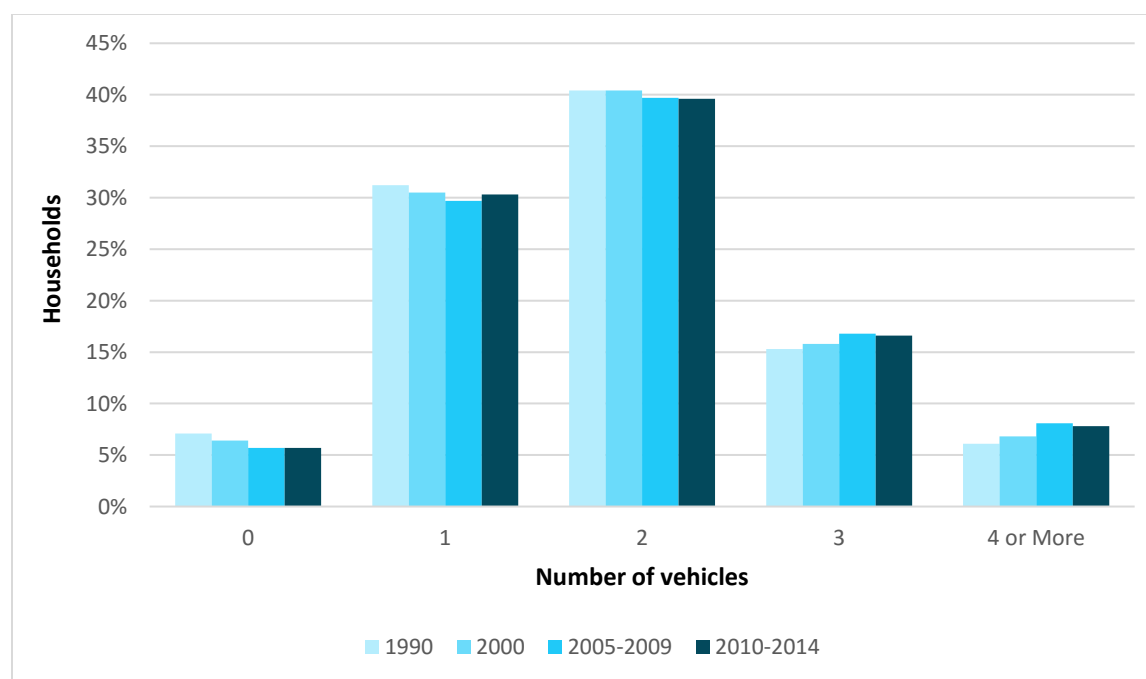
While aviation enplanements in Iowa grew 33.8 percent between 1990 and 2015, aviation enplanements throughout the United States increased by an even larger factor, 60.3 percent. Amtrak has only seen a 13.6 percent increase in ridership in Iowa from 1990 levels, while U.S. ridership has increased nearly 40 percent. A Chicago to Iowa City passenger rail route study was conducted and it estimated that 300,000 travelers would use the route on an annual basis. If this idea comes to fruition, passenger rail ridership could increase significantly in Iowa.

In relative terms, passenger VMT and public transit increased more in Iowa from 1990 to 2015 than the United States. Iowa passenger VMT increased 42 percent from 1990 to 2015, while US passenger VMT increased 37.5 percent over this same time period. Public transit rides increased 28.3 percent in Iowa from 1990-2015, but only 18.5 percent nationally.

The number of vehicles per household has increased

Between 1990 and 2014, the number of households with four or more vehicles increased 28 percent, while the number of households without any vehicles decreased nearly 20 percent. It is interesting to note that the percentage of households owning 1 or 2 vehicles slightly decreased between 1990 and 2014, but the percentage of households owning 3 vehicles increased 8.5 percent. However, as in 1990, the majority of households still have one or two vehicles. Figure 2.12 illustrates the number of vehicles per household from 1990 to 2014.

Figure 2.12: Number of vehicles available per household in Iowa, 1990-2014

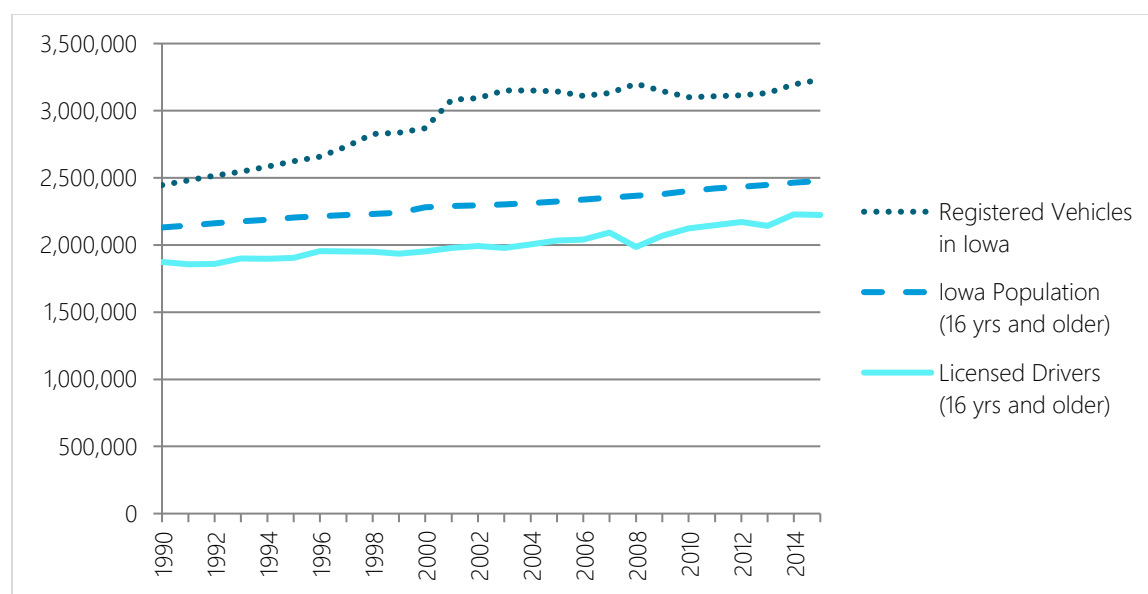


Sources: U.S. Census Bureau, American Community Survey Five-Year Estimates

The number of registered vehicles outnumbers licensed drivers

Figure 2.13 shows the relationship of licensed drivers to driving-age population (16 years and older), and the number of registered personal passenger vehicles in Iowa. Registered vehicles include private automobiles, trucks (up to 5 tons), vans, and SUVs. In the United States, the number of registered vehicles exceeded the number of licensed drivers in 1972. This trend has continued to this day, although in varying degrees. From 1990 to 2015, the United States averaged 1.16 registered vehicles per licensed driver, with a peak of 1.21 vehicles in 2007. From 1990 to 2015, Iowa averaged 1.46 registered vehicles per licensed driver, with a peak of 1.61 vehicles in 2008.

