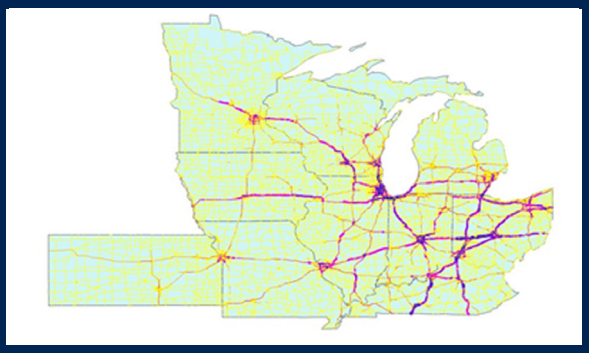

Identification and Characterization of the MAASTO Region's Multimodal Freight Network

MID-AMERICA FREIGHT COALITION

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About the Mid-America Freight Coalition (MAFC)

The industries and farms of the Mid-America region can compete in the marketplace only if their products can move reliably, safely and at reasonable cost to market.

State Departments of Transportation play an important role in providing the infrastructure that facilitates movement of the growing amount of freight. The Mid-America Freight Coalition was created to support the ten states of the Mid America Association of Transportation Officials (MAASTO) region in their freight planning, freight research needs and in support of multi-state collaboration across the region.

www.midamericafreight.org

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1. INTRODUCTION

1.1. Background

Freight transportation has a huge impact on the national and regional economies. The 2017 status report on the nation's highways, bridges and transit from the Federal Highway Administration (FHWA) *(1)* presents that the freight transportation employed 4.6 million workers, contributed 9.5% of U.S. economic activity in terms of gross domestic product (GDP), and moved approximately 55 million tons (valued at $49.5 billion) per day in 2015. The report also forecasts that the total value of freight in the U.S. will be nearly double in 2045 from what it was in 2012. Trucks on the highway network represent the largest mode of freight transportation, carrying 64% of the weight and 69% of the value *(1)*.

To improve the performance of freight transportation on the nation's highways, the FHWA established the National Highway Freight Network (NHFN) under the Fixing America's Surface Transportation (FAST) ACT *(2)*. The NHFN presents the most critical highway portions of the U.S. freight system including over 50,000 centerline miles of Interstate and non-Interstate roads. From a freight data perspective, on the other hand, the Freight Analysis Framework (FAF) has been produced to describe specific freight volumes and values for each state by all modes since 2002. Other data related to freight transportation, such as Commodity Flow Survey (CFS) data *(3)*, are incorporated in the FAF and widely developed on national and regional levels to support policy decisions and research analysis. The CFS data is collected every five years, in years that end in 2 or 7. Research for the economic value of freight transportation is widely conducted with an array of approaches. On the national level, researchers found close relationships between freight transportation and economic growth using various indicators such as GDP or GVA (Gross Value Added) *(4–6)*. They also suggested that more detailed data and disaggregated models are desired to better describe the relationships. Similarly, studies at the state and county levels have also been conducted to analyze the regional impact of freight transportation and to support regional planning *(7–10)*. However, there have been few efforts to derive the value of corridors that span multiple states despite the fact that freight trucks are the largest mode of traffic across the nation's highway network. Thus, understanding the value of multistate freight corridors will lead to a more systematic analysis of their economic impact beyond county and state boundaries. This can better support regional planning of multistate corridors by helping prioritize corridors for regional development and demonstrating to policy makers the importance of these corridors to the economic well-being of a region or state.

1.2. Research Objectives

This research aims to (i) investigate physical and operational features of corridors to identify the principal freight network, and (ii) develop a framework to estimate the value of freight corridors based on these features. To this end, we conducted both geographic information system (GIS) and statistical analysis on the MAASTO (Mid America Association of State Transportation Officials) region as a case study. The MAASTO region consists of ten states in the Midwestern United States: Illinois, Indiana, Iowa, Kansas, Kentucky, Michigan, Minnesota, Missouri, Ohio, and Wisconsin.

1.3. Report Organization

The remainder of this report is organized as follows:

- Section 2 presents an extensive literature review for the freight network and national-level database including the NHFN and FAF, and studies for economic analysis related to freight transportation.
- Section 3 shows the status of freight movement in the MAASTO region with transportation-mode distribution and detailed physical and operational features of the freight network.
- Section 4 investigates features of freight commodities in terms of weight and value and presents a method to estimate the corridor value with the results of GIS and statistical analysis.
- Section 5 shows the importance of freight corridors with economic activity demonstrated by the prevalence of business and employees within a six-mile buffer along the corridors.
- Section 6 provides the responses of state DOTs for major freight corridors with a comparison of the results from this research. All three of these approaches verify the importance of the network to local and rural economies.
- Conclusions and suggestions for future research are provided in Section 7.

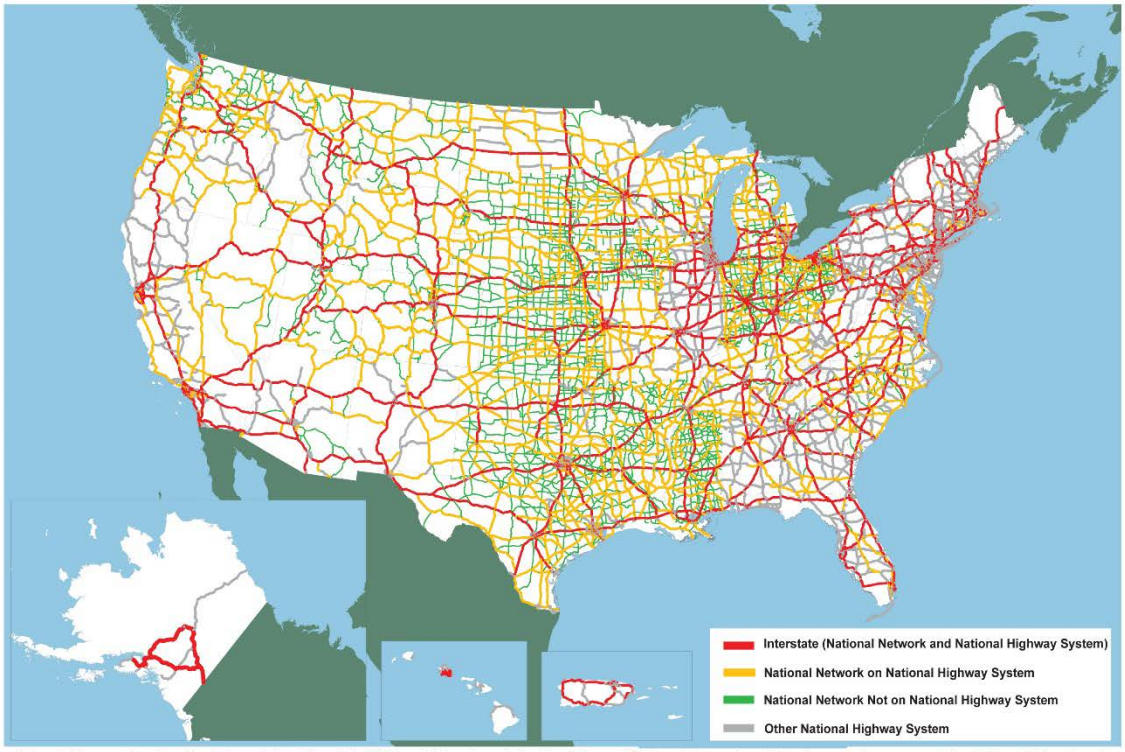
2. LITERATURE REVIEW

2.1. Overview of Freight Network

The freight network of the U.S. includes 985,000 miles of highways, 141,000 miles of railroads, 11,000 miles of inland waterways, and 1.6 million miles of pipelines connecting ports, airports, cities, manufacturing centers, farms, mines, and other economic activity *(11)*. Among them, approximately 200,000 miles of highways were authorized as a national network for use by large trucks by the Surface Transportation Assistance Act of 1982 (P.L. 97-424) *(12)*. The National Network (or National Truck Network) has been designated to the following criteria by CFR Title 23 (658.9):

- The route is a geometrically typical component of the Federal-Aid Primary System, serving to link principal cities and densely developed portions of the States.
- The route is a high-volume route utilized extensively by large vehicles for interstate commerce.
- The route does not have any restrictions precluding use by conventional combination vehicles.
- The route has adequate geometrics to support safe operations, considering sight distance, severity, and length of grades, pavement width, horizontal curvature, shoulder width, bridge clearances and load limits, traffic volumes, and vehicle mix, and intersection geometry.
- The route consists of lanes designed to be a width of 12 feet or more or is otherwise consistent with highway safety.
- The route does not have any unusual characteristics causing current or anticipated safety problems.

The National Network differs in extent and purpose from the National Highway System (NHS) by the National Highway System Designation Act of 1995 (P.L. 104-59). The National Network supports interstate commerce by regulating the size of trucks and standardized corridor characteristics, while the NHS supports interstate commerce by focusing federal investments that maintain freight flows *(12)*. Figure 1 presents a map of the National Network.



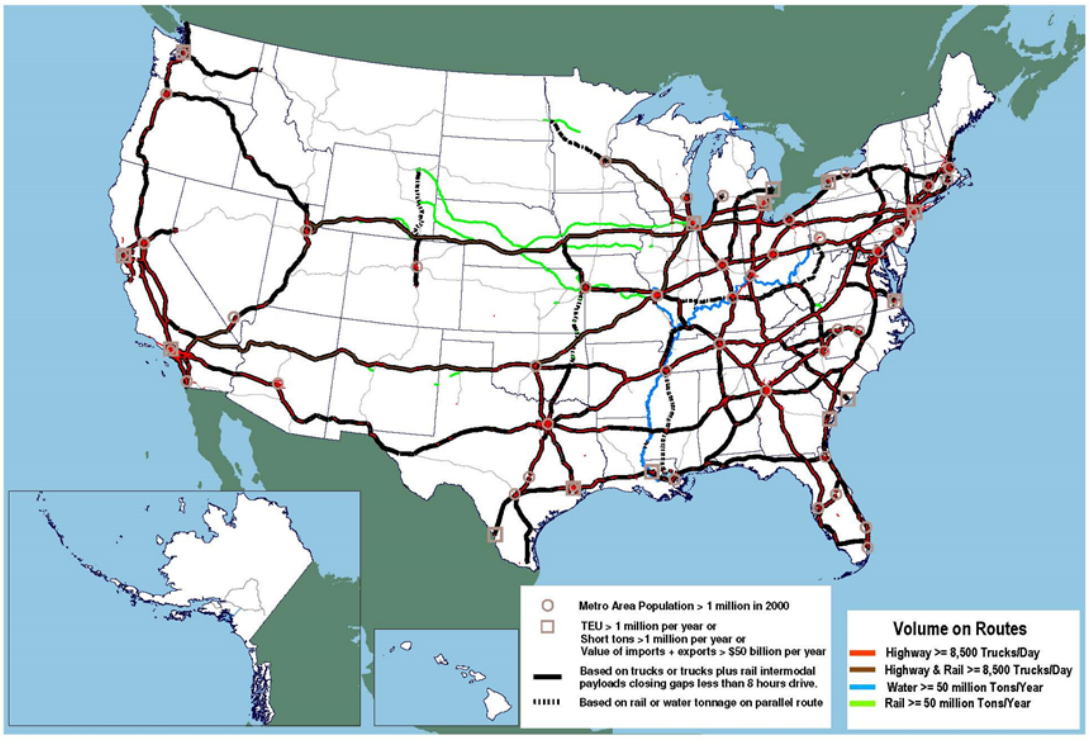
Notes: This map should not be interpreted as the official National Network and should not be used for truck size and weight enforcement purposes. The National Network and the National Highway System (NHS) are approximately 200,000 miles in length, but the National Network includes 65,000 miles of highways beyond the NHS, and the NHS encompasses about 50,000 miles of highways that are not part of the National Network. "Other NHS" refers to NHS mileage that is not included on the National Network. Conventional combination trucks are tractors with one semitrailer up to 48 feet in length or with one 28-foot semitrailer and one 28-foot trailer. Conventional combination trucks can be up to102 inches wide.
Source: U.S. Department of Transportation, Federal Highway Administration, Office of Freight Management and Operations, Freight Analysis Framework, version 2.2, 2009.

Figure 1: Map of National Network *(12)*

Among the national network, the largest freight flows are concentrated on a relatively small number of corridors, which are presented by Figure 2, including the following network *(11)*:

- Highway segments that carry at least 8,500 trucks per day, which is the number needed to move 50 million tons per year at 16 tons per truck.
- Additional highway segments and parallel rail lines that together carry at least 8,500 truck, trailer-on-flatcar, and container-on-flatcar payloads of typically high-value, time-sensitive cargo at 16 tons per payload.
- Rail lines and waterways that carry 50 million tons in bulk cargo per year.
- Connecting gaps less than 440 miles between above highway segments, and additional routes that parallel bulk cargo rail lines and waterways.

The presented major freight network includes approximately 26,000 miles of highways and 1,500 miles of bulk cargo rail and waterway routes. The total mileage is about 60% of the length of the Interstate system and less than 17% of the National Network *(13)*.



Note: Highway & Rail is additional highway mileage with daily truck payload equivalents based on annual average daily truck traffic plus average daily intermodal service on parallel railroads. Average daily intermodal service is the annual tonnage moved by container-on-flatcar and trailer-on-flatcar service divided by 365 days per year and 16 tons per average truck payload.
Source: U.S. Department of Transportation, Federal Highway Administration, Office of Freight Management and Operations, 2008.

Figure 2: Major Freight Network (*13*)

2.2. National Highway Freight Network (NHFN)

The Fixing America's Surface Transportation Act (FAST ACT) directed the FHWA to establish a National Highway Freight Network (NHFN) to strategically direct Federal resources and policies toward improved performance of highway portions of the U.S. freight transportation system *(14)*. The map of the NHFN is presented in Figure 3.

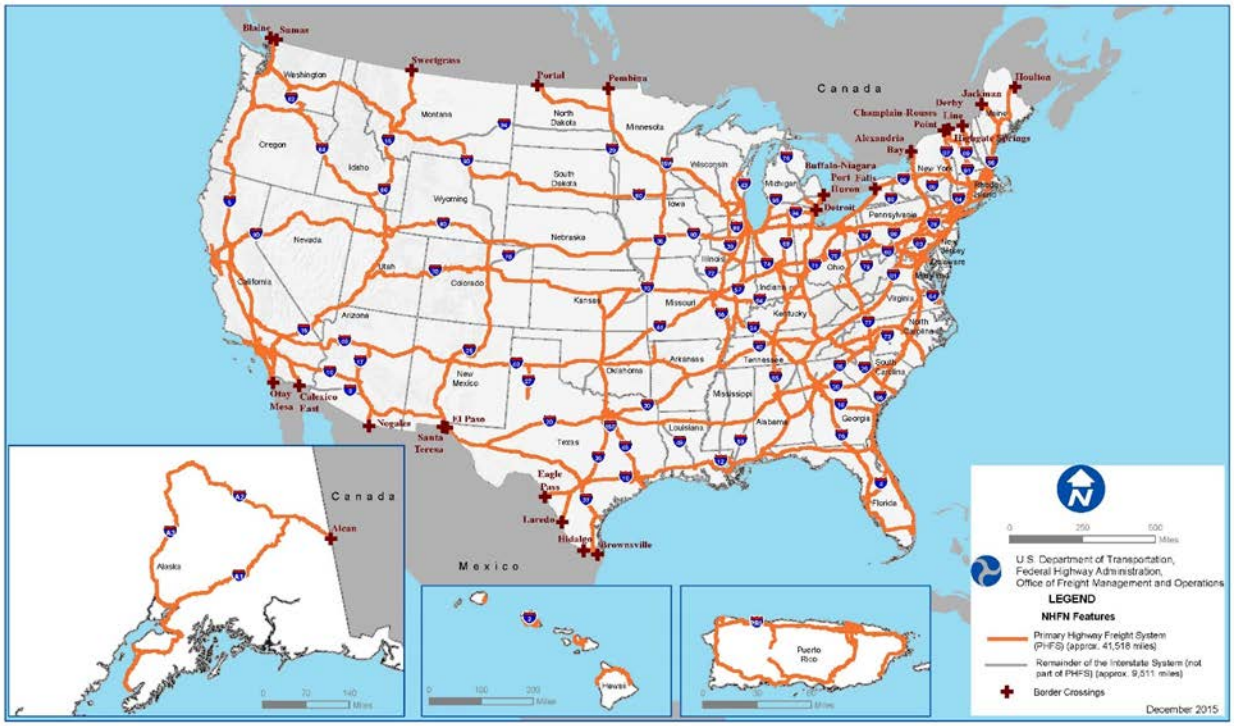


Figure 3: Map of National Highway Freight Network (*14*)

NHFN consists of the following components *(1)*:

- The Primary Highway Freight System (PHFS)
- Other Interstate portions not on the PHFS
- Critical Rural Freight Corridors (CRFCs)
- Critical Urban Freight Corridors (CUFCs)

The PHFS is the most critical highway system for freight transportation and consists of 41,518 miles of highway. This includes 37,436 miles of Interstate and 4,082 miles of non-Interstate highways. To provide continuity and access to freight transportation facilities, some remaining portions of Interstates are also included in the NHFN. The additional Interstate length is estimated to be 9,511 miles nationwide, though the mileage fluctuates based on changes in the Interstate system. CRFCs (rural areas) and CUFCs (urbanized area) are public roads that provide access to the PHFS and the Interstates with important freight transportation facilities, such as ports or public transportation facilities. States and Metropolitan Planning Organizations (MPOs) are responsible for designating CRFCs and CUFCs. These roads have a maximum of 150 miles (or 20% of the PHFS mileage in the state, whichever is greater) for CRFCs and 75 miles (or 10% of the PHFS mileage in the state, whichever is greater) of CUFCs.

In Section 3, we investigate the physical features of NHFN in the MAASTO region in detail using GIS. Note that FHWA provides a Shapefile of the NHFN for GIS with periodic updating, and in this research, we use the latest version as of October 2016 *(15)*.