Figure 2.13: Population, licensed drivers, and registered vehicles*, 1990-2015



*Registered Vehicles include private automobiles, trucks (up to 5 tons), vans, and SUVs

Source: Iowa DOT, Office of Program Management and U.S. Census Bureau

Most Iowans drive to work alone

The overwhelming majority of Iowans drive to work alone. From 1990 to 2014, this trend continued to increase, while those who chose to carpool or walk to work saw the largest percentage decrease. The mode that saw the largest relative increase in users was bicycling, which increased 54.4 percent from 1990 to 2014. Table 2.3 shows the mode of transportation Iowans used to get to work from 1990 to 2014.

Table 2.3: Iowans' mode of transportation to work, 1990-2014

	1990	2000	2005-2009	2010-2014
Drove alone	73.4%	78.6%	78.7%	80.3%
Carpool	11.9%	10.8%	10.3%	9.0%
Public transportation	1.2%	1.0%	1.0%	1.1%
Bicycle	0.3%	0.4%	0.5%	0.5%
Walk	5.8%	4.0%	3.9%	3.5%
Other (includes motorcycle and taxi)	0.7%	0.6%	0.9%	1.0%
Worked at home	6.7%	4.7%	4.7%	4.6%

Sources: U.S. Census Bureau, American Community Survey Five-Year Estimates

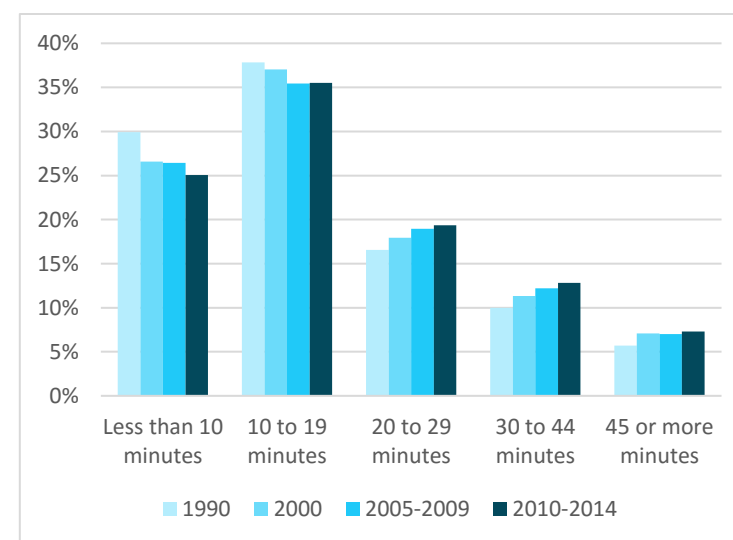
Average travel time to work has increased, but lowans still have one of the lowest average commute times nationally

Average travel time to work for lowans has slowly increased over the past twenty-five years, and this trend will likely continue. Since 1990, the percentage of workers commuting 30 minutes or more to work increased from 16 percent to 20 percent, while the percentage of workers commuting less than 10 minutes decreased from 30 percent in 1990 to 25 percent in 2014. Figure 2.14 shows the change in travel time to work for lowans from 1990 to 2014. Despite the increase in travel time, lowans enjoyed the fifth-shortest average commute time in the United States in 2014. The average travel time to work for lowans was 19 minutes, compared to an average of 25.7 minutes nationally.

More lowans are commuting to locations outside their county of residence, which may help explain the increased travel times noted above. In 1990, approximately 17 percent of workers commuted to a job outside their county of residence; by 2014, this increased to 24.1 percent. Additionally, there were 12 counties in Iowa where more than 50 percent of residents traveled to jobs outside their home county in 2014, compared to only two counties in 1990. Figure 2.15 illustrates some potential commuter routes, highlighting the passenger vehicle annual average daily traffic (AADT) on primary highways, along with the percentage of the workforce leaving their county of residence for work.

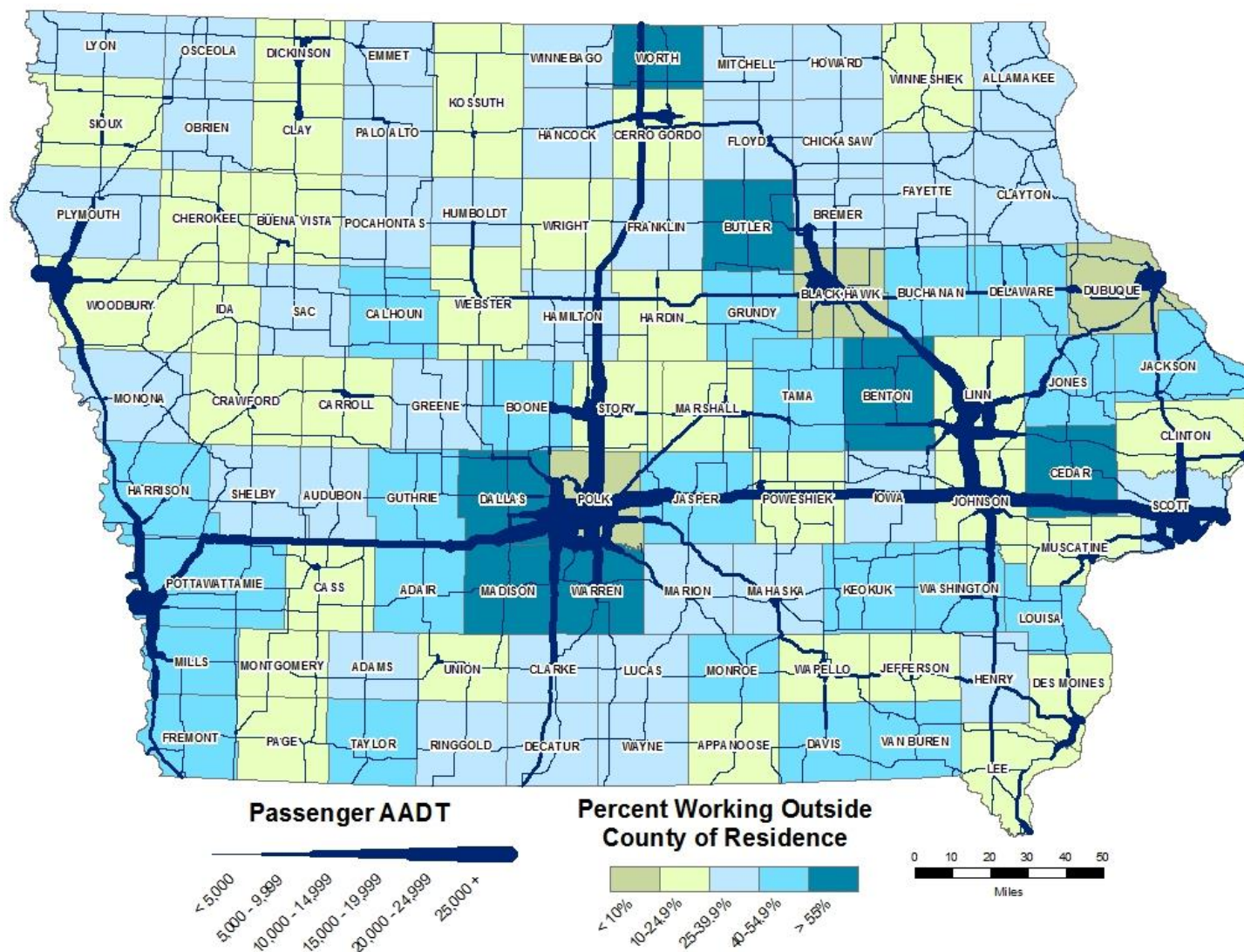
With jobs continuing to migrate towards Iowa's metropolitan areas, commuting has taken on more of a role to support the labor force necessary for these metro areas. The influence of a metropolitan area is not just on the urbanized area it encompasses, but on surrounding counties as well. An example of this is Polk County and the surrounding region. The 2010-2014 ACS estimated Polk County had approximately 231,000 workers age 16 and older, less than ten percent of which commute to a different county for work. Two neighboring counties, Dallas and Warren, both have over 50 percent of their workers traveling to Polk County for work.

Figure 2.14: Travel time to work in Iowa



Sources: U.S. Census Bureau, American Community Survey Five-Year Estimates

Figure 2.15: Commuting trends: passenger AADT on primary highways, and percent of workforce leaving county of residence to work, 2014



Sources: U.S. Census Bureau, American Community Survey Five-Year Estimates; Iowa DOT

Implications for transportation – passenger trends

- Travel across all passenger modes has increased nearly 43 percent since 1990, while Iowa's population has only grown by 12 percent. Investments in all passenger modes are necessary to ensure mobility options for Iowans.
- If population and vehicle ownership trends continue, there will be more travel on Iowa's roadway system.
- Driving to work alone is by far the most common mode choice for commuters, and its percentage share has increased over time. However, bicycling to work is becoming a more popular choice and saw the largest relative increase in users between 1990 and 2014.
- With more Iowans driving farther to work, it will be increasingly important to identify and maintain commuter routes and provide associated services.

2.4 Freight trends

The last three federal transportation reauthorization acts encouraged states and metropolitan planning organizations to consider freight movements in their overall planning processes. The purpose is to bring attention to freight movement issues affecting transportation infrastructure and economic development. The State of Iowa is part of a global economy that demands the efficient movement of freight. There is a growing need for adequate infrastructure to move freight safely, securely, and efficiently.

Like many other states, the majority of freight in and around Iowa is moved by truck and rail, both of which have experienced steady growth in freight traffic over the past two decades. Iowa has the advantage of a vast network of highways and railroads to serve these movements. Freight is also moved in the state via air, pipeline, and water. Over the past ten years, air cargo movements have declined as trucking has been integrated into delivery systems. Iowa's two major waterways, the Mississippi and Missouri rivers, move primarily grain and other bulk commodities to and from Iowa and provide access to the nation's extensive network of inland waterways.

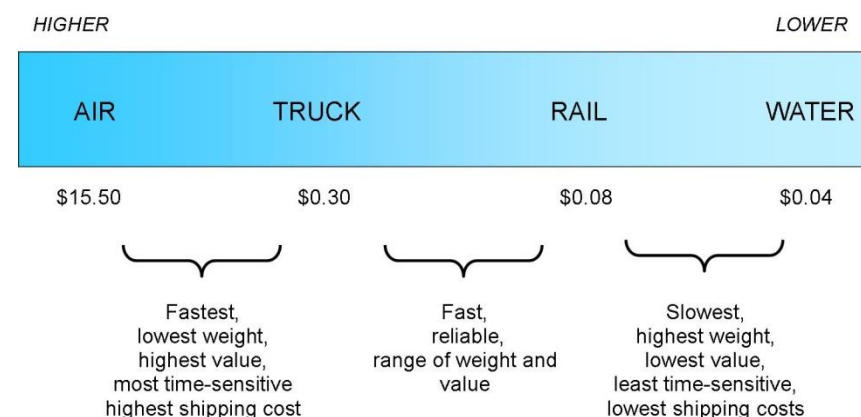
Freight transportation in the United States is projected to double by the year 2045. This growth will be reflected in Iowa and will not be uniform across all modes. If this projected growth occurs, it will prove to be a sizable challenge for the overall freight transportation system. Understanding freight dynamics is a crucial element in a proactive planning approach.

Freight costs and efficiencies will continue to vary across modes

Transportation costs play a large role in the decisions of Iowa shippers. Having various transportation options is important to these companies as it allows for cost savings and opportunities to optimize their supply chains. The different transportation modes all play a crucial part in the overall freight transportation system, each having distinct strengths and weaknesses. The characteristics of each option may make the efficient transport of different commodities ideal for one mode but not another. Figure 2.16 shows the per-pound value of freight moved in Iowa by mode for total freight movements (originating, terminating, intrastate, and through). The value of freight per pound is substantially higher for air, which is the fastest way to ship. Air handles the most time-sensitive cargo and has the highest shipping costs. Truck and rail carry much lower values per pound and handle higher weights at lower shipping costs. The lowest value per pound is handled by water, which is also the slowest mode with the lowest shipping cost. These comparisons help explain which mode can handle a certain type of commodity most efficiently.

Currently, the majority of freight tonnage in Iowa is carried by truck, train, and barge. Although trucking is the most expensive per pound, it is the also the most flexible of these three modes. Trucking companies provide various services to shippers. Full truckload service providers move products from one customer to another using a variety of equipment, including dry van, flatbed, hopper, and refrigerated. Trucks can move small amounts of a few hundred pounds all the way up to 48,000 pounds per shipment. Rail is less expensive than trucking and more fuel-efficient, but is more restricted by the privately-owned networks the trains move on. This mode is well suited for moving large volumes of freight between two shipping points and, like trucks, uses dry car, flatbed, hopper, and refrigerated equipment.

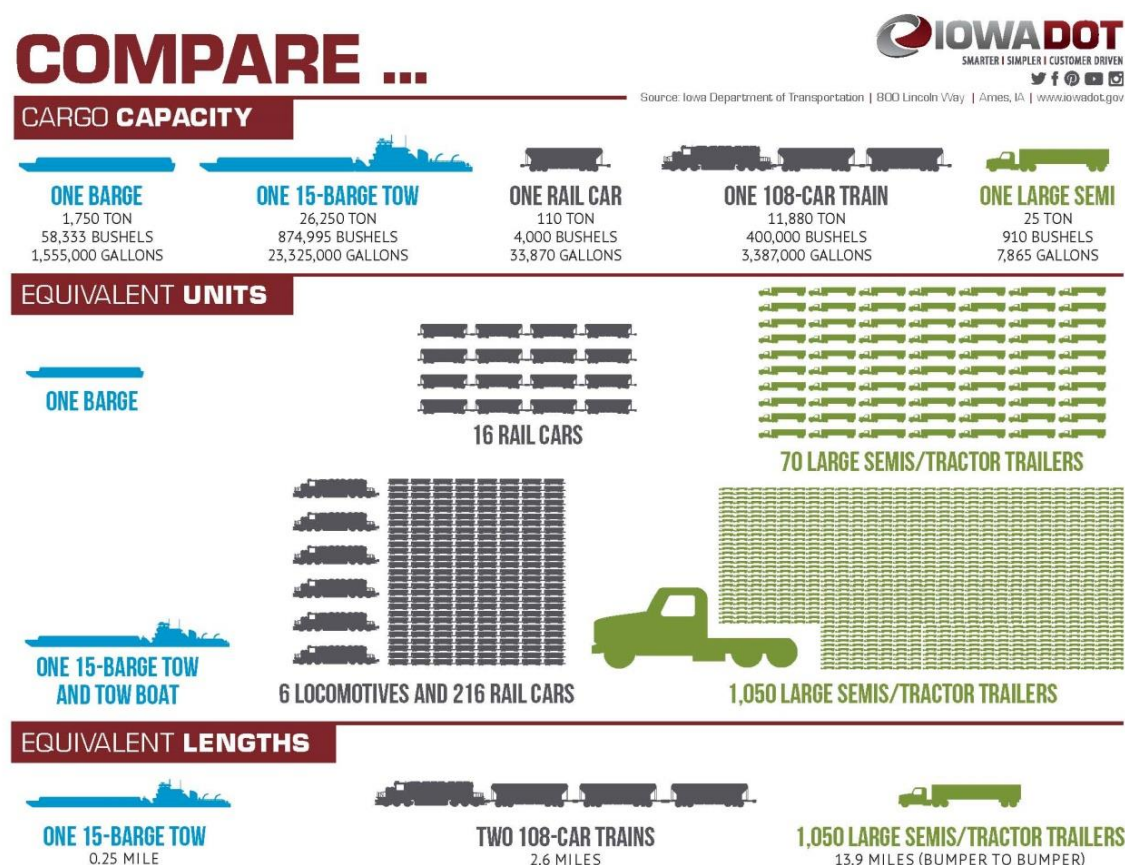
Figure 2.16: Iowa freight price comparisons