2.3. Freight Analysis Framework (FAF)

To describe national and state freight movement, the Freight Analysis Framework (FAF) is produced by FHWA in cooperation with other departments, such as the Bureau of Transportation Statistics (BTS) *(16)*. FAF integrates various data sources, such as the CFS and international trade data from the Census Bureau, to estimate regional freight flow distribution. The latest FAF is the fourth generation of FAF (FAF4 hereafter) with the base year of 2012. It has 132 domestic and 8 international zones. FAF4 provides estimation for tonnage and value by the zone of origin and destination for each mode (e.g., truck, rail or water) with forecasting through 2045 *(17–19)*. In addition, FAF4 provides various traffic data on a predefined road network (FAF4 network hereafter). The traffic data of FAF4 is mainly from the Highway Performance Monitoring System (HPMS) including AADT (annual average daily traffic) and AADTT (annual average daily truck traffic) for each road section. For freight traffic assignment *(20)*, FAF4 provides long-distance truck freight flow (typically greater than 50 miles *(21)*) based on the FAF4 freight origin-destination distribution. FAF4 also provides detailed attributes for the FAF4 network, which includes the following roadways *(20)*:

- Interstate highways
- Other FHWA designated NHS routes
- National Network routes that are not part of NHS
- Other rural and urban principal arterials
- Intermodal connectors
- Rural minor arterials for those counties that are not served by either National Network or NHS routes
- Urban bypass and streets as appropriate for network connectivity.

Since the NHFN in section 2.2 is included in the FAF4 network, FAF4 can provide the operational features of the NHFN such as long-distance truck volume for each corridor, and the volume and value of freight. Thus, in Section 3, we will investigate the operational features of the NHFN in the MAASTO region, as well as the physical characteristics (i.e., length), to verify the role of the NHFN in freight movement. FAF4 also provides the economic value of freight for each zone that includes multiple corridors. Thus, in Section 4, we will develop a framework to estimate the corridor value using the freight value for each zone and assigned truck volume for each corridor.

2.4. Economic Analysis for Freight Transportation Corridors

The contribution of freight transportation to the economy has been widely investigated *(4, 7, 10, 22–24)*. For example, Wang et al. *(22)* proposed a method to estimate direct freight benefits from transportation projects. The benefits included improvements in travel-time and operating-cost savings and reductions in environmental impact. Based on these benefits, researchers derived regional economic impacts in terms of employment, wages and GDP. The case study of a widening project on a major Interstate in Washington showed that the freight investment has resulted in significant benefits stemming from improved transportation performance. The benefits transfer to economic impacts via job creation and the improvement of regional economic activity. On the other hand, Peng and Yu *(7)* developed an economic analysis framework for freight transportation by integrating the Freight Supply chain Intermodal Model (FreightSIM) and a regional economic model (input-output model). Two case studies in Florida demonstrate that this model can derive impacts from freight transportation projects (e.g., highway expansion) for each sector (e.g., transportation, construction, or finance) at both county

and state levels. Nonetheless, efforts to identify the economic value at the corridor level are largely missing in the current literature.

3. IDENTIFICATION OF THE FREIGHT NETWORK IN THE MAASTO REGION

This section firstly investigates mode distribution in terms of freight weight and economic value in the MAASTO region. Secondly, for the road network, the physical (e.g., length) and operational (e.g., truck volume) features are investigated in detail to confirm a principal freight network. In the final subsection, marine highways of inland waterways are presented with their economic value.

3.1. Freight Mode Distribution in the MAASTO Region

We investigate the FAF4 data to obtain the mode distribution for freight in the MAASTO region. Specifically, we derive the sum of all freight weight (or value) from/to each state in the base year of 2012 for each transportation mode. The types of mode in FAF4 data are described in Table 1.

Table 1: Mode in FAF4 Data (17)

Code	Mode	Description
1	Truck	Includes private and for-hire trucks. Does not include trucks that are part of Multiple Modes and Mail or truck moves in conjunction with domestic air cargo.
2	Rail	Includes any common carrier or private railroad. Does not include rail that is part of Multiple Modes and Mail.
3	Water	Includes shallow draft, deep draft, Great Lakes, and intra-port shipments. Does not include water that is part of Multiple Modes and Mail.
4	Air (includes truck-air)	Includes shipments moved by air or a combination of truck and air in commercial or private aircraft. Includes air freight and air express. In the case of imports and exports by air, domestic moves by ground to and from the port of entry or exit are categorized with Truck.
5	Multiple Modes and Mail	Includes shipments by multiple modes and by parcel delivery services, U.S. Postal Service, or couriers (capped at 150 pounds). This category is not limited to containerized or trailer-on-flatcar shipments.
6	Pipeline	Includes crude petroleum, natural gas, and product pipelines. Note: Includes flows from offshore wells to land which are counted as Water moves by the U.S. Army Corps of Engineers. Does not include pipeline that is part of Multiple Modes and Mail.
7	Other and Unknown	Includes movements not elsewhere classified, such as flyaway aircraft, and shipments for which the mode cannot be determined.
8	No Domestic Mode	Includes shipments that have an international mode, but no domestic mode and is limited to import shipments of crude petroleum transferred directly from inbound ships to a U.S. refinery at the zone of entry. This is done to ensure a proper accounting of import flows while avoiding assigning flows to the domestic transportation network that do not use it.

Figure 4 shows the mode distribution based on the freight weight. In the MAASTO region, the Truck mode has the largest portion at 66.1% of total tonnage. In descending order, the Pipeline (13.7%) and Rail (13.5%) modes are followed by the other modes as presented in Figure 4(a). The proportion of Water is 3.4% across the MAASTO region. In each state, as presented in Figure 4(b)-4(k), the Truck mode maintains the dominant proportion, mostly over 60% except in Kentucky, where it makes up 54.9%. The Pipeline mode ranges from 4.8% (Wisconsin) to 18.0% (Indiana), and the Rail mode ranges from 9.9% (Ohio) to 16.9% (Michigan). The Water mode makes up a significant proportion of Kentucky's mode distribution at 14.3%.

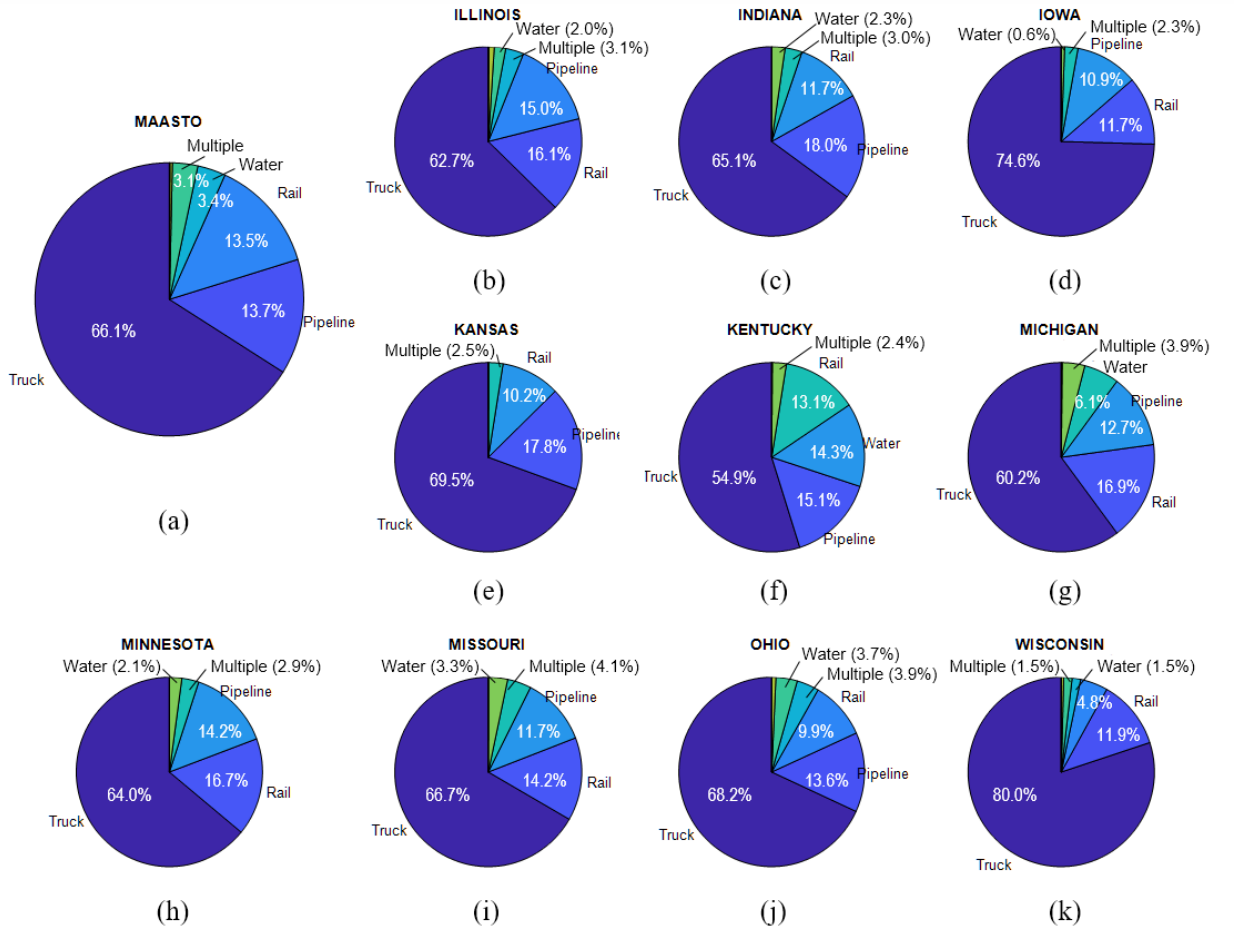


Figure 4: Mode Distribution by Freight Weight; (a) for MAASTO Region, (b)-(k) for Each State

Figure 5 presents the mode distribution based on the freight value in FAF4 data. The Truck mode (71.9%) makes up the largest portion across the MAASTO region as well as in each state, from 54.9% (Kentucky) to 79.5% (Wisconsin). Comparing this figure with Figure 4, the proportion of the Truck mode mostly increases for the states except in Wisconsin where it falls by 0.5%. The proportions of the Rail, Water, and Pipeline modes all decrease. The Air proportion increases significantly in Kentucky (△13.1%) and Illinois (△5.0%). This result is not surprising as each mode tends to carry specific types of materials and goods. Heavier and high-volume freight is moved on the water or rail. Trucks tend to focus on finished goods and manufacturing inputs, and air freight is typically used for high-value finished goods and time-sensitive products.

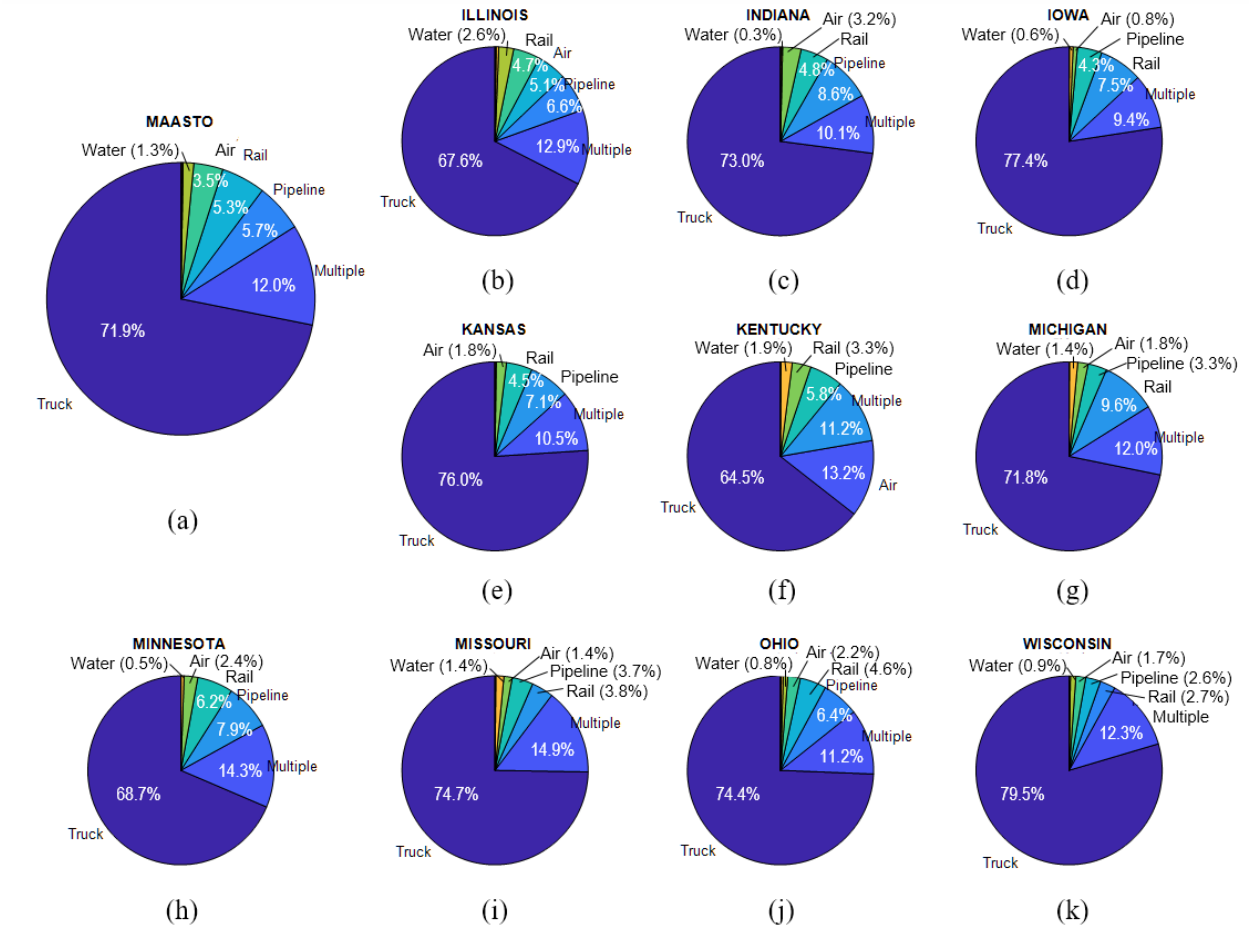


Figure 5: Mode Distribution by Freight Value; (a) for MAASTO Region, (b)-(k) for Each State

3.2. Freight Highway Network

We investigate the FAF4 network in the MAASTO region, which includes the NHFN and other corridors as presented in Figure 6(a). The total length of the FAF4 network in the MAASTO region is 110,844 miles with 11,932 miles (10.8%) on the NHFN and 98,912 miles (89.2%) on non-NHFN corridors. The length by state is presented in Table 2. Figure 6(c) presents the proportion of the road length for each state in the FAF4 network. The results show that the 10 states have similar proportions of road length in the FAF4 network ranging from 7.2% (Kentucky) to 12.3% (Illinois). In contrast, Figure 6(b) presents the NHFN in the MAASTO region, and Figure 6(d) shows the proportion of road length in the NHFN by state. By comparing two pie charts in Figure 6(c) and 6(d), we found that the distribution of the NHFN across the 10 states is more disproportionate. Specifically, five states have larger proportions of the NHFN than the FAF4 network (Illinois △6.8%, Ohio △3.8%, Indiana △2.5%, Michigan △0.4%, and

Missouri △0.4%), but the other five states have smaller proportions of the NHFN (Minnesota ▽4.4%, Wisconsin ▽3.5%, Kansas ▽2.7%, Iowa ▽2.4%, and Kentucky ▽0.7%)[1].

Table 2: Length of FAF Network for Each Road Type

STATE	Sum	IL	IN	IA	KS	KY	MI	MN	MO	OH	WI
Sum	110,844	13,596	8,454	10,206	11,167	8,006	11,516	13,308	10,826	11,420	12,347
NHFN	11,932	2,271	1,204	804	893	778	1,280	912	1,209	1,672	909
%	10.8	16.7	14.2	7.9	8.0	9.7	11.1	6.9	11.2	14.6	7.4
PHFS	8,834	1,686	971	549	740	616	630	547	1,023	1,418	654
%	8.0	12.4	11.5	5.4	6.6	7.7	5.5	4.1	9.5	12.4	5.3
non-PHFS	3,098	586	233	255	153	161	650	365	185	254	256
%	2.8	4.3	2.8	2.5	1.4	2.0	5.6	2.7	1.7	2.2	2.1
other	98,912	11,325	7,250	9,402	10,274	7,228	10,236	12,396	9,617	9,748	11,437
%	89.2	83.3	85.8	92.1	92.0	90.3	88.9	93.1	88.8	85.4	92.6
											(Unit: mile)

[1] Some numbers in the manuscript may not exactly match as compared to numbers in Figures due to rounding error.

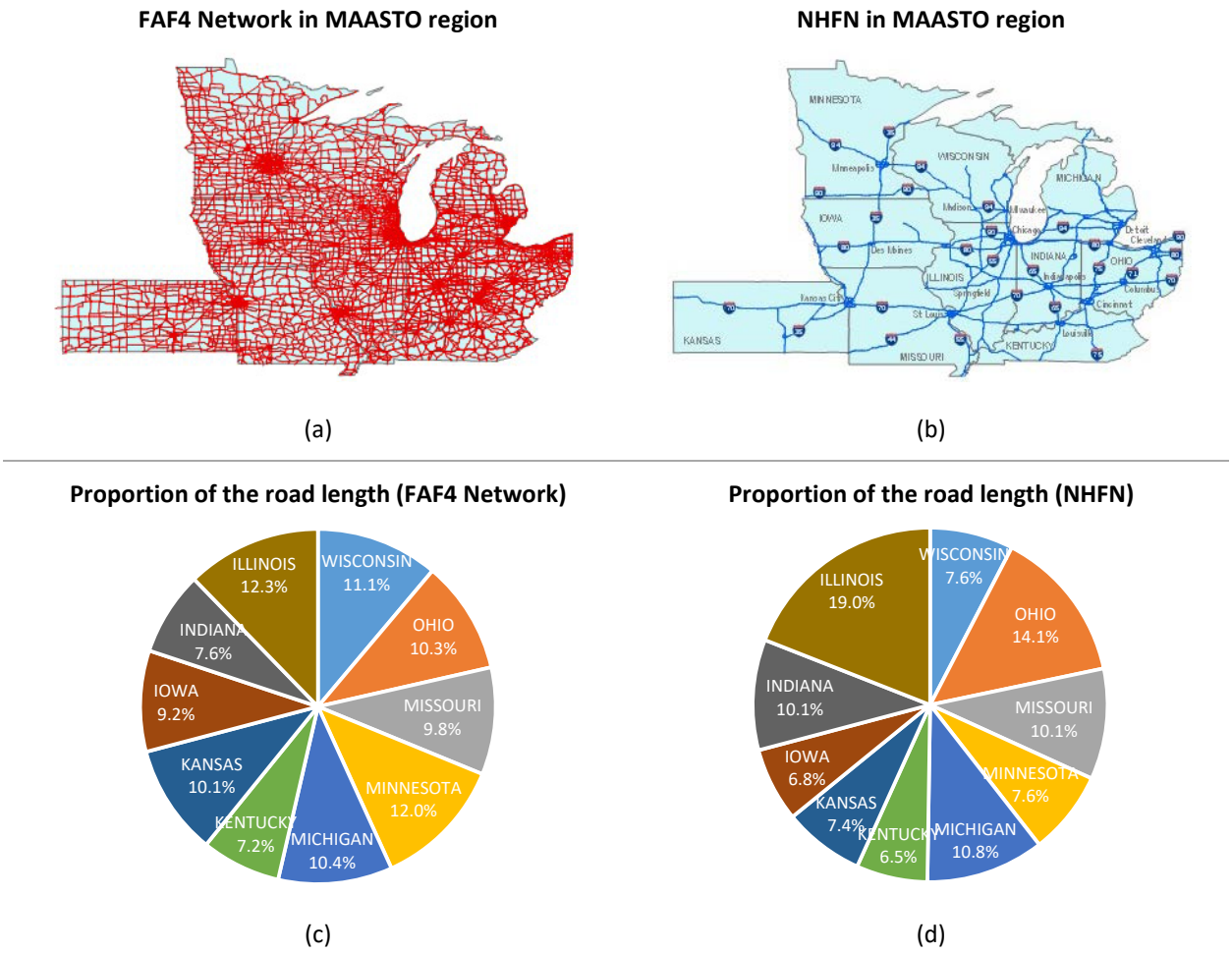


Figure 6: GIS Map of (a) FAF4 Network and (b) NHFN; Proportion of the Road Length for Each State in the MASSTO Region for (c) the FAF4 Network and (d) NHFN

The length of Interstates on NHFN in the MAASTO region is presented in detail below. Figure 7(a) shows the top ten longest corridors, and the sum of their length comprises nearly 60% of the total length. Note that some corridors have multiple road names in certain areas, and in this analysis, we identify the road name following the definition of FAF4 network (and the NHFN system, which is the same). Figure 7(b)–7(f) shows the top five longest corridors and the proportion in each state. The results show that most major corridors are multistate corridors in this region.