Source: USDOT, Bureau of Transportation Statistics, Commodity Flow Survey 2007

Transporting commodities via waterway is the slowest and least flexible of these three modes. However, it is the most fuel-efficient, the cheapest, and can handle the largest volumes per trip. Figure 2.17 compares these three modes by the amount of freight each can carry at a time. This comparison shows that one barge can handle as much as 70 trucks or more than 16 rail cars.

Figure 2.17: Iowa freight tonnage comparisons



Source: Iowa DOT

Each of the freight transportation options in Iowa has its own strengths that play a critical role in the state's freight transportation network. These options enable Iowa to be a major player in the global economy.

Iowa's freight is expected to steadily increase through 2045

In 2015, Iowa's transportation system facilitated the movement of approximately 1.1 billion tons of freight with an estimated value exceeding \$608 billion. These numbers are anticipated to grow to 1.4 billion tons of freight with an estimated value exceeding \$896 billion in 2045. Table 2.4 illustrates the tonnage and value for freight movements in 2015 and 2045. While all categories of movements are anticipated to increase significantly, goods exported from Iowa are projected to grow much more than goods imported into the state or moving solely within the state.

- The weight of goods **exported from Iowa** is expected to grow 39.5 percent from 2015 to 2045, with the value of these goods increasing 61.3 percent.
- The weight of goods being **imported into Iowa** is expected to grow 16.5 percent from 2015 to 2045, with the value of these goods increasing 40.9 percent.
- The weight of goods that have **both an origin and destination in Iowa** is expected to grow 21.2 percent from 2015 to 2045, with the value of these goods increasing 26.4 percent.

Table 2.4: Iowa commodity flows* by tonnage and value, 2015 and 2045

	2015		2045		Percent Change	
	Tons (millions)	Value (\$millions)	Tons (millions)	Value (\$millions)	Tons	Value
From Iowa	448.14	\$263,256	625.18	\$424,680	39.5%	61.3%
To Iowa	405.09	\$242,671	471.88	\$341,927	16.5%	40.9%
Within Iowa	264.53	\$102,582	320.68	\$129,622	21.2%	26.4%
Total	1,117.75	\$608,508	1417.74	\$896,228	26.8%	47.3%

*Commodity flow data does not include freight moving solely through Iowa
Source: FHWA, Freight Analysis Framework (FAF)

Iowa's freight growth will not be uniform across modes

Truck is the dominant mode used for transporting freight in Iowa, handling 80 percent of the total freight in 2015. The total tonnage transported by truck is poised to grow by 25.7 percent by 2045. Rail and pipeline are the next largest contributors handling nine percent and eight percent of the total tonnage, respectively. This trend is projected continue through 2045. Table 2.5 shows tonnage by mode projections from 2015 to 2045.

Table 2.5: Freight tonnage and value by mode, 2015 and 2045

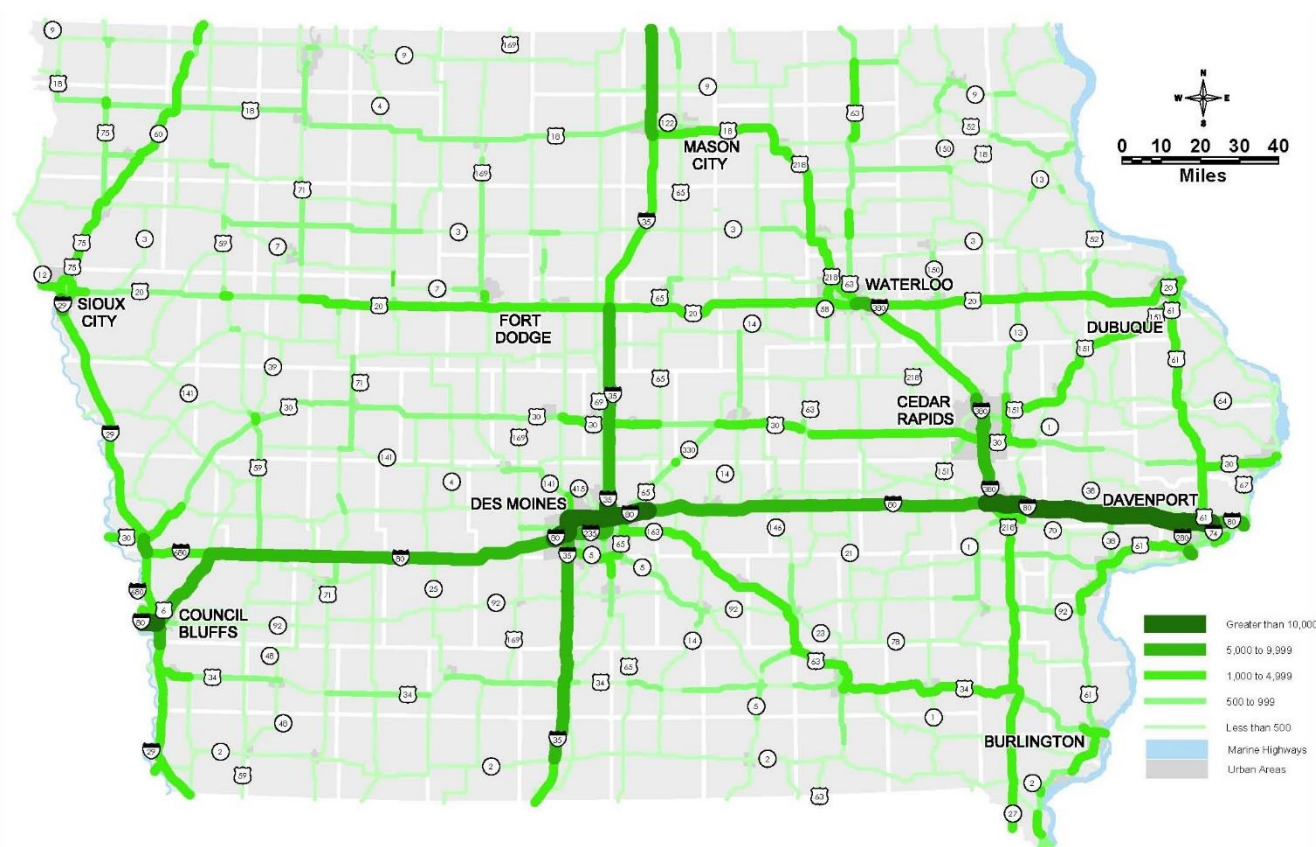
	2015		2045		Percent Change	
	Tons (millions)	Value (\$millions)	Tons (millions)	Value (\$millions)	Tons	Value
Truck	895.16	\$486,707	1125.36	\$682,484	25.7%	40.2%
Rail	99.90	\$39,512	129.98	\$63,828	30.1%	61.5%
Water	7.29	\$6,522	15.53	\$19,691	112.9%	201.9%
Air (include truck-air)	0.10	\$4,200	0.29	\$16,044	188.4%	282.0%
Multiple modes & mail	21.23	\$48,265	41.55	\$87,453	95.7%	81.2%
Pipeline	94.04	\$23,022	104.90	\$25,626	11.6%	11.3%
Other and unknown	0.03	\$281	0.13	\$1,102	285.7%	292.8%
Total	1117.75	\$608,509	1417.74	\$896,229	26.8%	47.3%

Source: FHWA, Freight Analysis Framework

The majority of Iowa's freight will continue to be moved by truck

Commodity movement by truck in Iowa is heavily concentrated on the Interstate System and Commercial and Industrial Network (CIN), which comprise the majority of the National Highway System (NHS) in the state (see Figure 2.18). The Interstates carried 62 percent of the state's large truck traffic (combination units) in 2015, the CIN carried 24 percent, and the rest of primary system carried the remaining 14 percent.

Figure 2.18: Total annual average daily truck traffic (AADTT), 2015



Source: Iowa DOT

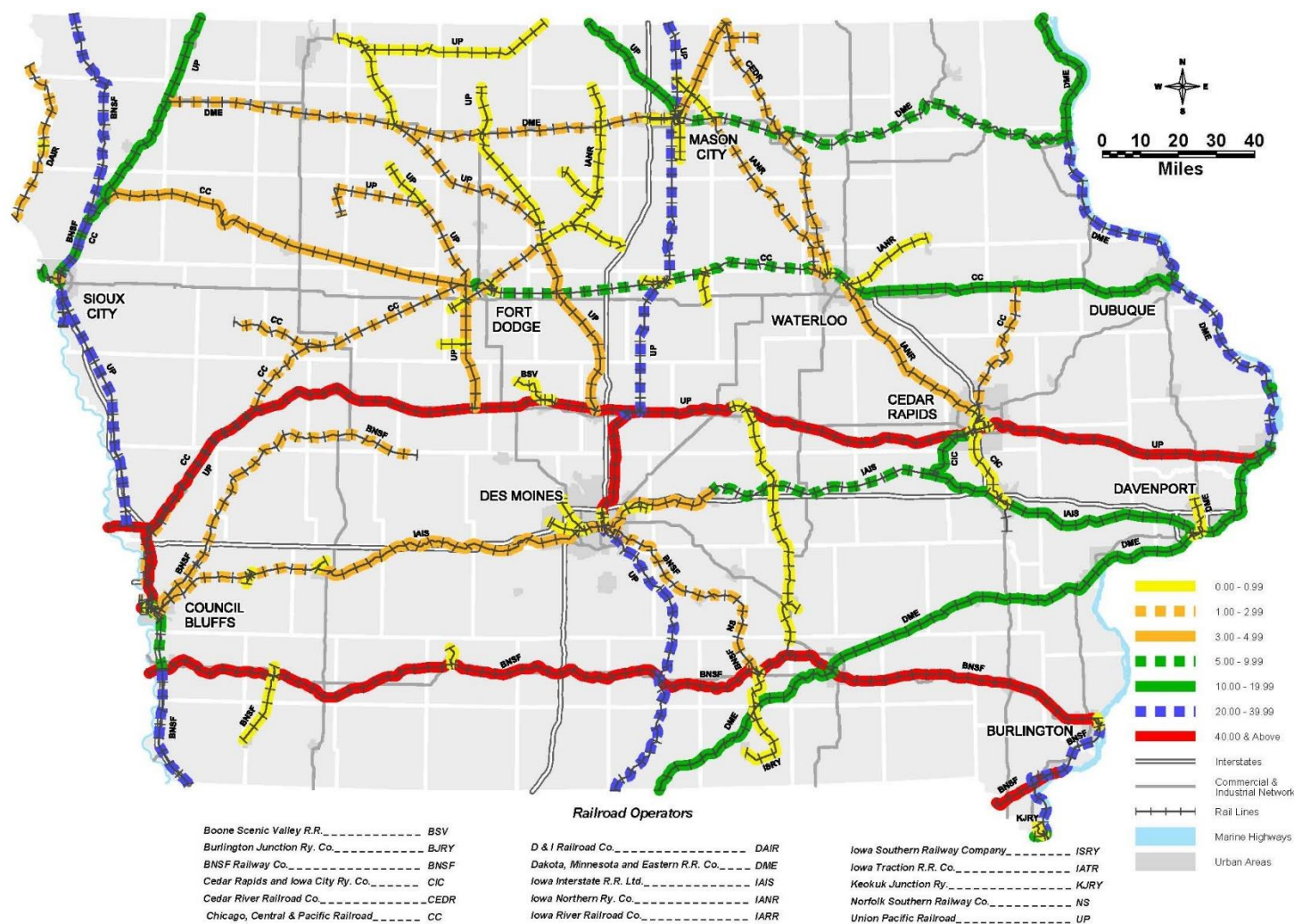
Increasing amounts of freight will move through Iowa via rail main lines

Rail service in Iowa is dominated by the six Class I carriers that operate 83 percent of the state's rail mileage, generate 91 percent of the ton-miles, and earn 94 percent of the revenues. Iowa's two busiest rail lines are the UP Overland Route, an east-west double track route that passes through the center of Iowa (Clinton to Council Bluffs) and the BNSF line in southern Iowa, an east-west route that is partially double tracked (Burlington to west of Pacific Junction). The Class II and III railroads often provide feeder service to the Class I carriers which results in smaller allocations of mileage, ton miles, and revenue.

The activity on individual rail lines is measured in terms of density or gross ton miles per mile (gtm/m). Gross ton miles are defined as the total weight of all freight traveling on the rail line including the weight of freight-train cars and locomotives. While Iowa's rail miles have remained stable, the amount of gross tonnage moving over the network has been increasing. Between 1985 and 2015, gross ton miles increased by approximately 134 percent while rail miles fell by 18 percent. Average rail line density has nearly tripled over the last 30 years primarily as a result of the increased through traffic moving on Iowa's main lines. As of 2015, the average rail line density in Iowa was 29.5 gtm/m. Figure 2.19 shows Iowa's rail traffic density in 2015.