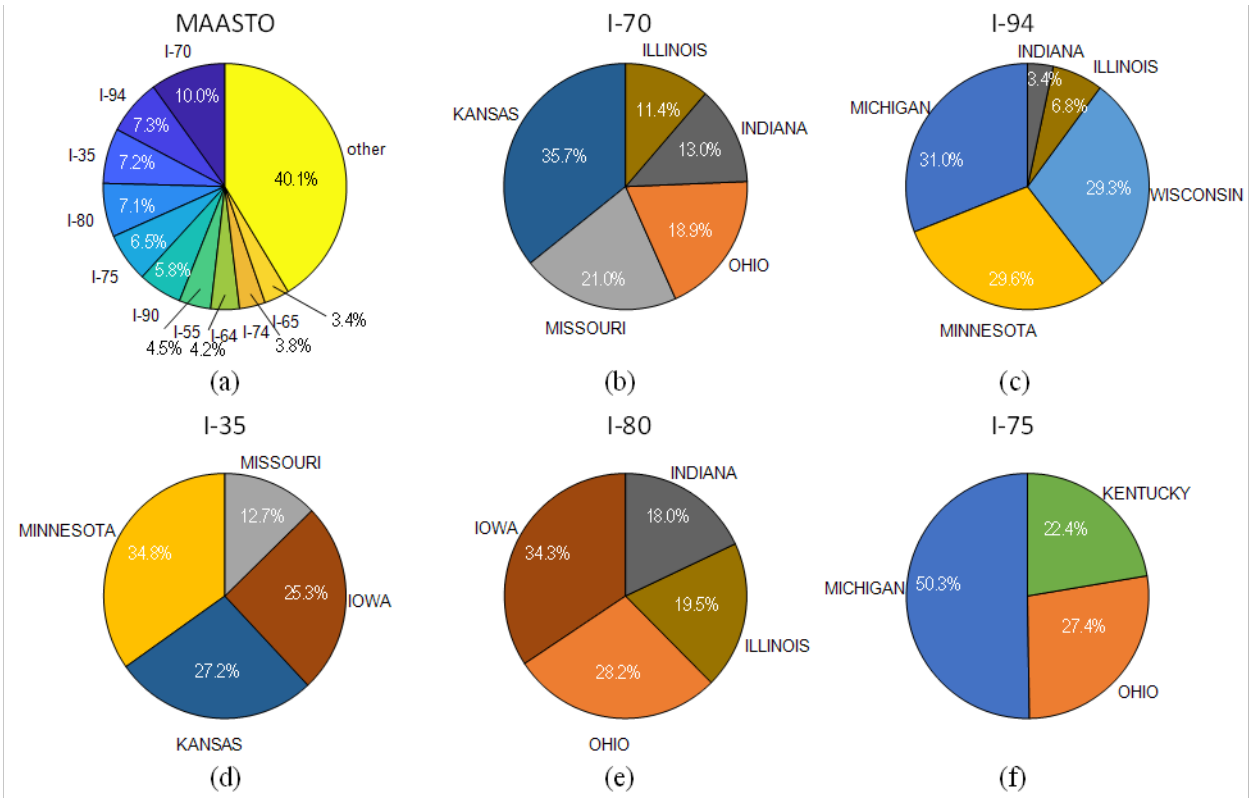


Figure 7: (a) The Top Ten Longest Corridors in the MAASTO Region; (b)–(f) Proportion of States for the Top Five Longest Corridors

Figure 8 shows the proportion of road length and truck volume by road type for each state. The first pie chart for each state presents the proportion of road length by road type. (Note that NHFN is divided into PHFS and non-PHFS as described in Section 2.2.) The second and third pie charts respectively show the distributions of all truck volumes and long-distance truck volumes. The figure shows that NHFN comprises a small proportion of the FAF4 network in terms of length, ranging from 6.9% (Minnesota) to 16.7% (Illinois). Yet, it carries the majority of truck volumes, particularly long-distance truck volumes. For example, in Illinois, 73% of all truck volumes and 94.6% of long-distance truck volumes are distributed on the NHFN.

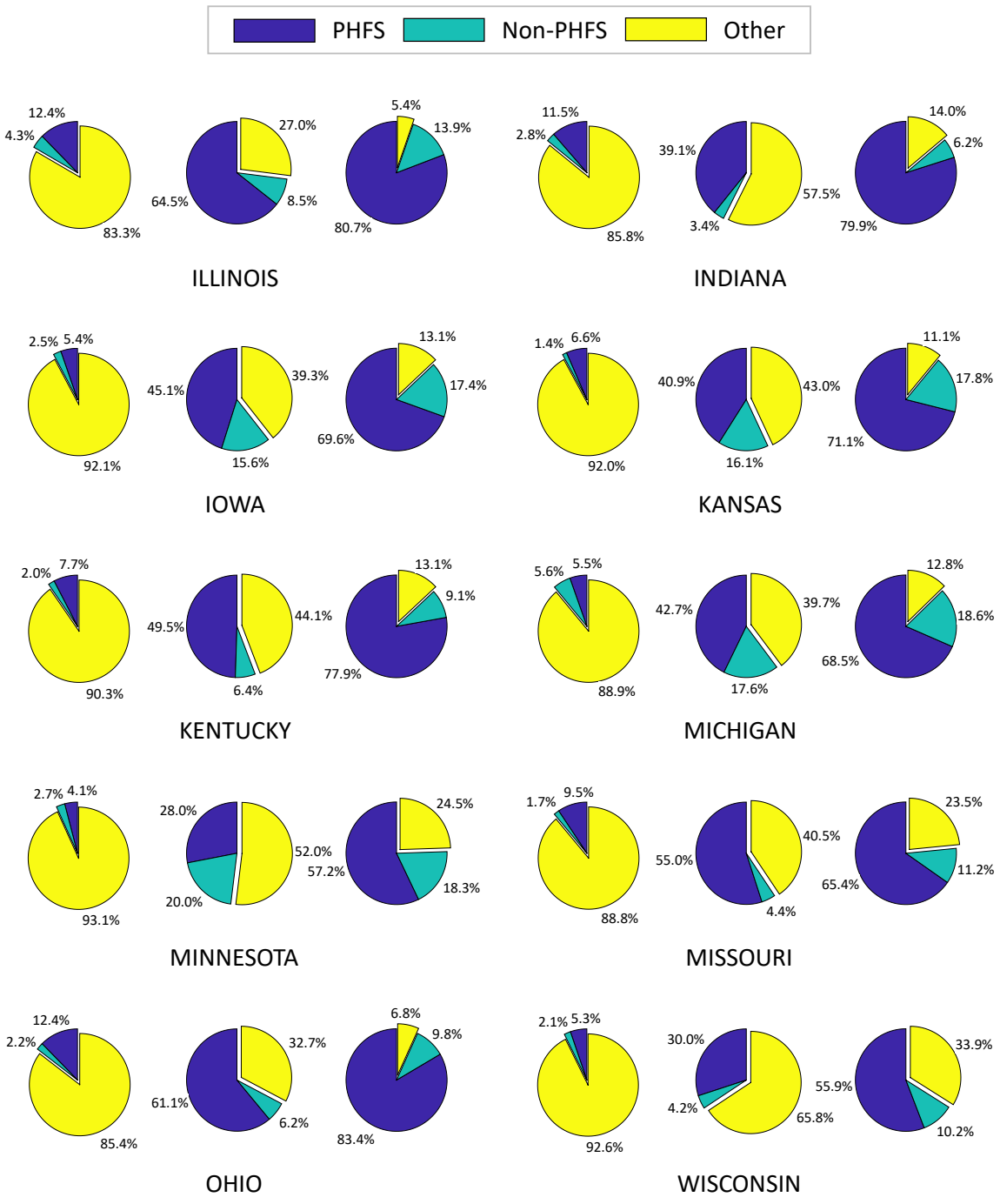
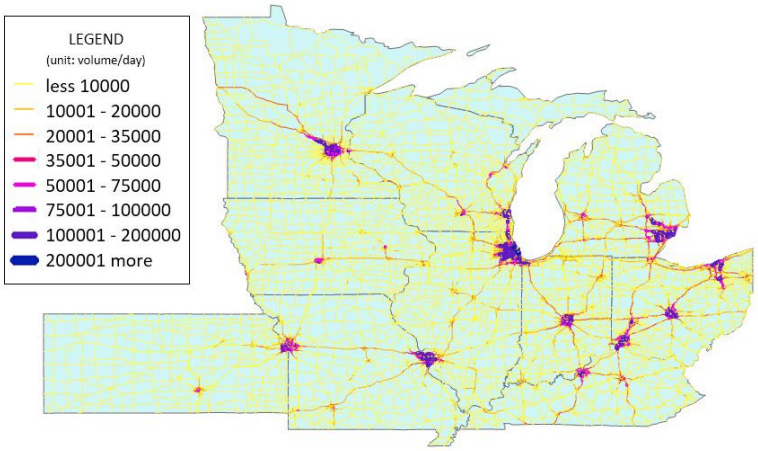


Figure 8: Proportion of Road Length, All Truck Volume, and Long-Distance Truck Volume by Road Type for Each State

These features are also investigated through a GIS analysis. In the FAF4 network, average annual daily traffic (AADT) is quantified, including both passenger vehicles and trucks, for each road section, as presented in Figure 9(a). As expected, the corridors near metropolitan areas (e.g., Minneapolis, Chicago, and Detroit) have large AADT values, and the distribution of AADT is not clearly related to NHFN. To see the distribution of truck volume, we quantify

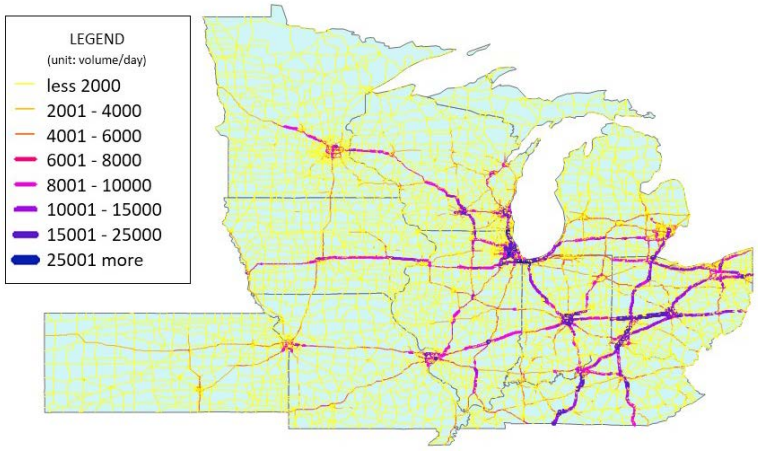
average annual daily truck traffic (AADTT) using all truck volumes for each road section as illustrated in Figure 9(b). Unlike the distribution of AADT, the corridors with large truck volumes largely correspond to the NHFN (Figure 6(b)). Specifically, I-94 (in Minnesota, Wisconsin, Illinois, Indiana and Michigan), I-90 (in Minnesota, Wisconsin, Illinois, Indiana and Ohio), I-80 (in Iowa, Illinois, Indiana, and Ohio), I-70 (in Kansas, Missouri, Illinois, Indiana, and Ohio), I-75 (in Kentucky, Ohio and Michigan), I-65 (in Kentucky and Indiana) and I-55 (in Illinois) are all well represented in Figure 9(b). The similarity with NHFN is even more noticeable with the distribution of long-distance truck volumes in the FAF4 network as presented in Figure 9(c). Thus, we can verify that the NHFN accurately represents the major freight corridors and network in the MAASTO region.

Distribution of AADT

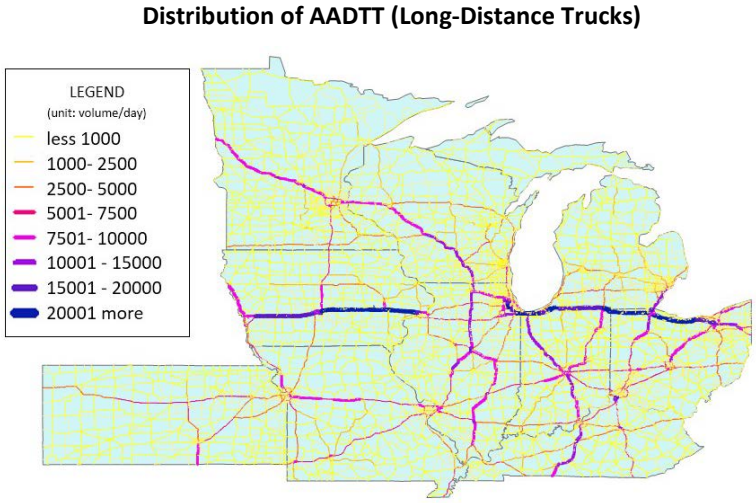


(a)

Distribution of AADTT (All Trucks)



(b)



(c)

Figure 9: NHFN and Truck Volume Distribution: (a) AADT; (b) AADTT (All Trucks); (c) AADTT (Long-Distance Trucks)

3.3. Freight Waterway Network

In the U.S., there are 25 Marine Highways that extend the surface transportation system with marine-based options. The inland rivers and Great Lakes can help relieve traffic congestion on freight highways and decrease air emissions *(25)*. In the MAASTO region, there are five major waterways of Marine Highway as presented in Figure 10. The detailed descriptions and freight weight/value from 2016 for each route are provided in Table 3. Specifically, the M-35 highway links the Upper Mississippi River with the M-55, which includes the Mississippi and Illinois Rivers. Those Marine Highways provide a waterway from the Mississippi River to the Gulf of Mexico. They also connect to other Marine Highways, such as M-90 (at Chicago, IL) and M-70 (at St. Louis, MO). The M-70 and M-29 include the Ohio, Mississippi, and Missouri Rivers, and connect the major ports from Pittsburgh to Kansas City (M-70) and from Kansas City to Sioux City (M-29). The M-90 route spans the entire Great Lakes area to the East Coast via the Saint Lawrence Seaway.