Additionally, railroads continue to focus their attention on heavier axle load freight equipment and using longer, heavier trains to lower costs. Using larger rail cars in 100-plus car unit trains allows the greatest savings and economic benefits, and also keeps would-be truck traffic off the highways, resulting in less congestion and roadway deterioration. The current industry standard for rail car weight, which includes the weight of the commodities and the rail car combined, is 286,000 pounds. Iowa has rail lines that are unable to carry the sizes and weights of railroad equipment that meet this threshold.

Figure 2.19: Rail density, 2015



Source: Iowa DOT, Railroad Annual Reports

Iowa exports to other states and other countries will continue to increase

Iowa will continue to trade primarily with Midwestern states

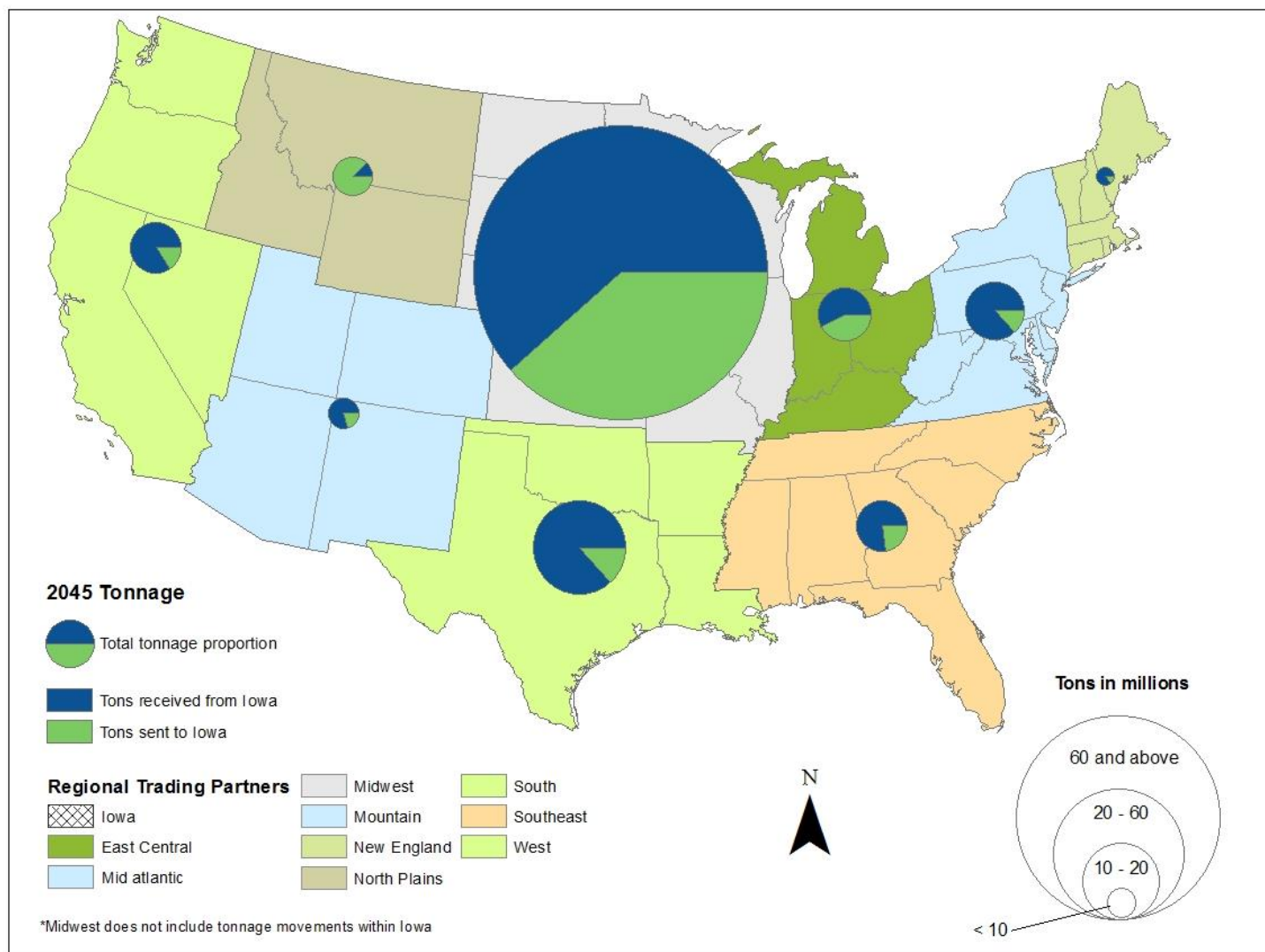
Iowa's regional trading partners provide markets for its producing industries and serve as suppliers to Iowa's consuming industries. In 2015, nearly 67 percent of the freight tonnage and 49 percent of the freight value leaving Iowa went to states in the Midwest. About 75 percent of the freight tonnage and 60 percent of the value coming into Iowa was from Midwestern states. This trend is projected to continue through 2045. Table 2.6 provides both tonnage and value of freight being shipped to and from Iowa in 2015 and projections for 2045. Figure 2.20 provides a visual of Iowa's regional trading partners and the projected amount of freight tonnage being sent from Iowa to those areas and from those areas to Iowa in 2045. Typically, the only region that sends more to Iowa than it receives from Iowa is the North Plains. A large portion of this tonnage is coal being delivered from Wyoming for utility generation. The amount of tonnage coming from the North Plains is expected to decrease roughly 45 percent by 2045, most likely due to the fact that Iowa is using other resources such as wind turbines and natural gas to generate power.

Table 2.6: Domestic trade by region, 2015 and 2045

Region	2015				2045			
	Sent to Iowa		Received from Iowa		Sent to Iowa		Received from Iowa	
	Tons	\$ Millions	Tons	\$ Millions	Tons	\$ Millions	Tons	\$ Millions
West	1.40	\$7,826	7.73	\$13,288	2.96	\$14,981	15.93	\$28,837
North Plains	16.99	\$973	0.73	\$1,192	9.36	\$1,195	1.30	\$1,851
Mountain	0.84	\$1,970	2.99	\$4,249	1.34	\$3,221	5.01	\$6,835
South	5.73	\$10,340	23.50	\$19,464	8.13	\$19,638	52.60	\$40,091
East Central	5.25	\$13,054	5.65	\$13,724	8.44	\$20,903	11.53	\$28,881
Southeast	3.34	\$9,165	8.59	\$12,675	4.16	\$13,630	14.29	\$22,104
Mid-Atlantic	2.03	\$10,654	10.58	\$15,733	3.15	\$18,555	20.70	\$35,001
New England	0.28	\$2,863	1.07	\$2,131	0.34	\$4,123	1.97	\$3,842
Midwest	104.71	\$83,243	122.78	\$78,217	113.32	\$116,060	181.16	\$127,615
Iowa	264.52	\$102,582	264.52	\$102,582	320.68	\$129,622	320.68	\$129,622

Source: FHWA, Freight Analysis Framework

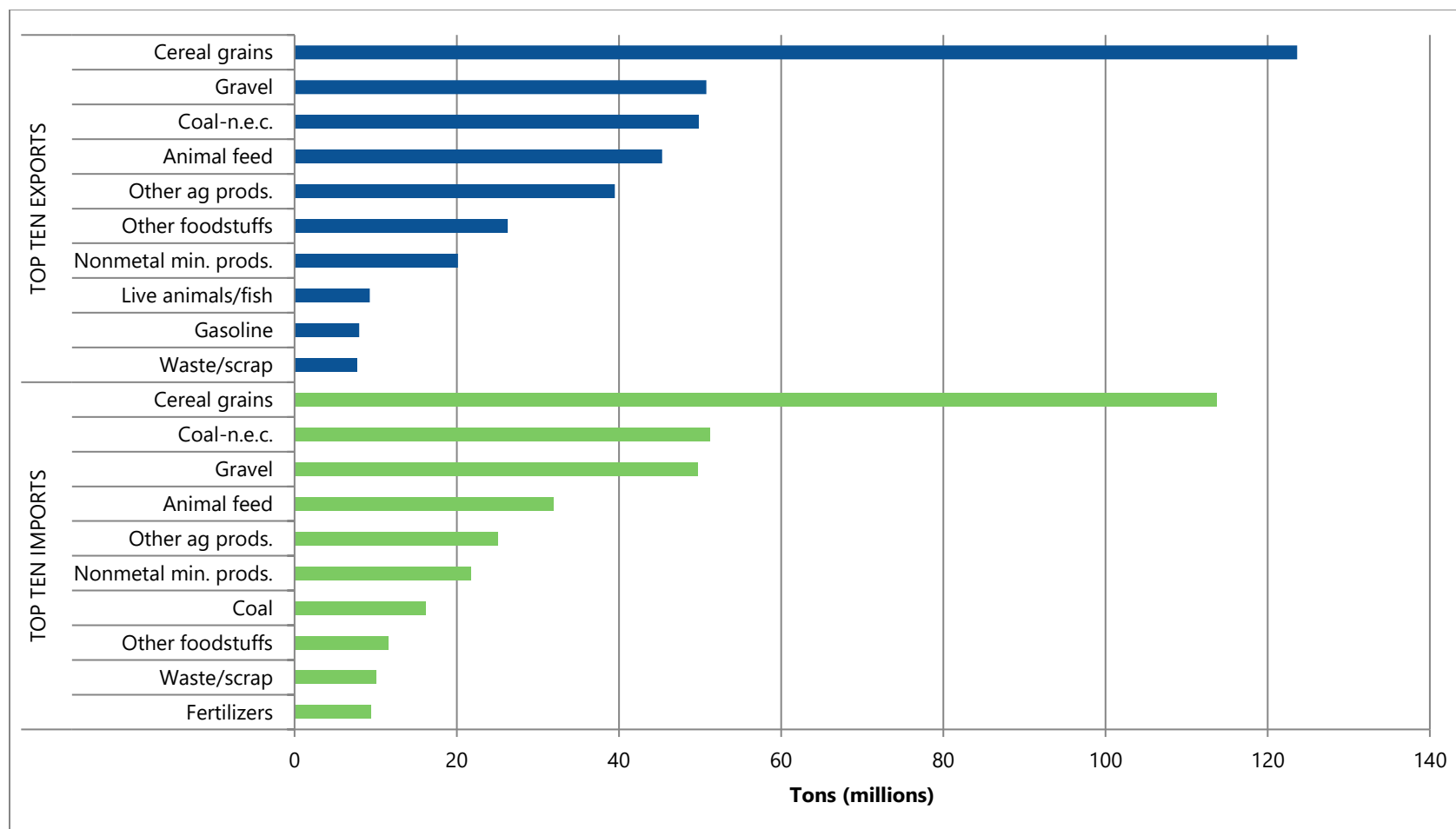
Figure 2.20: Regional trading partners and projected freight tonnage movements in 2045



Source: FHWA, Freight Analysis Framework

In terms of types of commodities being moved, agriculture plays a key role in originating and terminating movements. Iowa is one of the leading states in the production of corn, soybeans, eggs, pork, and beef each year. However, cereal grains (includes corn, oats, and wheat) account for 123.6 million tons originating in the state and 113.7 million tons terminating in the state, far more than any other commodity. This accounts for nearly 27.6 percent of the total commodities shipped from Iowa, as well as 28.1 percent of the total commodities received into the state (for processing and transport to export terminals). Other top commodities being imported to and/or exported from Iowa include gravel, animal feed (includes eggs), coal-n.e.c. (includes natural gas and propane), other agricultural products (includes soybeans), and other food stuffs. Figure 2.21 shows the top commodities originating and terminating in Iowa by total tonnage.

Figure 2.21: Top ten domestic commodities exported from and imported to Iowa by weight, 2015



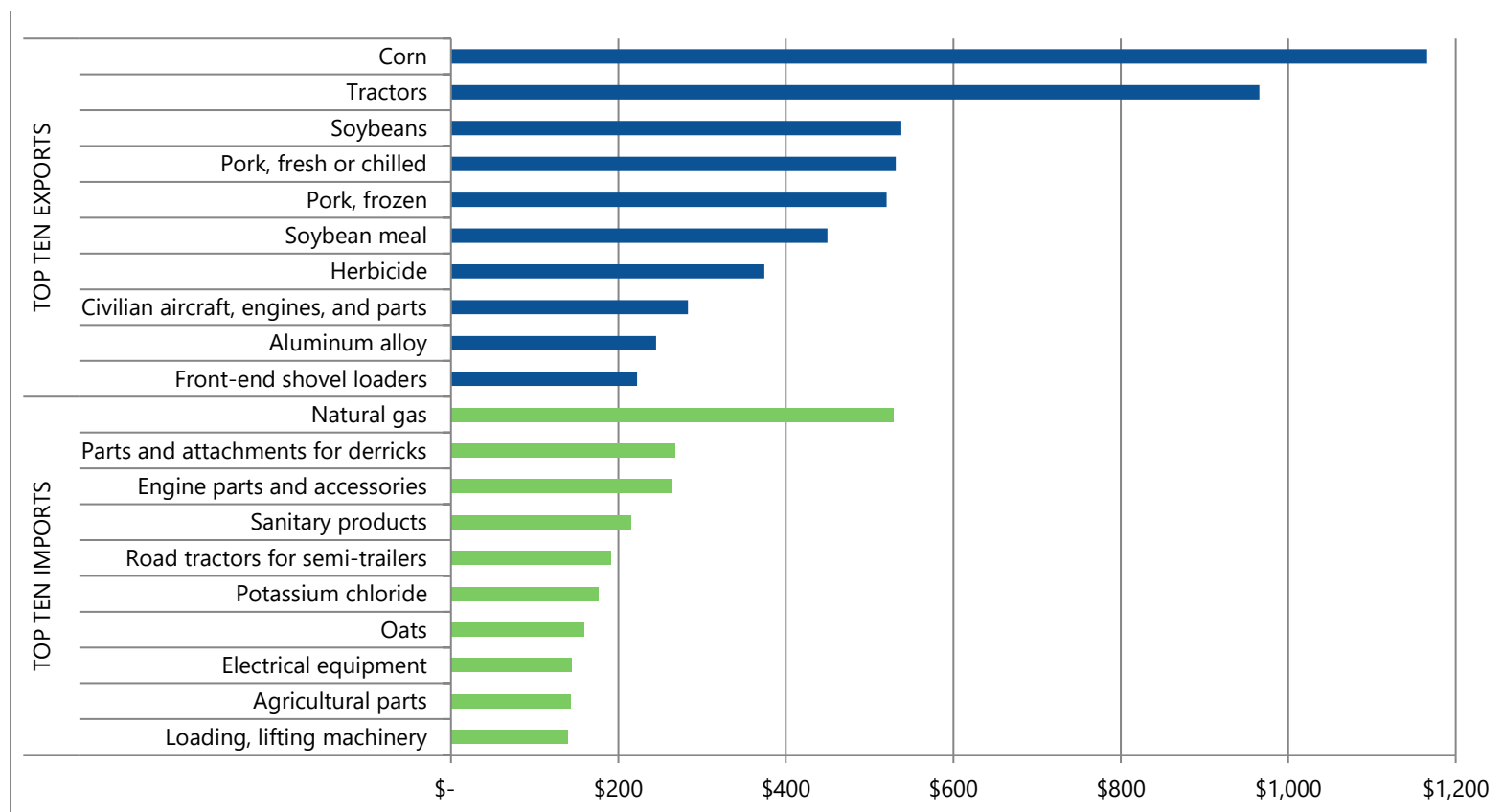
Source: FHWA, Freight Analysis Framework