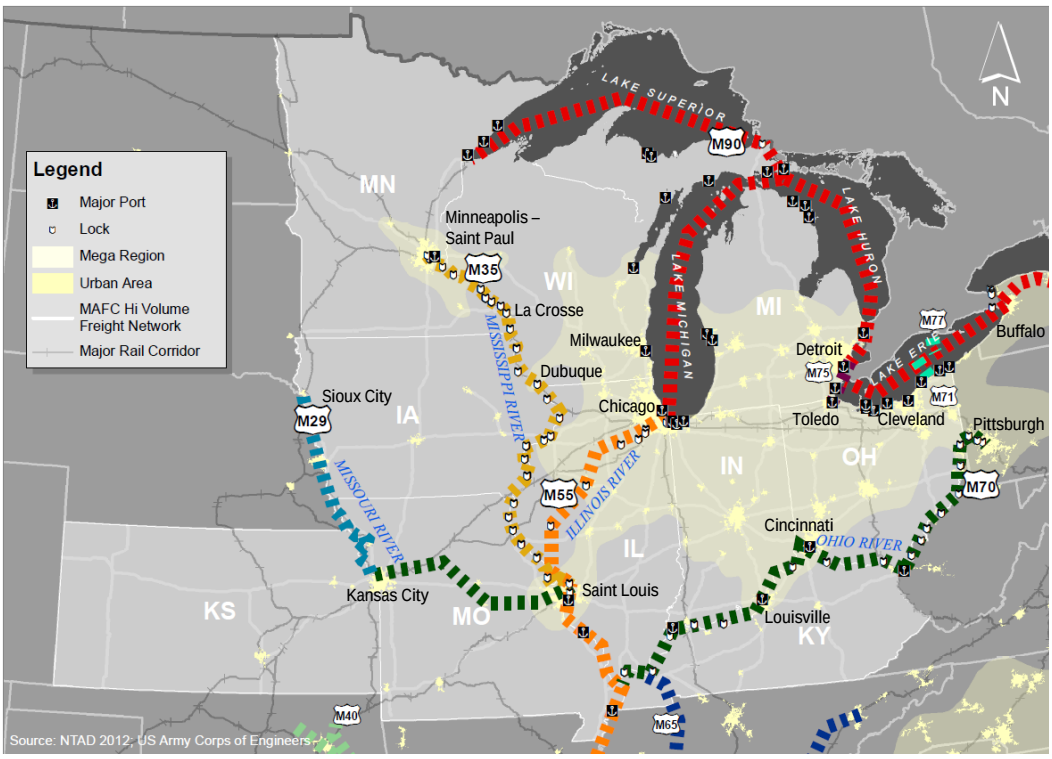


Figure 10: Marine Highways in the MAASTO Region (*26*)

Table 3: Description of the Marine Highways in the MAASTO region (*26, 27*)

Name	Length (miles)	Route	Major Ports	Major Cities/Markets	Freight weight (million ton)	Freight Value (million dollar)
M-35	636	St. Paul, MN to St. Louis, MO.	St. Paul, St. Louis.	Minneapolis-St. Paul, La Crosse, Dubuque, Quad Cities, St. Louis.	84.3	27,648
M-55	1,400	Lake Michigan at Chicago, Illinois to New Orleans, Louisiana.	Chicago, St. Louis, SE MO Port, Elvis Stahr Harbor, Memphis, Vicksburg, Baton Rouge, South Louisiana, New Orleans, Plaquemines.	Chicago, Peoria, St. Louis, Memphis, Baton Rouge, New Orleans.	534.2	188,170

M-70 & M-29	(M-70) 1541; (M-29) 366	(M70) Pittsburgh, PA to Port of Kansas City, MO; (M29) Port of Kansas City, MO to Sioux City, IA.	Port of Pittsburgh, Port of Huntington-Tri State, Port of Cincinnati, Port of Louisville, Port of Mount Vernon, Port of SE Missouri, Port of St. Louis, Port of Kansas City.	Pittsburgh, Cincinnati, Louisville, St. Louis, Kansas City.	213.2	44,561
M-90	1300	Lake Superior, Lake Michigan, Lake Huron, Lake Erie, Lake Ontario, the Saint Lawrence River.	Port of Duluth-Superior, MN-WI; Chicago, IL; Two Harbors, MN; Detroit, MI; Cleveland, OH; Toledo, OH; Indiana Harbor, IN; Port of Thunder Bay, Port of Hamilton, Port of Montreal, Port of Quebec.	Chicago, Milwaukee, Detroit, Toledo, Cleveland, Buffalo, Rochester, Toronto, Montreal, Quebec.	161.9	18,742

4. ECONOMIC VALUE OF FREIGHT CORRIDORS

In Section 3, we verified that the NHFN accurately represents the major freight corridors based on truck volume distribution and investigated the physical features of the corridors. Importantly, we found that the major freight corridors in the MAASTO region are multistate corridors. This underscores the need to look at freight corridors regionally and consider multistate collaboration on the investments and operations of economically important, multistate corridors. In this section, we investigate major commodities in the MAASTO region and propose a simple method to estimate the economic value for corridors. The GIS analysis results in the MAASTO region from the proposed method are also provided.

4.1. Commodities in the MAASTO Region

We investigate the FAF4 data to identify top commodities in the MAASTO region.[2] The description of commodities in the FAF4 data is presented in Table 4. Specifically, we add all weight (or value) of each commodity in the FAF4 data from/to each state to derive the commodity distribution. Figure 11(a) and Figure 11(b)-11(k) present the top 10 commodities based on the freight weight for the MAASTO region and each state respectively. In both the MAASTO region as a whole and most individual states, “Cereal Grain” (#2), “Coal” (#15), “Gravel and Crushed Stone” (#12), and “Other Coal and Petroleum Products” (#19) make up significant proportions of freight weight. Michigan stands out with a 6.5% proportion of “Motorized and Other Vehicles” (#36). On the other hand, Figure 12 shows the commodity distribution in terms of freight value. In this case, “Machinery” (#34), “Electronic and Other Electrical Equipment and Components, and Office Equipment” (#35), and “Motorized and Other Vehicles” (#36) make up large proportions.

This analysis shows that the distribution of freight value is different from that of freight weights across the corridors. Therefore, to determine priority corridors based on the economic value, the freight value of each corridor should be considered as well as freight weight (or truck volume). In the following section, we propose methods to estimate corridor value that take these factors into consideration.

Table 4: Code for Commodity in FAF4 Data (*17*)

Code	Commodity Description
1	Animals and Fish (live)
2	Cereal Grains (includes seed)
3	Agricultural Products (excludes Animal Feed, Cereal Grains, and Forage Products)
4	Animal Feed, Eggs, Honey, and Other Products of Animal Origin
5	Meat, Poultry, Fish, Seafood, and Their Preparations
6	Milled Grain Products and Preparations, and Bakery Products

[2] With the FAF4 data, the entire state of Iowa is treated as a single origination and destination zone. Further, in previous work completed in Iowa, it was shown that some of the state’s export grain products were shown as originating as an export from the Gulfport area in the FAF4 data. As a result, the FAF4 data for Iowa, as well as for most states, contain deficiencies in the tonnage, origination, and destination of freight shipments.

7	Other Prepared Foodstuffs, Fats and Oils
8	Alcoholic Beverages and Denatured Alcohol
9	Tobacco Products
10	Monumental or Building Stone
11	Natural Sands
12	Gravel and Crushed Stone (excludes Dolomite and Slate)
13	Other Non-Metallic Minerals not elsewhere classified
14	Metallic Ores and Concentrates
15	Coal
16	Crude Petroleum
17	Gasoline, Aviation Turbine Fuel, and Ethanol (includes Kerosene, and Fuel Alcohols)
18	Fuel Oils (includes Diesel, Bunker C, and Biodiesel)
19	Other Coal and Petroleum Products, not elsewhere classified
20	Basic Chemicals
21	Pharmaceutical Products
22	Fertilizers
23	Other Chemical Products and Preparations
24	Plastics and Rubber
25	Logs and Other Wood in the Rough
26	Wood Products
27	Pulp, Newsprint, Paper, and Paperboard
28	Paper or Paperboard Articles
29	Printed Products
30	Textiles, Leather, and Articles of Textiles or Leather
31	Non-Metallic Mineral Products
32	Base Metal in Primary or Semi-Finished Forms and in Finished Basic Shapes
33	Articles of Base Metal
34	Machinery
35	Electronic and Other Electrical Equipment and Components, and Office Equipment
36	Motorized and Other Vehicles (includes parts)
37	Transportation Equipment, not elsewhere classified
38	Precision Instruments and Apparatus
39	Furniture, Mattresses and Mattress Supports, Lamps, Lighting Fittings, and Illuminated Signs
40	Miscellaneous Manufactured Products
41	Waste and Scrap (excludes of agriculture or food)
43	Mixed Freight
99	Commodity unknown

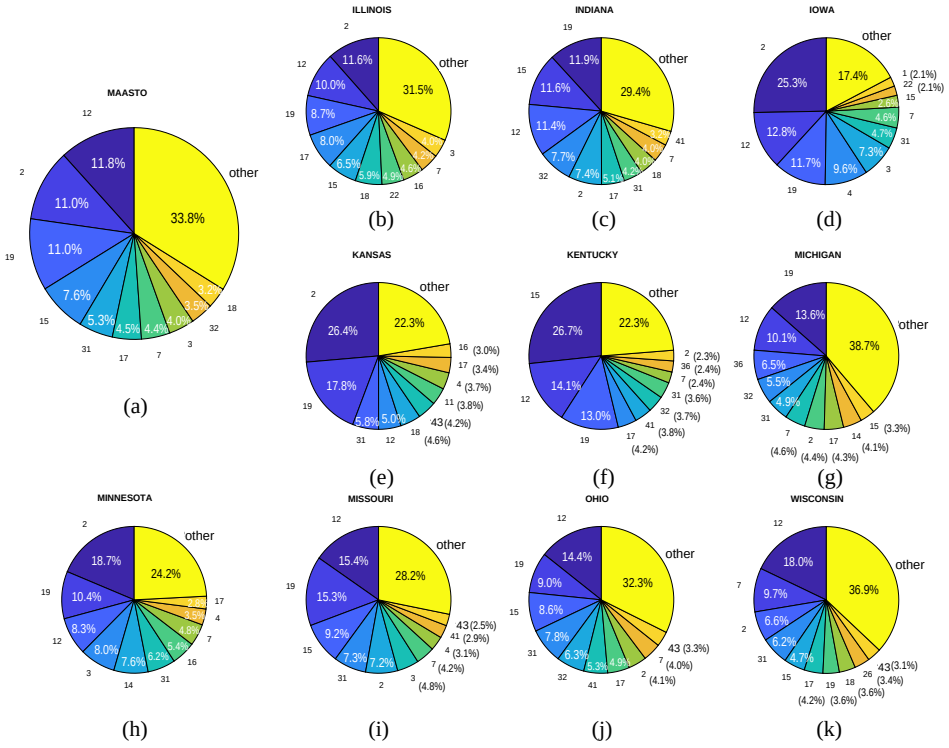


Figure 11: Commodity Distribution by Freight Weight

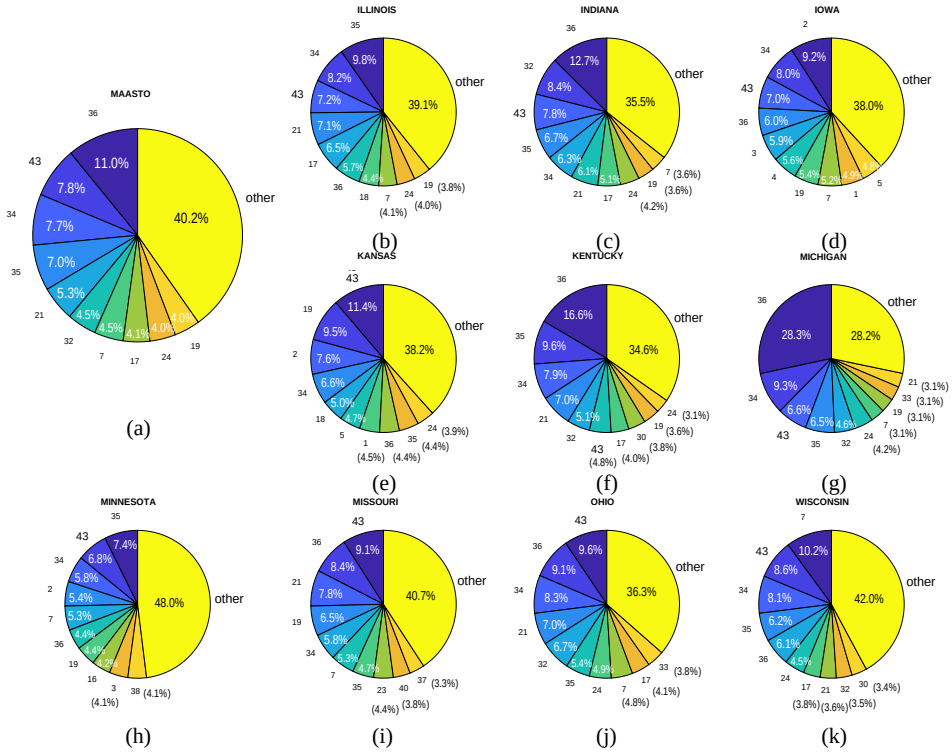


Figure 12: Commodity Distribution by Freight Value

4.2. Method to Estimate the Economic Value of a Corridor

As stated in Section 2.3, FAF4 provides an aggregated origin-destination (OD) table of tonnage and value for each mode at a level of state or CFS zone. Thus, deriving a corridor value from the large-scale FAF4 data directly is quite challenging. To account for this when estimating the economic value of a corridor, we assume that:

(i) The corridor value is proportional to the corridor's truck volume.

(ii) The value of each truck is proportional to the total value of freight in the travel area.

The first assumption simply indicates that a corridor with larger truck volumes has a higher value. The second assumption suggests that a freight truck has a higher value if it travels in an area with an overall higher value. These assumptions are obviously not precise as freight trucks traveling in the same area can have different values depending on its origin, destination, or commodity. However, these simplifying assumptions are made due to the lack of disaggregate freight economic data beyond the level of state and major urban regions in the FAF4 dataset.

Since one corridor is composed of multiple road sections with different truck volumes, we first derive the road section value, as:

$$V_s^{i,k} = V_a \times \frac{q_s^{i,k}}{\sum_{i=1}^{I} \sum_{k=1}^{K^i} q_s^{i,k}} \quad (1)$$

where, $V_s^{i,k}$ is the value for road section k (=1,… K^i) of corridor i, V_a is the total freight value of the area where corridor i extends, $q_s^{i,k}$ is the truck volume for road section k of corridor i, K^i is the number of road sections of corridor i (=1,… I), and I is the number of corridors in the area. Note that, for the case study in the MAASTO region, the area is defined as 29 CFS zones including metropolitan areas and the remainder of each state for consistency with FAF4 data. But, to derive more sophisticated results, disaggregating FAF data to smaller zones would be feasible using existing methods *(8, 9, 28, 29)*. We also define the total freight value of area, V_a, as the sum of all values from/to the area in FAF4 data, and use long-distance truck volumes since freight transportation in FAF4 is mostly long-distance travel rather than local activity. These road section values, $V_s^{i,k}$, are used for GIS analysis in the following subsection. To estimate the corridor value, the length of road sections within the corridor should be considered: Thus, we define the corridor total value (in dollar-miles) as:

$$V_c^i = \sum_{k=1}^{K^i} \left(V_s^{i,k} \times l_s^{i,k} \right) \quad (2)$$

where, V_c^i is the total value of corridor i, and $l_s^{i,k}$ is the length of road section k in corridor i. Equation (2) shows that a corridor will have a relatively large value when (i) the length of the corridor is long, or (ii) the value of road sections is large. Thus, V_c^i presents physical (by $l_s^{i,k}$), operational (by $q_s^{i,k}$ in (1)), and area-specific economic (V_a in (1)) characteristics. We also derive the average value of the corridor (in dollars) as:

$$\bar{V}_c^i = \frac{V_c^i}{\sum_{k=1}^{K^i} l_s^{i,k}} \quad (3)$$

4.3. Economic Value of Freight Corridors in the MAASTO Region

Using the method presented in the previous subsection, we estimate corridor values for the NHFN in the MAASTO region. First, we derive the value of each road section on the NHFN and then quantify the value in a GIS map as presented in Figure 13. The result shows that I-94 (in Minnesota and Wisconsin) and I-80 (in Iowa, Illinois, Indiana, and Ohio) have relatively large

values. Other major Interstates of east-west direction, I-90 (in Illinois, Indiana, and Ohio) and I-70 (in Kansas, Missouri, Illinois, Indiana, and Ohio), and north-south direction, I-75 (in Kentucky, Ohio, and Michigan), I-65 (in Kentucky and Indiana) and I-55 (in Missouri and Illinois) also have large values.

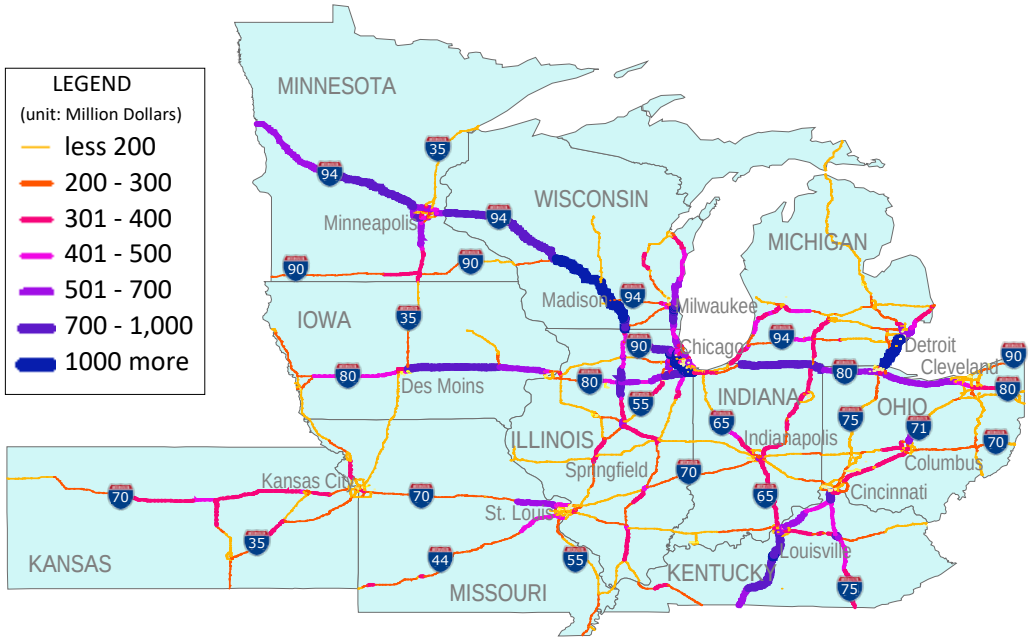


Figure 13: Distribution of Road Section Value in the MAASTO Region

The corridor values are investigated at the state and interstate levels in more detail. Figure 14(a) shows the value of each state, which is the sum of the truck freight values from/to the state in the FAF4 data. The proportion of the total value in each state ranges from 5.7% (Kansas) to 20.2% (Illinois). We also investigate the value distribution as presented in Figure 14(b)–6(k). The results show that the area value is distributed widely to multiple corridors in some states (e.g, Illinois or Indiana) or concentrated on several major corridors in others (e.g., Iowa, Kansas, Minnesota or Wisconsin).

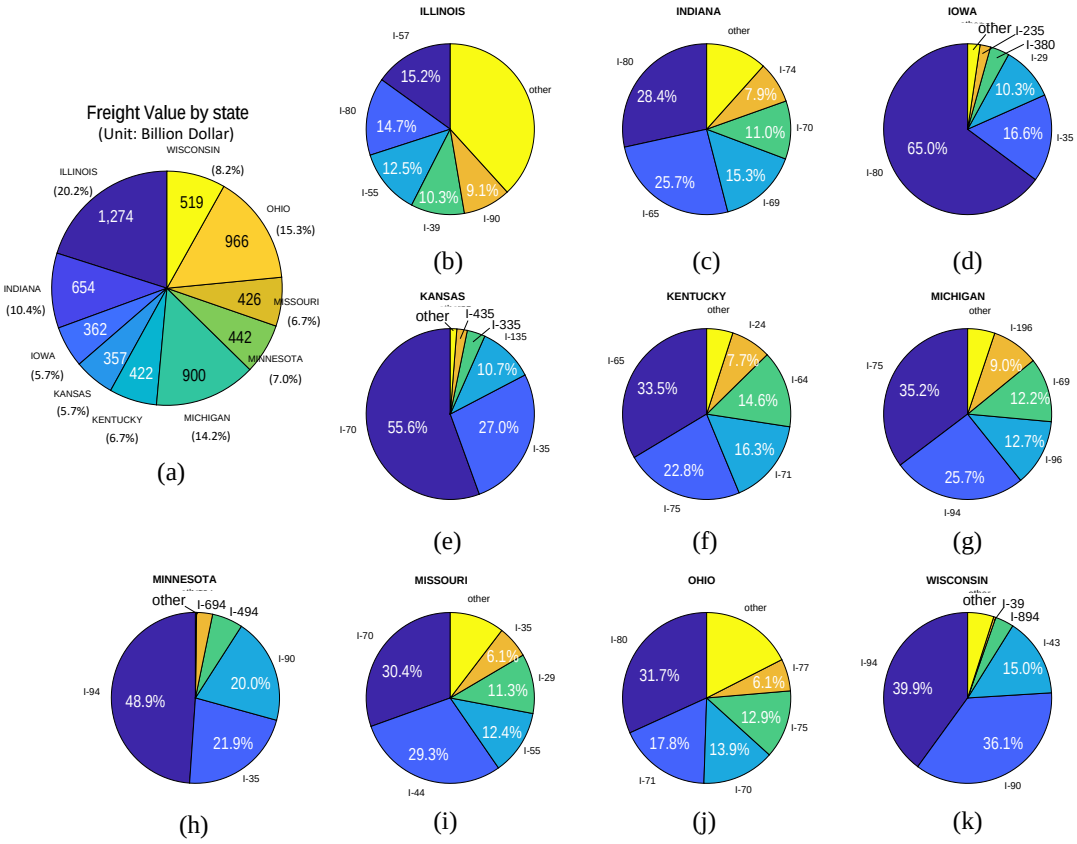


Figure 14: Corridor Values at the State Level, and Distributions for Major Freight Corridors

This research also investigates the value distribution at the regional (spanning multiple states) level. Figure 15(a) shows the value distribution in the MAASTO region for each Interstate. Similar to the result of the GIS analysis in Figure 5, I-80, I-94, I-70, I-90, and I-75 have a large portion of the total value. Interestingly, the value distribution has a different order (and proportion) as compared to the length distribution (see Figure 7(a)). In Figure 7(a), I-70 has the largest proportion for length, but it is the third highest in terms of corridor total value in Figure 14(a). This indicates that I-70 is the longest corridor in the MAASTO region, but its overall value is relatively smaller compared to other major corridors. Note that the GIS analysis in Figure 13 also shows that the value of I-70 is not as prominent as the other Interstates, in general. On the other hand, I-80 has 13.3% of the value (in Figure 15(a)) though the proportion of length is only 7.1% (in Figure 7(a)). The changes of proportions of the length distributions as compared to the value distributions for eight major corridors that are included in both Figure 7(a) and Figure 15(a) are presented as: increasing (I-80: △6.2%, I-94: △5.6%, I-90 △3.1%, I-65: △2.1%, and I-75: △0.1%) and decreasing (I-35: ▽1.7%, I-55: ▽1.3%, and I-70: ▽0.9%). In addition, the proportion of "other" corridors (except the top ten corridors for length or value) decrease from 40.1% (length) to 28.9% (value), which shows that the value of the major corridors is more significant than other corridors.

Figure 15(b)–15(f) shows the proportion by state for major freight corridors. This distribution is also different when comparing the proportion of corridor length in Figure 7(b)-7(f) since the corridor total value is affected by the total value of the area (e.g., CFS zone) and the truck volume as well as the corridor length. For example, the breakdown of the total value of I-

80 is: Iowa (35.2%), Ohio (24.2%), Indiana (20.4%), and Illinois (20.3%) respectively. In comparison, the breakdown of the length is: Iowa (34.3%, ▽0.9%), Ohio (28.2%, △4.0%), Indiana (18.0%, ▽2.4%), and Illinois (19.5%, ▽0.8%). Thus, the derived corridor values provide a different perspective for the characteristics of corridors than physical (e.g., length) and operational (e.g., volume) features.

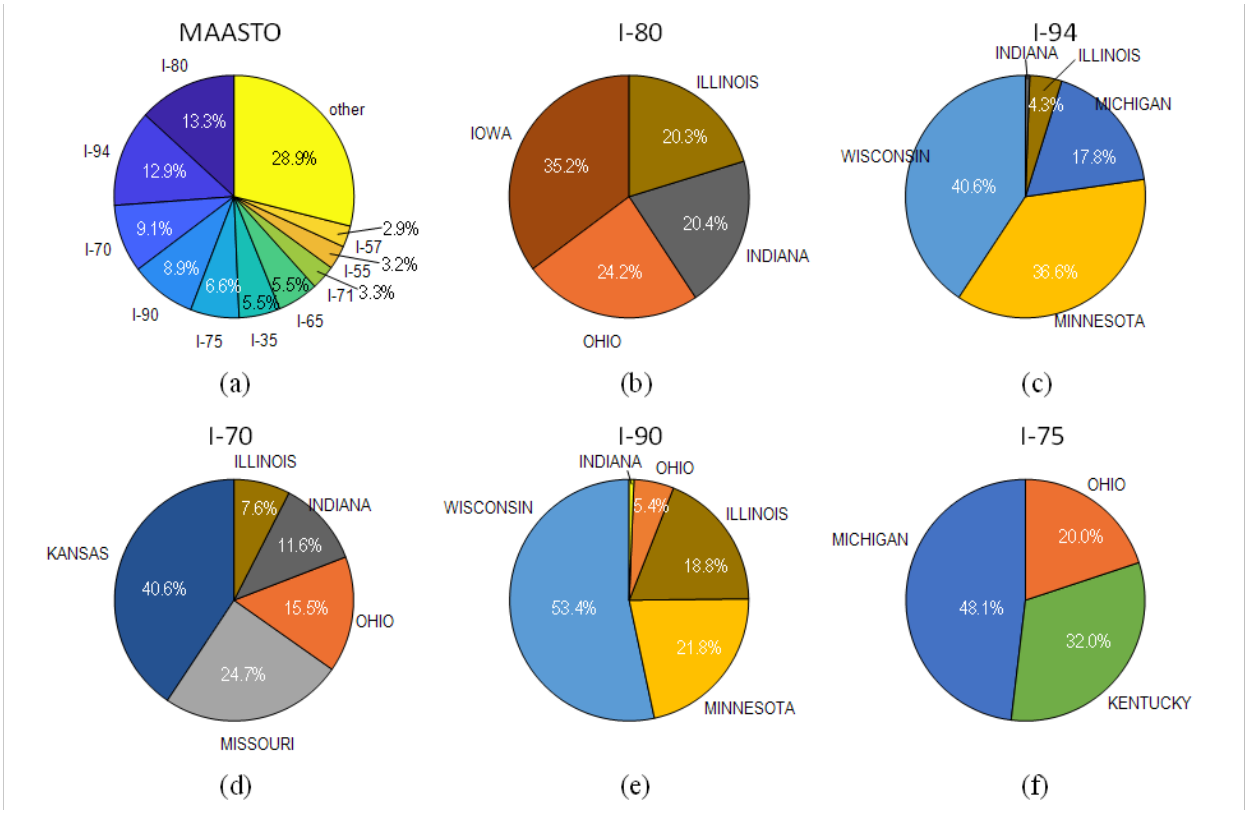


Figure 15: (a) The Top Ten Value Corridors in the MAASTO Region; (b)–(f) Proportion of States for the Top Five Value Corridors

Finally, Figure 16 presents the top 20 corridors in terms of the average value derived in equation (3). Note that, this average value is unit value that divide total value of corridor by its length. The corridors of large value in Figure 15(a) are also presented in this result though the rankings are different (e.g., I-80: 1st → 3rd, I-94: 2nd → 5th, and I-70: 3rd → 17th). Figure 17 shows the top seven corridors of average value for each state. These results include some corridors that have relatively short lengths but large average corridor values. For example, the length of I-190, which extends near Chicago O'Hare airport in Illinois, is 1.8 miles, but it has the largest average corridor value of 1,065 million dollars. Thus, for prioritization of freight corridors, we should consider both the "total value" and "average value" of corridors.

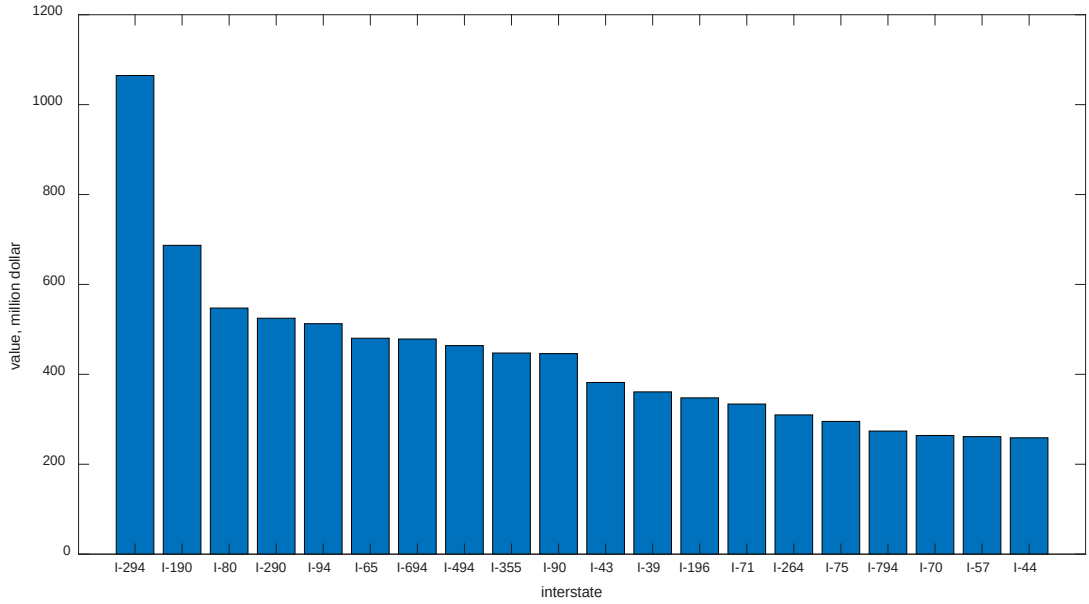


Figure 16: Top Twenty Corridors That Have the Largest Average Corridor Value in the MAASTO Region

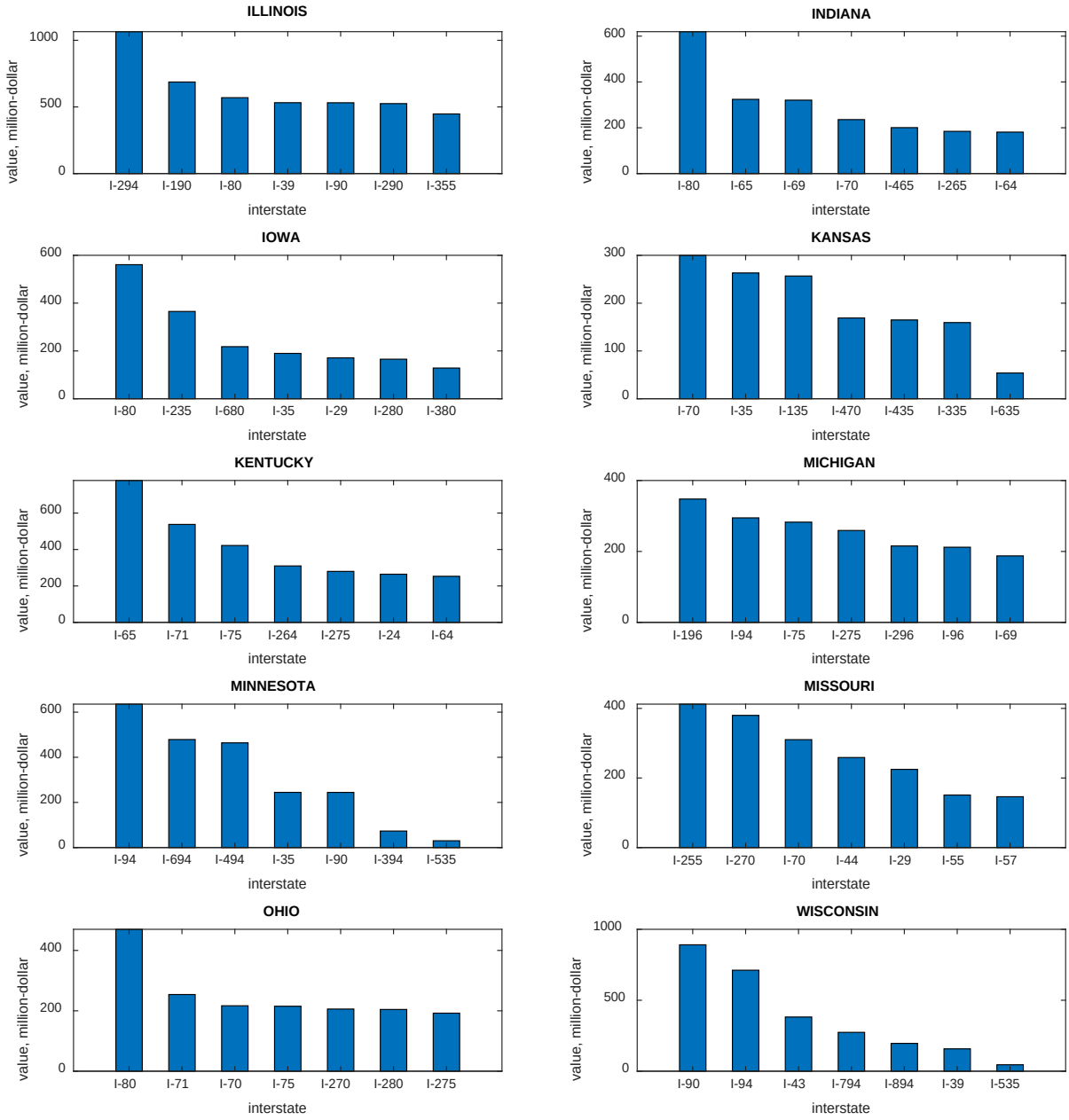


Figure 17: Top Seven Corridors That Have the Largest Average Corridor Value in Each State

5. IMPORTANCE OF FREIGHT CORRIDORS WITH ECONOMIC ACTIVITY

This section verifies the importance of major freight corridors from previous sections in terms of economic activity. Specifically, GIS analysis is conducted to estimate the number of businesses and employees located within certain buffer areas along each side of corridors of the NHFN. Note that ESRI's Business Analyst data of 2017 is used for the business activity. Initially, we consider a three-mile buffer from each side of the corridors. Table 5 shows the analysis results. In the MAASTO region, 56.1% of businesses and 63.9% of employees are located within three miles of freight corridors, i.e. the NHFN. For the state level, Illinois has the largest proportion of businesses (67.2%) and employees (71.8%), and Indiana, Kansas, Michigan, Missouri, Ohio, and Wisconsin also have proportions larger than 50% of both businesses and employees. Iowa shows the lowest proportion of 35.9% of businesses, and 48.1% of employees.

We also consider different buffer lengths for urban and rural areas since the business activities in urban areas are more concentrated than rural areas. Thus, we reduce the buffer length in urban areas to one mile while maintaining a three-mile buffer in rural areas. The results are presented in Table 6. In the MAASTO region, 29.5% of businesses and 33.6% of employees are located within one-mile (urban) and three-mile (rural) areas of freight corridors.

These results clearly show that the major freight corridors provide for significant economic activity and support local and regional economies. The access, continuity and multistate presence of these corridors are imperative for continued economic performance and growth.

Table 5: Businesses and Employees within 3-Mile Buffer from Freight Corridors

State	Businesses			Employees		
	All	Within 3 miles	% within 3 Miles	All	Within 3 miles	% within 3 Miles
IL	445,998	299,645	67.2%	6,447,795	4,628,743	71.8%
IA	129,531	46,481	35.9%	1,755,974	844,548	48.1%
IN	217,276	109,984	50.6%	3,240,564	1,844,048	56.9%
KS	115,231	59,061	51.3%	1,590,880	988,909	62.2%
KY	146,932	72,429	49.3%	1,977,054	1,143,474	57.8%
MI	340,324	191,290	56.2%	4,769,230	2,954,492	61.9%
MN	209,696	104,633	49.9%	3,248,786	1,924,083	59.2%
MO	221,360	122,104	55.2%	3,169,805	2,045,437	64.5%
OH	393,047	253,923	64.6%	6,200,259	4,453,282	71.8%
WI	223,366	111,740	50.0%	3,201,051	1,923,703	60.1%
MAASTO	**2,442,761**	**1,371,290**	**56.1%**	**35,601,398**	**22,750,719**	**63.9%**

Table 6: Businesses and Employees within 1-Mile (Urban) and 3-Mile (Rural) Buffer from Freight Corridors

State	Businesses			Employees		
	All	Within 1 or 3 miles	% within 1 or 3 Miles	All	Within 1 or 3 miles	% within 1 or 3 Miles
IL	445,998	141,150	31.6%	6,447,795	2,203,860	34.2%
IA	129,531	24,722	19.1%	1,755,974	428,413	24.4%
IN	217,276	57,818	26.6%	3,240,564	945,032	29.2%
KS	115,231	37,088	32.2%	1,590,880	613,353	38.6%
KY	146,932	46,282	31.5%	1,977,054	737,418	37.3%
MI	340,324	87,618	25.7%	4,769,230	1,298,712	27.2%
MN	209,696	63,328	30.2%	3,248,786	1,143,056	35.2%
MO	221,360	69,913	31.6%	3,169,805	1,246,780	39.3%
OH	393,047	144,767	36.8%	6,200,259	2,553,405	41.2%
WI	223,366	49,090	22.0%	3,201,051	806,480	25.2%
MAASTO	**2,442,761**	**721,766**	**29.5%**	**35,601,398**	**11,976,509**	**33.6%**

6. MAJOR FREIGHT CORRIDORS FROM STATE DOT RESPONSE

We asked each state DOT in the MAASTO region to identify their major economic corridors along with a qualitative definition of the freight network. The response results with description are presented in Table 7. The top five corridors that have the largest corridor value from Section 4 and multi-state corridors are also presented in the third and fourth columns respectively in Table 7 to compare to the responses from the DOTs. The corridors selected by the state DOTs mostly included the freight corridors with high economic value estimated in this research, demonstrating consistency.