Canada and Mexico are Iowa's largest international trading partners

The state of Iowa exported roughly \$15.1 billion in goods in 2014, which is about a one percent share of the entire U.S. export market. Corn was the top exported commodity by value at approximately \$1.2 billion, tractors were the second largest commodity group at \$966 million, and soybeans were third at \$538 million. Other top exports included pork (chilled and frozen), soybean meal, herbicides, and machinery parts.

Similar to the domestic import/export climate, Iowa's import totals from foreign countries are much less than that of exports. In 2014, Iowa's total foreign imports were approximately \$10 billion, contributing about a 0.4 percent share of the U.S. total foreign import market. Natural gas was by far the largest imported commodity by value at \$528 million, followed by parts and attachments for derricks at \$268 million. Other commodities in the top ten included engine parts and accessories, sanitary products, road tractors, potassium chloride, oats, electrical equipment, agricultural parts, and loading/lifting machinery. Figure 2.22 shows the top ten internationally imported and exported commodities by value in 2014.

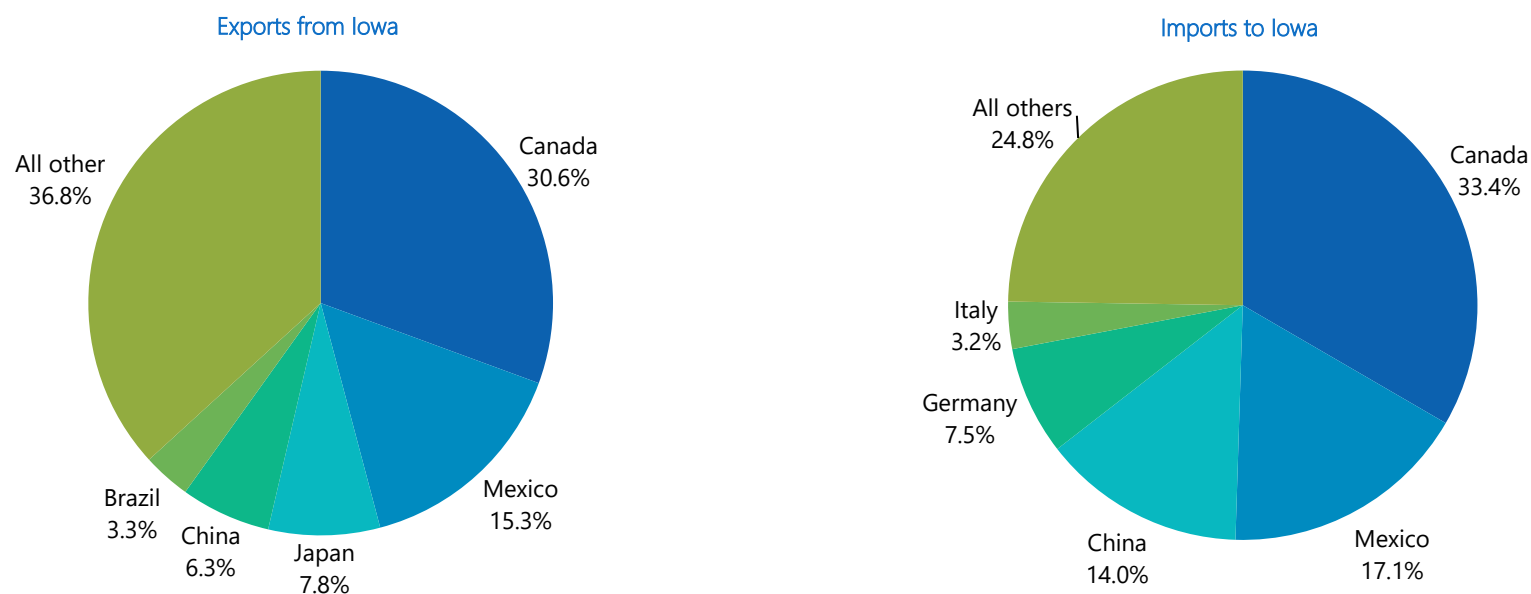
Figure 2.22: Top ten international commodities exported from and imported to Iowa by value, 2014 (\$millions)



Source: U.S. Census Bureau, Foreign Trade Division

In 2014, Iowa's top international trading partner was Canada with exports valued at \$4.6 billion. Other notable countries by value of exports included Mexico, Japan, China, and Brazil. Canada was also a leader in Iowa's foreign import trade market with imports valued at \$3.4 billion or 33.4 percent of the market share. Other notable countries included Mexico, China, Germany, and Italy, making up approximately 75 percent of total imports to Iowa. Figure 2.23 show the breakdown of Iowa's exports to and imports from foreign trading partners.

Figure 2.23: Top international trading partners, 2014



Source: U.S. Census Bureau, Foreign Trade Division

Implications for transportation – freight trends

The advancement of globalization leads to constantly shifting market variables. This makes adapting and evolving a challenge for all involved parties, including manufacturers, shippers, and government agencies. To be proactive in addressing developing patterns and overcoming new obstacles, it is necessary to identify current trends and issues and attempt to forecast the changes that will come. A number of these major trends in the freight industry will impact Iowa's transportation system. These items include:

- Globalization and growth in both national and international trade are placing more demands on our freight system.
- With value-added production and overall economic activity increasing in Iowa, freight movements will increase.
- The growing demand for freight increases concerns about its safety, energy consumption, and environmental impacts.
- With freight projected to increase, the effects of congestion on freight mobility, reliability, and costs will need to be taken into consideration.
- Reducing delays, maintaining infrastructure, and optimizing the state's freight system are key priorities.
- With weight limitations on trucks being relaxed in recent years, the impacts to infrastructure and operations need to be taken into consideration.