Table 7: Response from State DOT for Major Economic Corridors

State	Response from DOT	Top 5 Valued Corridors	Multi-State Corridors
IA	• I-80, I-35, Avenue of the Saints (I-35/I-380/US18/US218/IA 27): All three corridors are driven by the same industries and freight generators—agriculture facilities, distribution/warehousing facilities, and manufacturing facilities. I-80 has a lot of pass-thru traffic, as well.	I-80, I-35, I-29, I-380, I-235	I-29 (IA, MO) I-35 (IA, KS, MN, MO)
IL	• I-90/I94: Transcontinental east-west route serving the northeast Illinois transportation and manufacturing hub. Major commodities include machinery, motorized vehicles, electronics, base metals, plastics/rubber, and food/beverages. • I-80: Transcontinental east-west route serving the northeast Illinois transportation and manufacturing hub. Major commodities include machinery, motorized vehicles, electronics, base metals, plastics/rubber, food/beverages, and agricultural products. • I-55: Major north-south route from the Great Lakes to the Gulf of Mexico which also connects the Chicago and St. Louis metropolitan areas. Major commodities include machinery, motorized vehicles, electronics, plastics/rubber, food/beverages, agricultural products, and minerals.	I-57, I-80, I-55, I-39, I-90	I-39 (IL, WI) I-55 (IL, MO) I-65 (IN, KY) I-69 (IN, MI) I-70 (IN, KS, MO, OH) I-71 (KY, OH) I-75 (KY, MI, OH) I-80 (IL, IA, IN, OH) I-90 (IL, MN, WI) I-94 (MI, MN, WI)

IN	• I-65: Heavy truck volume, major north-south interstate connecting Illinois and Michigan with Kentucky and states south of there. Major industries contributing include steel (on the north end) and agriculture (throughout the state), but there are a large number of logistics hubs located along the route that distribute of any number of consumer and other products. There are at least a couple of big manufacturers on the I-65 corridor outside of Indianapolis (Subaru and Cummins come immediately to mind, and GE Aviation is growing rapidly) and some large food production centers. Indianapolis still has a good manufacturing presence. • I-70: Heavy truck volume, major east-west Interstate connecting Ohio and Illinois. The FedEx hub at the Indianapolis International Airport is on this corridor. As with I-65, there is a good manufacturing and logistics center presence along the corridor, but not overwhelmingly one thing. Outside of Indianapolis, on this corridor, Terre Haute seems to be a center for some specialized manufacturing (advanced materials, chemicals, biomedical), as are some other communities that are not right on the corridor but are accessible from it. Again, Indianapolis has a good manufacturing presence. • I-80 (I-90, I-94): Steel and other manufacturing in the northwest corner and the RV industry in the Elkhart area are the biggies. • Once I-69 is completed through Indiana, I expect this corridor to be very busy—it already is fairly busy, but I don't think we'll see the full extent until it is complete. Fort Wayne to the northeast and Bloomington to the southwest have significant biomedical and chemical manufacturing, and Indianapolis does as well. We'll also see a lot of pass-through.	I-80, I-65, I-69, I-70, I-74	
KS	• I-70: Agriculture—outbound grains; inbound fertilizers/additives and farm equipment; key connections to manufacturing and distribution facilities along the entire route. • I-135: outbound grains; inbound fertilizers/additives and farm equipment; key connections to manufacturing and distribution facilities along the entire route; wind energy components and other permitted loads. • I-35: BNSF intermodal facility; Logistics Park KC (distribution and warehousing); key connections to manufacturing and other distribution facilities along the entire route.	I-70, I-35, I-135, I-335, I-435	
KY	• I-75: Connects KY to Ohio, the northern states, the Great Lakes and Canada. To the south, it connects KY to Tennessee, southern states, the southern portion of the eastern seaboard and the Gulf of Mexico. • I-65: Connects KY to Indiana, the northern states, the Great Lakes and Canada. To the south, it connects KY to Tennessee, southern states, the Gulf of Mexico, and Mexico. • Tie between I-64 and I-71: They both provide connections to neighboring states but more importantly they both complete the economic triangle in KY made up between Cincinnati/Northern Kentucky, Louisville, and Lexington.	I-65, I-75, I-71, I-64, I-24	

MI	• I-75: Transportation equipment, nonmetallic ores, chemicals • I-94: Transportation equipment, agriculture, food products • I-69: Transportation equipment, agriculture	I-75, I-94, I-96, I-69, I-196	
MN	• I-35, I-90, and I-94: Almost all goods traveling by truck move through the state on one of these corridors. This includes Minnesota exports and imports as well as pass-through freight.	I-94, I-35, I-90, I-494, I-694	
MO	• I-70, I-44, I-270, I-435, and I-35: As with other states, we are having some challenges with freight generators since Amazon has opened several locations in Missouri and we are trying to identify how much impact that is going to have on freight traffic.	I-70, I-44, I-55, I-29, I-35	
OH	• I-75: Heavy north-south automobile industry supply chain route, electronics, high-value goods, western Ohio Agriculture corridor, and petroleum. • I-70: One of the country's key east-west freight corridors. Geographically to the north are the great lakes and to the south are the Appalachian Mountains. It threads between those two from east coast ports to the Midwest. This is a petroleum corridor with shale gas particularly from eastern Ohio to the west. Other commodities include chemicals, warehousing & logistics distribution. Along the western edge between Columbus & Indianapolis, there are agricultural commodities. • I-71: The heaviest freight internal route to Ohio and external to the country. Heavy scrap and primary metals, high-value goods, food products, and lumber/paper.	I-80, I-71, I-70, I-75, I-77	
WI	• I-94: Significant freight corridor connecting major manufacturing and population centers in Milwaukee and Madison to Chicago in the south and Minneapolis/St. Paul in the northwest. Large volumes of overhead truck traffic. • I-90: Significant freight corridor connecting Wisconsin to the U.S. east and west coasts. Large volumes of overhead truck traffic. • I-43: Significant freight corridor connecting Green Bay and Beloit, via Milwaukee. Includes major manufacturing centers along Lake Michigan. • I-41: Significant freight corridor connecting Green Bay and Milwaukee. Includes major manufacturing centers in Fond du Lac, Oshkosh, and Appleton.	I-94, I-90, I-43, I-894, I-39	

7. CONCLUSION

This research investigated the physical and operational features of corridors to verify and rank the freight network in the MAASTO region using the FAF4 data, business location data, and state DOT verification. The freight network in the MAASTO region was verified by the truck volume distribution (particularly the distribution of long-distance truck volume) using a GIS analysis. These results verified its close relationship with the NHFN. A simple method to estimate corridor value was proposed, and a statistical analysis in the MAASTO region was conducted. Results presented the principal corridors that have relatively large economic values for each state. The analysis for multi-state corridors also showed the relative values of states for each corridor. The corridor value accommodates physical and operational features of the corridors as well as characteristics of the areas where the corridors extend. The freight network was also verified with the proximity to economic activity in terms of the number of businesses and employees within a three-mile buffer from each side of the freight corridors. The responses from state DOTs describing their major freight corridors are also presented.

There are several issues that merit future research. To identify a major freight network, we used the truck volume distribution as a quantitative index for highway freight transportation. However, qualitative factors, such as connectivity to freight facilities or other modes, should be considered to complete the assessment of the multimodal freight transportation network. To estimate the corridor value, we assumed that the value of each truck is related to the total value of the travel area. However, some trucks may just pass through the area and their values likely depend more on their origins and destinations. Thus, to derive more accurate corridor values, more information related to passing freight trucks should be considered.

Further, as our transportation regions have realized the importance of freight corridors and especially multistate corridors, this analysis is a step toward prioritization of multistate freight corridors. Based on this information, multistate corridors can be selected for regional projects or synchronized for state-by-state improvements. Indeed, freight knows no borders and the multistate approach can better guide investments by departments of transportation and freight operations.

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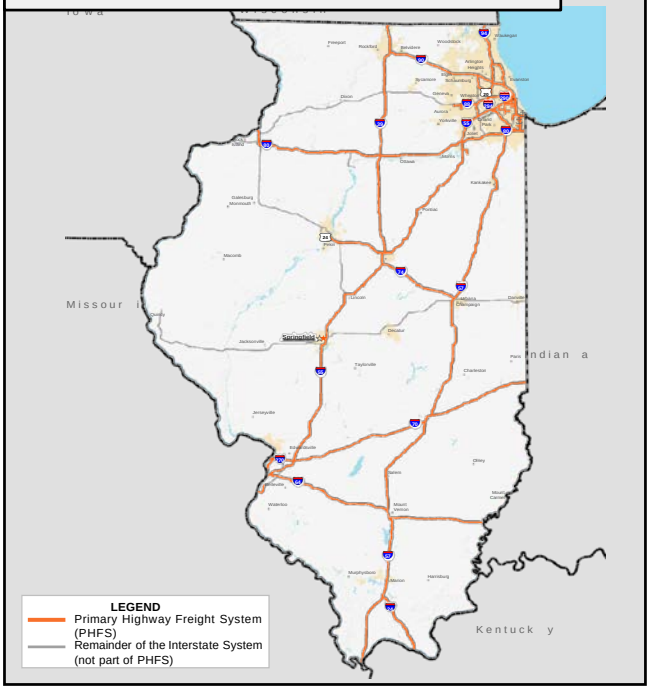
Appendices

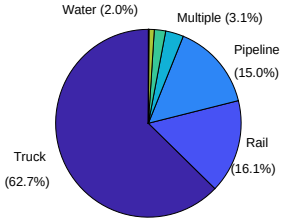
MID-AMERICA FREIGHT COALITION

Identification and Characterization of the Freight Network in Illinois

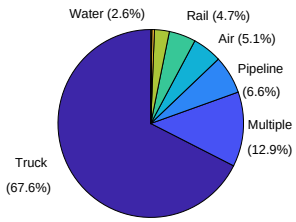
National Highway Freight Network



Mode Distribution

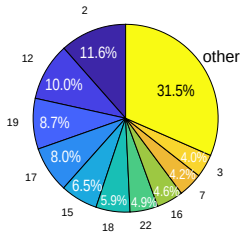


By Freight Weight

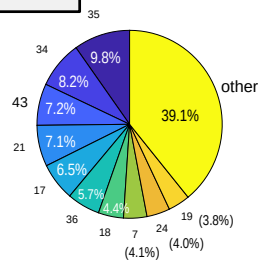


By Freight Value

Commodity Distribution



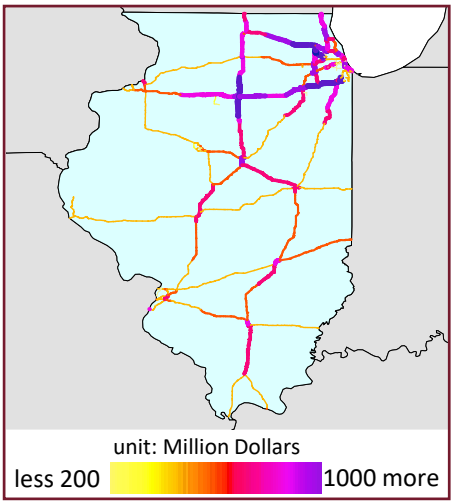
By Freight Weight



By Freight Value

* See the following page for code of commodity

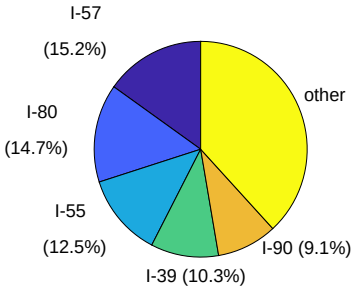
Corridor Value



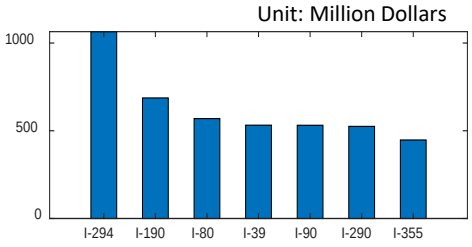
Corridor Value by TMC

Major Freight Corridors

Corridor	I-57	I-80	I-55	I-39	I-90
Value (Billion Dollar·Mile)	96.2	93.5	79.2	65.3	57.9



Corridor Value Distribution



Corridor Value per Unit Mile

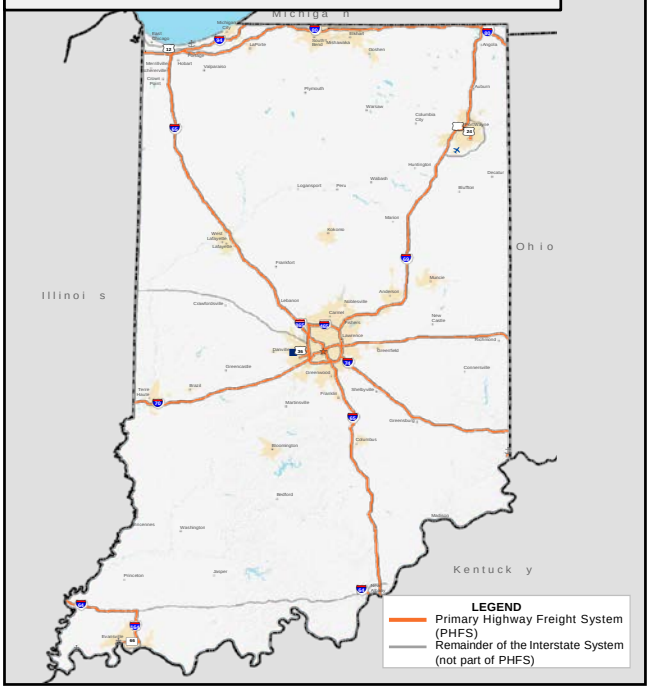
- In Illinois, the *Truck* mode has the largest portion at 62.7% and 67.6% based on the freight weight and value respectively.
- The major commodities are *Grains* (11.6%), *Gravel/Stone* (10.0%), and *Other Coal and Petroleum Products* (8.7%) by freight weight, and *Electronics* (9.8%), *Machinery* (8.2%), and *Mixed Freight* (7.2%) by freight value.
- The top five freight corridors in terms of total economic value are I-57, I-80, I-55, I-39, and I-90.
- The top five freight corridors in terms of value per unit mile are I-294, I-190, I-80, I-39, and I-90.

Code	Commodity Description
1	Animals and Fish (live)
2	Cereal Grains (includes seed)
3	Agricultural Products (excludes Animal Feed, Cereal Grains, and Forage Products)
4	Animal Feed, Eggs, Honey, and Other Products of Animal Origin
5	Meat, Poultry, Fish, Seafood, and Their Preparations
6	Milled Grain Products and Preparations, and Bakery Products
7	Other Prepared Foodstuffs, Fats and Oils
8	Alcoholic Beverages and Denatured Alcohol
9	Tobacco Products
10	Monumental or Building Stone
11	Natural Sands
12	Gravel and Crushed Stone (excludes Dolomite and Slate)
13	Other Non-Metallic Minerals not elsewhere classified
14	Metallic Ores and Concentrates
15	Coal
16	Crude Petroleum
17	Gasoline, Aviation Turbine Fuel, and Ethanol (includes Kerosene, and Fuel Alcohols)
18	Fuel Oils (includes Diesel, Bunker C, and Biodiesel)
19	Other Coal and Petroleum Products, not elsewhere classified
20	Basic Chemicals
21	Pharmaceutical Products
22	Fertilizers
23	Other Chemical Products and Preparations
24	Plastics and Rubber
25	Logs and Other Wood in the Rough
26	Wood Products
27	Pulp, Newsprint, Paper, and Paperboard
28	Paper or Paperboard Articles
29	Printed Products
30	Textiles, Leather, and Articles of Textiles or Leather
31	Non-Metallic Mineral Products
32	Base Metal in Primary or Semi-Finished Forms and in Finished Basic Shapes
33	Articles of Base Metal
34	Machinery
35	Electronic and Other Electrical Equipment and Components, and Office Equipment
36	Motorized and Other Vehicles (includes parts)
37	Transportation Equipment, not elsewhere classified
38	Precision Instruments and Apparatus
39	Furniture, Mattresses and Mattress Supports, Lamps, Lighting Fittings, and Illuminated Signs
40	Miscellaneous Manufactured Products
41	Waste and Scrap (excludes of agriculture or food)
43	Mixed Freight
99	Commodity unknown

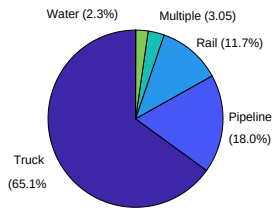
MID-AMERICA FREIGHT COALITION

Identification and Characterization of the Freight Network in Indiana

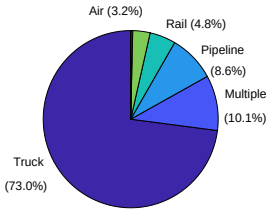
National Highway Freight Network



Mode Distribution

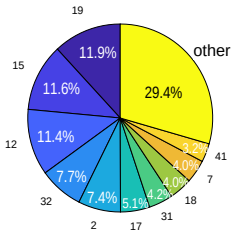


By Freight Weight

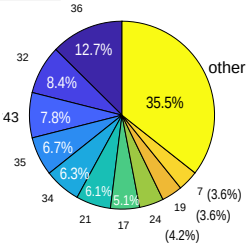


By Freight Value

Commodity Distribution



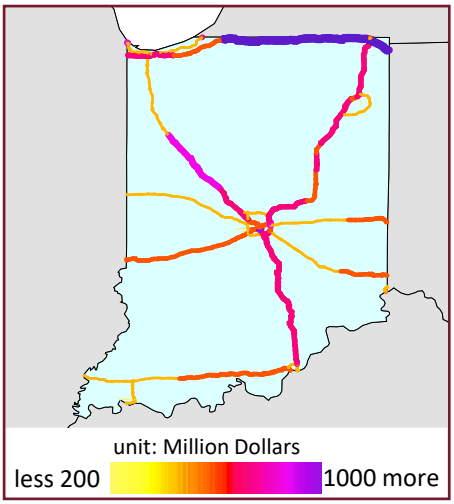
By Freight Weight



By Freight Value

* See the following page for code of commodity

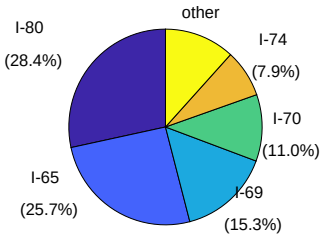
Corridor Value



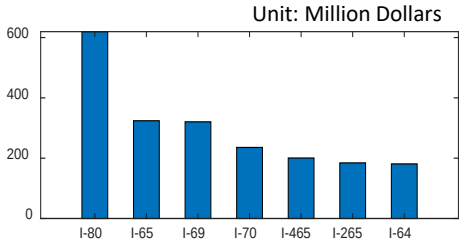
Corridor Value by TMC

Major Freight Corridors

Corridor	I-80	I-65	I-69	I-70	I-74
Value (Billion Dollar·Mile)	93.9	85.0	50.6	36.4	26.1



Corridor Value Distribution



Corridor Value per Unit Mile

- In Indiana, the *Truck* mode has the largest portion at 65.1% and 73.0% based on the freight weight and value respectively.
- The major commodities are *Other Coal and Petroleum Products* (11.9%), *Coal* (11.6%), and *Gravel/Stone* (11.4%) by freight weight, and *Vehicles* (12.7%), *Base Metal* (8.4%), and *Mixed Freight* (7.8%) by freight value.
- The top five freight corridors in terms of total economic value are I-80, I-65, I-69, I-70, and I-74.
- The top five freight corridors in terms of value per unit mile are I-80, I-65, I-69, I-70, and I-74.

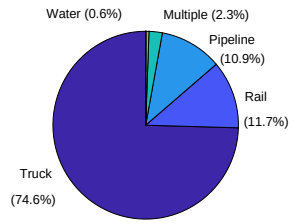
Code	Commodity Description
1	Animals and Fish (live)
2	Cereal Grains (includes seed)
3	Agricultural Products (excludes Animal Feed, Cereal Grains, and Forage Products)
4	Animal Feed, Eggs, Honey, and Other Products of Animal Origin
5	Meat, Poultry, Fish, Seafood, and Their Preparations
6	Milled Grain Products and Preparations, and Bakery Products
7	Other Prepared Foodstuffs, Fats and Oils
8	Alcoholic Beverages and Denatured Alcohol
9	Tobacco Products
10	Monumental or Building Stone
11	Natural Sands
12	Gravel and Crushed Stone (excludes Dolomite and Slate)
13	Other Non-Metallic Minerals not elsewhere classified
14	Metallic Ores and Concentrates
15	Coal
16	Crude Petroleum
17	Gasoline, Aviation Turbine Fuel, and Ethanol (includes Kerosene, and Fuel Alcohols)
18	Fuel Oils (includes Diesel, Bunker C, and Biodiesel)
19	Other Coal and Petroleum Products, not elsewhere classified
20	Basic Chemicals
21	Pharmaceutical Products
22	Fertilizers
23	Other Chemical Products and Preparations
24	Plastics and Rubber
25	Logs and Other Wood in the Rough
26	Wood Products
27	Pulp, Newsprint, Paper, and Paperboard
28	Paper or Paperboard Articles
29	Printed Products
30	Textiles, Leather, and Articles of Textiles or Leather
31	Non-Metallic Mineral Products
32	Base Metal in Primary or Semi-Finished Forms and in Finished Basic Shapes
33	Articles of Base Metal
34	Machinery
35	Electronic and Other Electrical Equipment and Components, and Office Equipment
36	Motorized and Other Vehicles (includes parts)
37	Transportation Equipment, not elsewhere classified
38	Precision Instruments and Apparatus
39	Furniture, Mattresses and Mattress Supports, Lamps, Lighting Fittings, and Illuminated Signs
40	Miscellaneous Manufactured Products
41	Waste and Scrap (excludes of agriculture or food)
43	Mixed Freight
99	Commodity unknown

MID-AMERICA FREIGHT COALITION

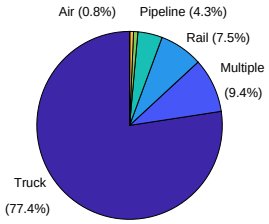
Identification and Characterization of the Freight Network in Iowa

National Highway Freight Network

Mode Distribution

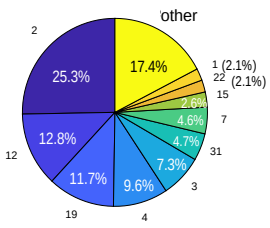


By Freight Weight

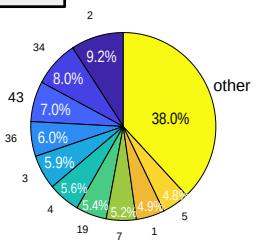


By Freight Value

Commodity Distribution



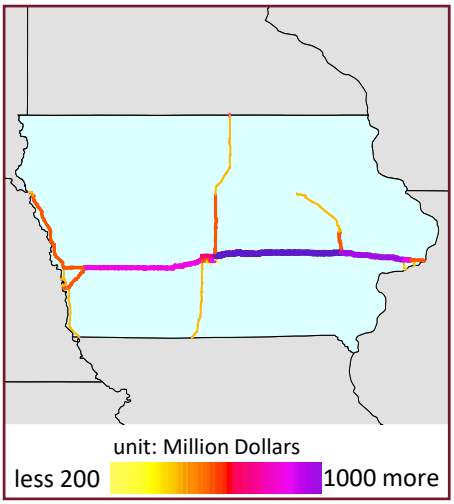
By Freight Weight



By Freight Value

* See the following page for code of commodity

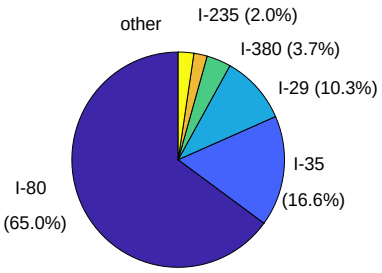
Corridor Value



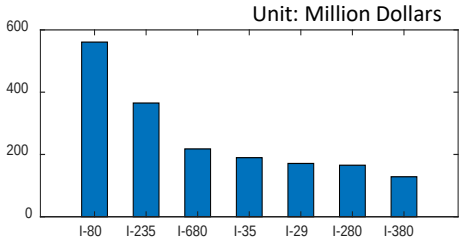
Corridor Value by TMC

Major Freight Corridors

Corridor	I-80	I-35	I-29	I-380	I-235
Value (Billion Dollar·Mile)	162.1	41.4	25.8	9.2	5.0



Corridor Value Distribution



Corridor Value per Unit Mile

- In Iowa, the *Truck* mode has the largest portion at 74.6% and 77.4% based on the freight weight and value respectively.
- The major commodities are *Grains* (25.3%), *Gravel/Stone* (12.8%), and *Other Coal and Petroleum Products* (11.7%) by freight weight, and *Grains* (9.2%), *Machinery* (8.0%), and *Mixed Freight* (7.0%) by freight value.
- The top five freight corridors in terms of total economic value are I-80, I-35, I-29, I-380, and I-235.
- The top five freight corridors in terms of value per unit mile are I-80, I-235, I-680, I-35, and I-29.

Code	Commodity Description
1	Animals and Fish (live)
2	Cereal Grains (includes seed)
3	Agricultural Products (excludes Animal Feed, Cereal Grains, and Forage Products)
4	Animal Feed, Eggs, Honey, and Other Products of Animal Origin
5	Meat, Poultry, Fish, Seafood, and Their Preparations
6	Milled Grain Products and Preparations, and Bakery Products
7	Other Prepared Foodstuffs, Fats and Oils
8	Alcoholic Beverages and Denatured Alcohol
9	Tobacco Products
10	Monumental or Building Stone
11	Natural Sands
12	Gravel and Crushed Stone (excludes Dolomite and Slate)
13	Other Non-Metallic Minerals not elsewhere classified
14	Metallic Ores and Concentrates
15	Coal
16	Crude Petroleum
17	Gasoline, Aviation Turbine Fuel, and Ethanol (includes Kerosene, and Fuel Alcohols)
18	Fuel Oils (includes Diesel, Bunker C, and Biodiesel)
19	Other Coal and Petroleum Products, not elsewhere classified
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21	Pharmaceutical Products
22	Fertilizers
23	Other Chemical Products and Preparations
24	Plastics and Rubber
25	Logs and Other Wood in the Rough
26	Wood Products
27	Pulp, Newsprint, Paper, and Paperboard
28	Paper or Paperboard Articles
29	Printed Products
30	Textiles, Leather, and Articles of Textiles or Leather
31	Non-Metallic Mineral Products
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33	Articles of Base Metal
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35	Electronic and Other Electrical Equipment and Components, and Office Equipment
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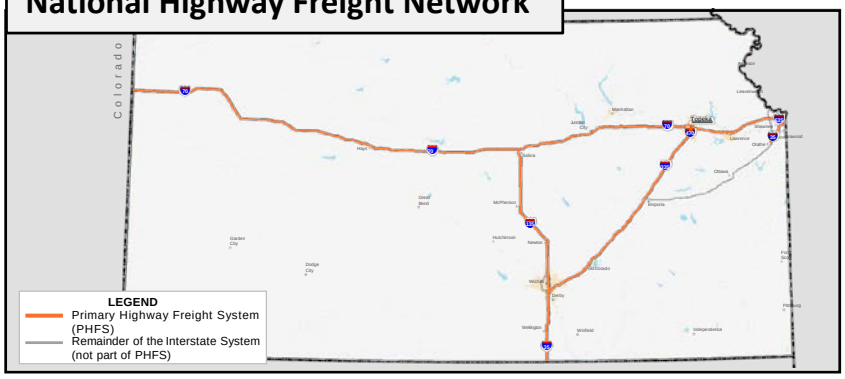
38	Precision Instruments and Apparatus
39	Furniture, Mattresses and Mattress Supports, Lamps, Lighting Fittings, and Illuminated Signs
40	Miscellaneous Manufactured Products
41	Waste and Scrap (excludes of agriculture or food)
43	Mixed Freight
99	Commodity unknown

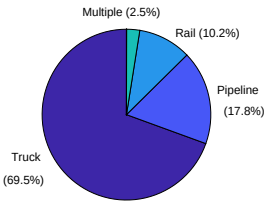
MID-AMERICA FREIGHT COALITION

Identification and Characterization of the Freight Network in Kansas

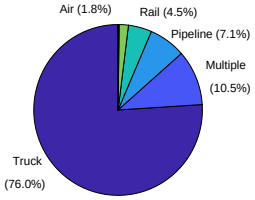
National Highway Freight Network



Mode Distribution

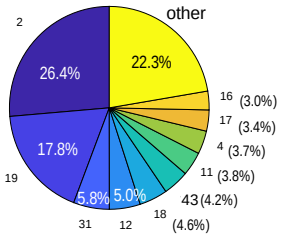


By Freight Weight

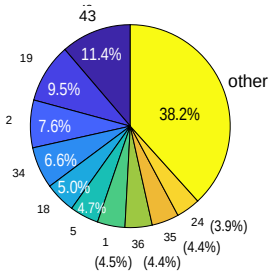


By Freight Value

Commodity Distribution



By Freight Weight



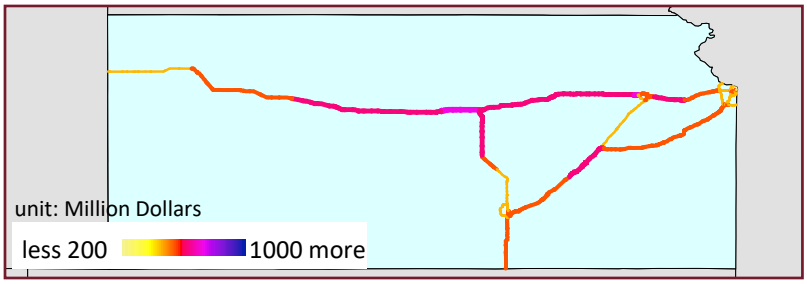
By Freight Value

* See the following page for code of commodity

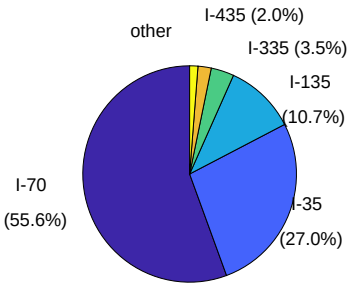
Corridor Value

Major Freight Corridors

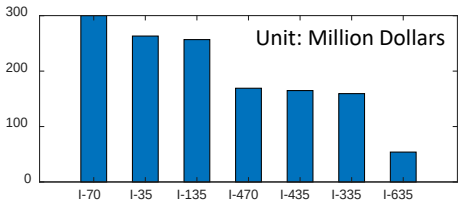
Corridor	I-70	I-35	I-135	I-335	I-435
Value (Billion Dollar·Mile)	127.9	62.0	24.6	8.0	4.6



Corridor Value by TMC



Corridor Value Distribution



Corridor Value per Unit Mile

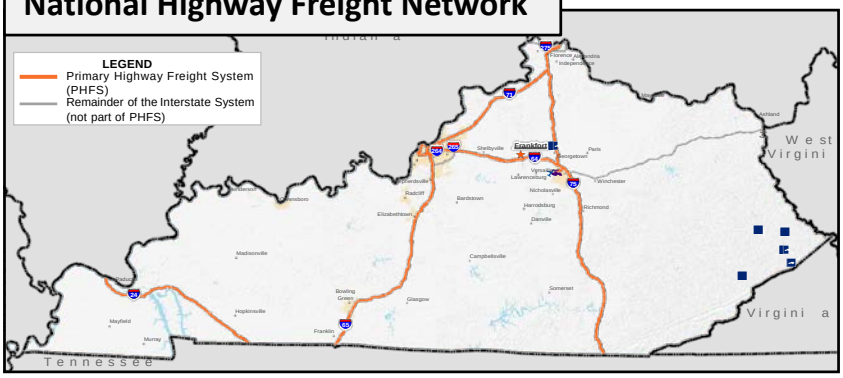
- In Kansas, the *Truck* mode has the largest portion at 69.5% and 76.0% based on the freight weight and value respectively.
- The major commodities are *Grains* (26.4%), *Other Coal and Petroleum Products* (17.8%), and *Non-Metallic Mineral Products* (5.8%) by freight weight, and *Mixed*(11.4%), *Other Coal and Petroleum Products* (9.5%), and *Grains* (6.6%) by freight value.
- The top five freight corridors in terms of total economic value are I-70, I-35, I-135, I-335 ,and I-435.
- The top five freight corridors in terms of value per unit mile are I-70, I-35, I-135, I-470, and I-435.

Code	Commodity Description
1	Animals and Fish (live)
2	Cereal Grains (includes seed)
3	Agricultural Products (excludes Animal Feed, Cereal Grains, and Forage Products)
4	Animal Feed, Eggs, Honey, and Other Products of Animal Origin
5	Meat, Poultry, Fish, Seafood, and Their Preparations
6	Milled Grain Products and Preparations, and Bakery Products
7	Other Prepared Foodstuffs, Fats and Oils
8	Alcoholic Beverages and Denatured Alcohol
9	Tobacco Products
10	Monumental or Building Stone
11	Natural Sands
12	Gravel and Crushed Stone (excludes Dolomite and Slate)
13	Other Non-Metallic Minerals not elsewhere classified
14	Metallic Ores and Concentrates
15	Coal
16	Crude Petroleum
17	Gasoline, Aviation Turbine Fuel, and Ethanol (includes Kerosene, and Fuel Alcohols)
18	Fuel Oils (includes Diesel, Bunker C, and Biodiesel)
19	Other Coal and Petroleum Products, not elsewhere classified
20	Basic Chemicals
21	Pharmaceutical Products
22	Fertilizers
23	Other Chemical Products and Preparations
24	Plastics and Rubber
25	Logs and Other Wood in the Rough
26	Wood Products
27	Pulp, Newsprint, Paper, and Paperboard
28	Paper or Paperboard Articles
29	Printed Products
30	Textiles, Leather, and Articles of Textiles or Leather
31	Non-Metallic Mineral Products
32	Base Metal in Primary or Semi-Finished Forms and in Finished Basic Shapes
33	Articles of Base Metal
34	Machinery
35	Electronic and Other Electrical Equipment and Components, and Office Equipment
36	Motorized and Other Vehicles (includes parts)
37	Transportation Equipment, not elsewhere classified
38	Precision Instruments and Apparatus
39	Furniture, Mattresses and Mattress Supports, Lamps, Lighting Fittings, and Illuminated Signs
40	Miscellaneous Manufactured Products
41	Waste and Scrap (excludes of agriculture or food)
43	Mixed Freight
99	Commodity unknown

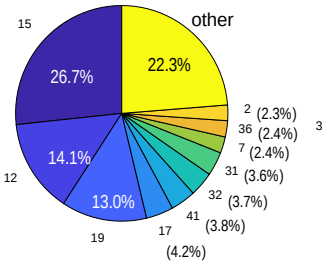
MID-AMERICA FREIGHT COALITION

Identification and Characterization of the Freight Network in Kentucky

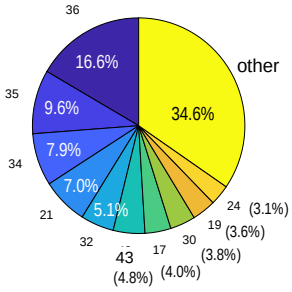
National Highway Freight Network



Commodity Distribution

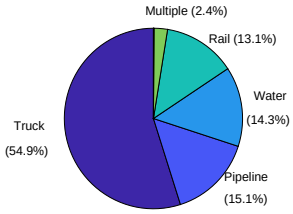


By Freight Weight

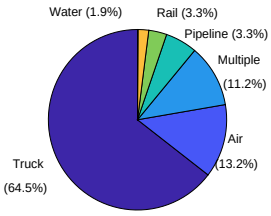


By Freight Value

Mode Distribution



By Freight Weight



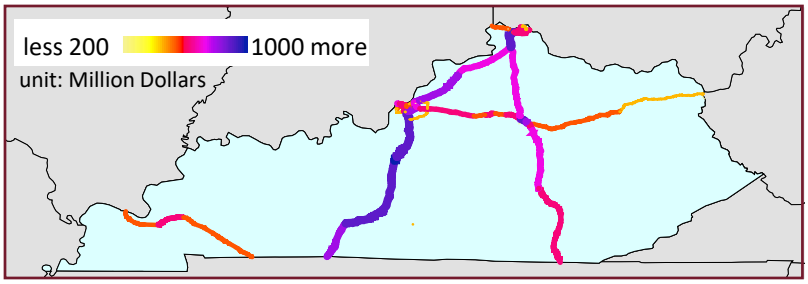
By Freight Value

* See the following page for code of commodity

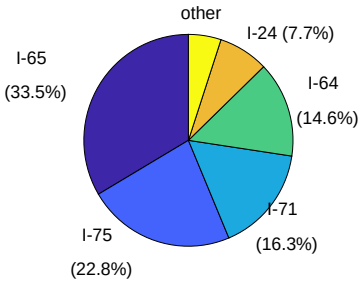
Corridor Value

Major Freight Corridors

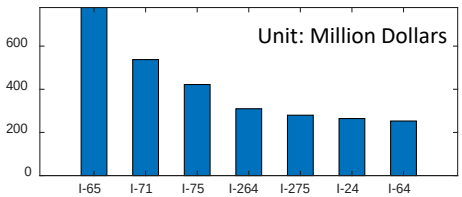
Corridor	I-65	I-75	I-71	I-64	I-24
Value (Billion Dollar·Mile)	106.9	72.8	52.0	46.6	24.7



Corridor Value by TMC



Corridor Value Distribution



Corridor Value per Unit Mile

- In Kentucky, the *Truck* mode has the largest portion at 54.9% and 64.5% based on the freight weight and value respectively.
- The major commodities are *Coal* (16.6%), *Gravel/Stone* (14.1%), and *Other Coal and Petroleum Products* (13.0%) by freight weight, and *Vehicles* (16.6%), *Electronic Equipment* (9.6%), and *Machinery* (7.9%) by freight value.
- The top five freight corridors in terms of total economic value are I-65, I-75, I-71, I-64, and I-24.
- The top five freight corridors in terms of value per unit mile are I-65, I-72, I-75, I-264, and I-275.

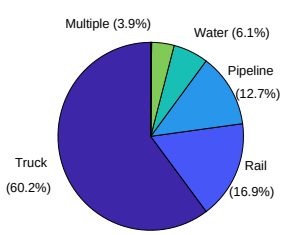
Code	Commodity Description
1	Animals and Fish (live)
2	Cereal Grains (includes seed)
3	Agricultural Products (excludes Animal Feed, Cereal Grains, and Forage Products)
4	Animal Feed, Eggs, Honey, and Other Products of Animal Origin
5	Meat, Poultry, Fish, Seafood, and Their Preparations
6	Milled Grain Products and Preparations, and Bakery Products
7	Other Prepared Foodstuffs, Fats and Oils
8	Alcoholic Beverages and Denatured Alcohol
9	Tobacco Products
10	Monumental or Building Stone
11	Natural Sands
12	Gravel and Crushed Stone (excludes Dolomite and Slate)
13	Other Non-Metallic Minerals not elsewhere classified
14	Metallic Ores and Concentrates
15	Coal
16	Crude Petroleum
17	Gasoline, Aviation Turbine Fuel, and Ethanol (includes Kerosene, and Fuel Alcohols)
18	Fuel Oils (includes Diesel, Bunker C, and Biodiesel)
19	Other Coal and Petroleum Products, not elsewhere classified
20	Basic Chemicals
21	Pharmaceutical Products
22	Fertilizers
23	Other Chemical Products and Preparations
24	Plastics and Rubber
25	Logs and Other Wood in the Rough
26	Wood Products
27	Pulp, Newsprint, Paper, and Paperboard
28	Paper or Paperboard Articles
29	Printed Products
30	Textiles, Leather, and Articles of Textiles or Leather
31	Non-Metallic Mineral Products
32	Base Metal in Primary or Semi-Finished Forms and in Finished Basic Shapes
33	Articles of Base Metal
34	Machinery
35	Electronic and Other Electrical Equipment and Components, and Office Equipment
36	Motorized and Other Vehicles (includes parts)
37	Transportation Equipment, not elsewhere classified
38	Precision Instruments and Apparatus
39	Furniture, Mattresses and Mattress Supports, Lamps, Lighting Fittings, and Illuminated Signs
40	Miscellaneous Manufactured Products
41	Waste and Scrap (excludes of agriculture or food)
43	Mixed Freight
99	Commodity unknown

MID-AMERICA FREIGHT COALITION

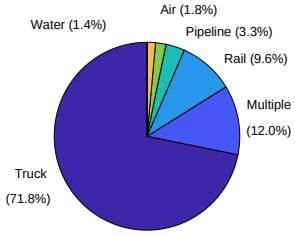
Identification and Characterization of the Freight Network in Michigan

National Highway Freight Network

Mode Distribution

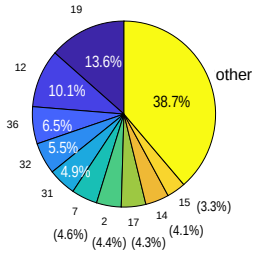


By Freight Weight

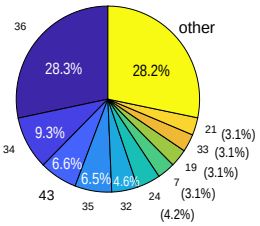


By Freight Value

Commodity Distribution



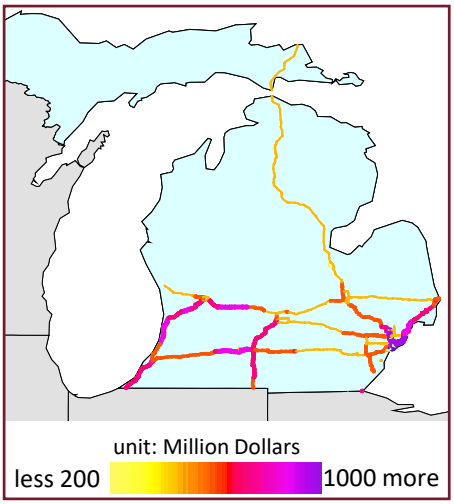
By Freight Weight



By Freight Value

* See the following page for code of commodity

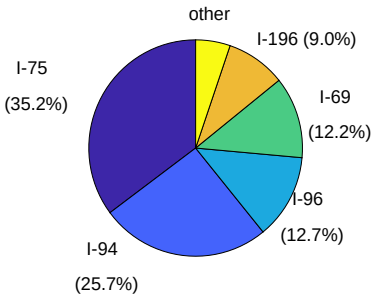
Corridor Value



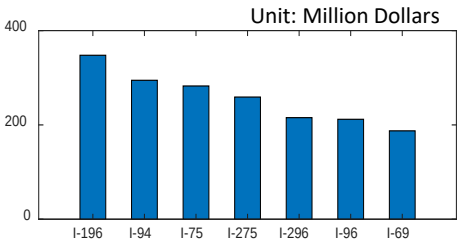
Corridor Value by TMC

Major Freight Corridors

Corridor	I-75	I-94	I-96	I-69	I-196
Value (Billion Dollar·Mile)	109.6	79.9	39.6	38.0	28.0



Corridor Value Distribution



Corridor Value per Unit Mile

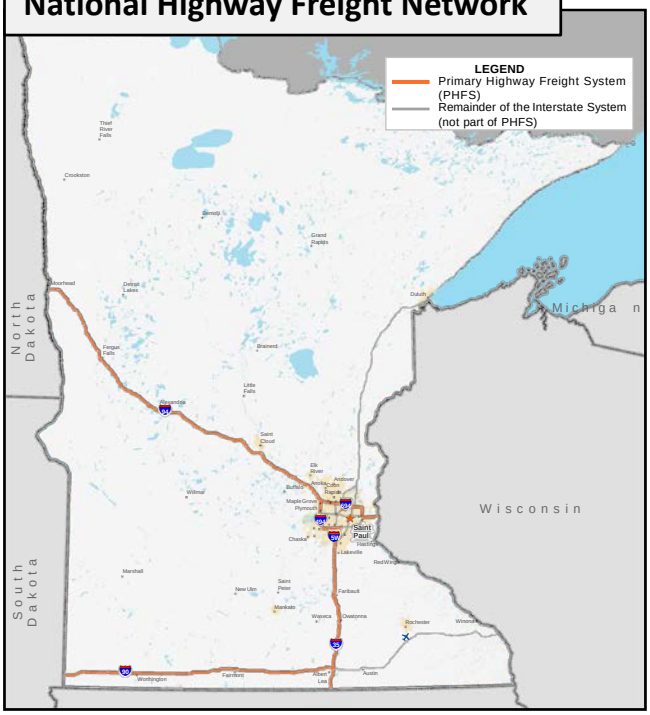
- In Michigan, the *Truck* mode has the largest portion at 60.2% and 71.8% based on the freight weight and value respectively.
- The major commodities are *Other Coal and Petroleum Products* (13.6%), *Gravel/Stone* (10.1%), and *Electronic Equipment* (6.5%) by freight weight, and *Vehicles* (28.3%), *Machinery* (9.3%), and *Mixed Freight* (6.6%) by freight value.
- The top five freight corridors in terms of total economic value are I-75, I-94, I-96, I-69, and I-196.
- The top five freight corridors in terms of value per unit mile are I-196, I-94, I-75, I-275, and I-296.

Code	Commodity Description
1	Animals and Fish (live)
2	Cereal Grains (includes seed)
3	Agricultural Products (excludes Animal Feed, Cereal Grains, and Forage Products)
4	Animal Feed, Eggs, Honey, and Other Products of Animal Origin
5	Meat, Poultry, Fish, Seafood, and Their Preparations
6	Milled Grain Products and Preparations, and Bakery Products
7	Other Prepared Foodstuffs, Fats and Oils
8	Alcoholic Beverages and Denatured Alcohol
9	Tobacco Products
10	Monumental or Building Stone
11	Natural Sands
12	Gravel and Crushed Stone (excludes Dolomite and Slate)
13	Other Non-Metallic Minerals not elsewhere classified
14	Metallic Ores and Concentrates
15	Coal
16	Crude Petroleum
17	Gasoline, Aviation Turbine Fuel, and Ethanol (includes Kerosene, and Fuel Alcohols)
18	Fuel Oils (includes Diesel, Bunker C, and Biodiesel)
19	Other Coal and Petroleum Products, not elsewhere classified
20	Basic Chemicals
21	Pharmaceutical Products
22	Fertilizers
23	Other Chemical Products and Preparations
24	Plastics and Rubber
25	Logs and Other Wood in the Rough
26	Wood Products
27	Pulp, Newsprint, Paper, and Paperboard
28	Paper or Paperboard Articles
29	Printed Products
30	Textiles, Leather, and Articles of Textiles or Leather
31	Non-Metallic Mineral Products
32	Base Metal in Primary or Semi-Finished Forms and in Finished Basic Shapes
33	Articles of Base Metal
34	Machinery
35	Electronic and Other Electrical Equipment and Components, and Office Equipment
36	Motorized and Other Vehicles (includes parts)
37	Transportation Equipment, not elsewhere classified
38	Precision Instruments and Apparatus
39	Furniture, Mattresses and Mattress Supports, Lamps, Lighting Fittings, and Illuminated Signs
40	Miscellaneous Manufactured Products
41	Waste and Scrap (excludes of agriculture or food)
43	Mixed Freight
99	Commodity unknown

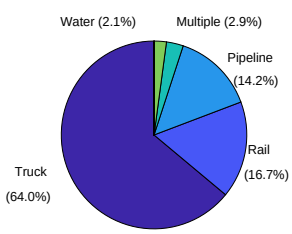
MID-AMERICA FREIGHT COALITION

Identification and Characterization of the Freight Network in Minnesota

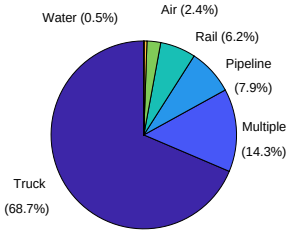
National Highway Freight Network



Mode Distribution

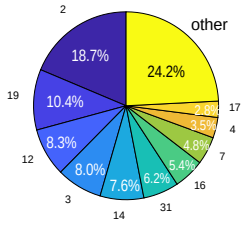


By Freight Weight

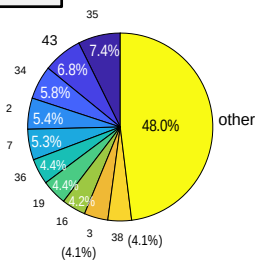


By Freight Value

Commodity Distribution



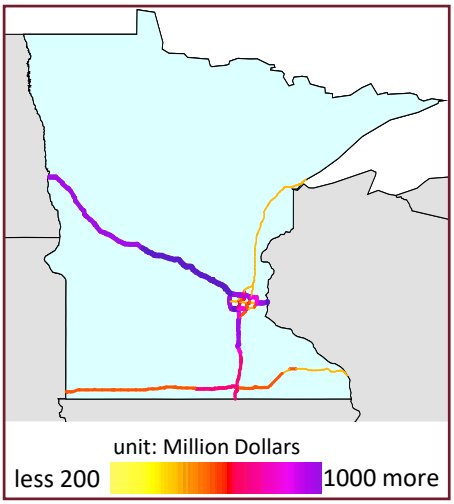
By Freight Weight



By Freight Value

* See the following page for code of commodity

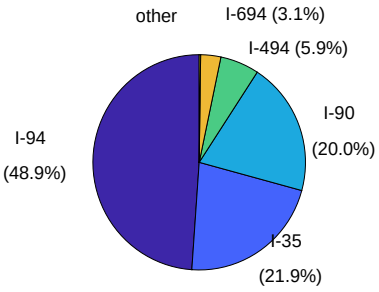
Corridor Value



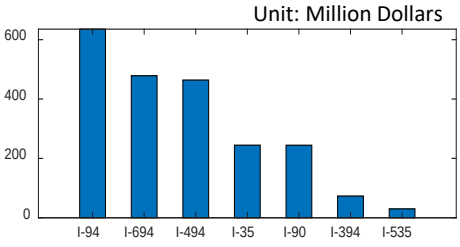
Corridor Value by TMC

Major Freight Corridors

Corridor	I-94	I-35	I-90	I-494	I-694
Value (Billion Dollar·Mile)	164.4	73.6	67.3	19.9	10.3



Corridor Value Distribution



Corridor Value per Unit Mile

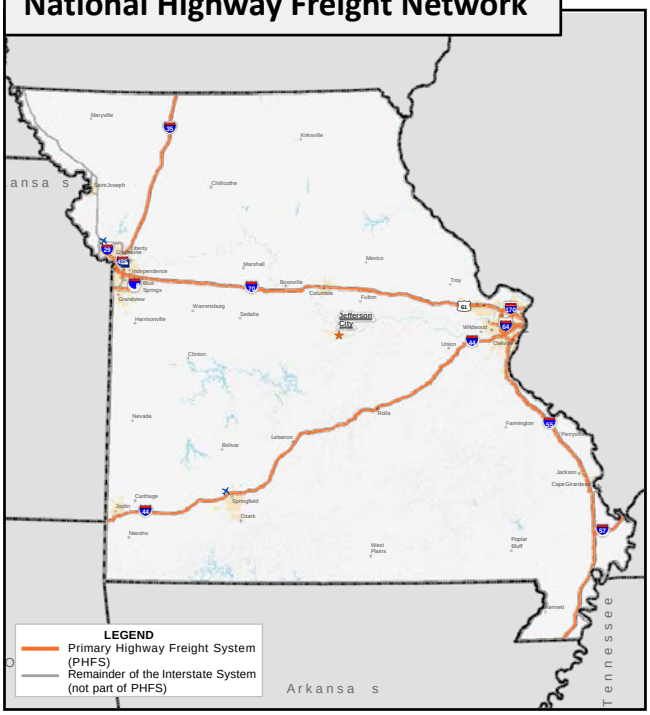
- In Minnesota, the *Truck* mode has the largest portion at 64.0% and 68.7% based on the freight weight and value respectively.
- The major commodities are *Grains* (18.7%), *Other Coal/Petroleum Products* (10.4%) and *Gravel/Stone* (8.3%) by freight weight, and *Electronic Equipment* (7.4%), *Mixed Freight* (6.8%), and *Machinery* (5.8%) by freight value.
- The top five freight corridors in terms of total economic value are I-94, I-35, I-90, I-494, and I-694.
- The top five freight corridors in terms of value per unit mile are I-94, I-694, I-494, I-35, and I-90.

Code	Commodity Description
1	Animals and Fish (live)
2	Cereal Grains (includes seed)
3	Agricultural Products (excludes Animal Feed, Cereal Grains, and Forage Products)
4	Animal Feed, Eggs, Honey, and Other Products of Animal Origin
5	Meat, Poultry, Fish, Seafood, and Their Preparations
6	Milled Grain Products and Preparations, and Bakery Products
7	Other Prepared Foodstuffs, Fats and Oils
8	Alcoholic Beverages and Denatured Alcohol
9	Tobacco Products
10	Monumental or Building Stone
11	Natural Sands
12	Gravel and Crushed Stone (excludes Dolomite and Slate)
13	Other Non-Metallic Minerals not elsewhere classified
14	Metallic Ores and Concentrates
15	Coal
16	Crude Petroleum
17	Gasoline, Aviation Turbine Fuel, and Ethanol (includes Kerosene, and Fuel Alcohols)
18	Fuel Oils (includes Diesel, Bunker C, and Biodiesel)
19	Other Coal and Petroleum Products, not elsewhere classified
20	Basic Chemicals
21	Pharmaceutical Products
22	Fertilizers
23	Other Chemical Products and Preparations
24	Plastics and Rubber
25	Logs and Other Wood in the Rough
26	Wood Products
27	Pulp, Newsprint, Paper, and Paperboard
28	Paper or Paperboard Articles
29	Printed Products
30	Textiles, Leather, and Articles of Textiles or Leather
31	Non-Metallic Mineral Products
32	Base Metal in Primary or Semi-Finished Forms and in Finished Basic Shapes
33	Articles of Base Metal
34	Machinery
35	Electronic and Other Electrical Equipment and Components, and Office Equipment
36	Motorized and Other Vehicles (includes parts)
37	Transportation Equipment, not elsewhere classified
38	Precision Instruments and Apparatus
39	Furniture, Mattresses and Mattress Supports, Lamps, Lighting Fittings, and Illuminated Signs
40	Miscellaneous Manufactured Products
41	Waste and Scrap (excludes of agriculture or food)
43	Mixed Freight
99	Commodity unknown

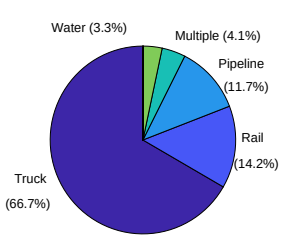
MID-AMERICA FREIGHT COALITION

Identification and Characterization of the Freight Network in Missouri

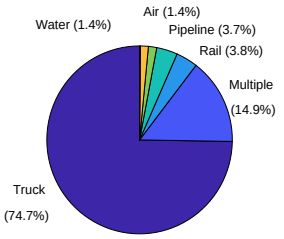
National Highway Freight Network



Mode Distribution

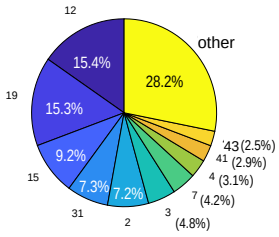


By Freight Weight

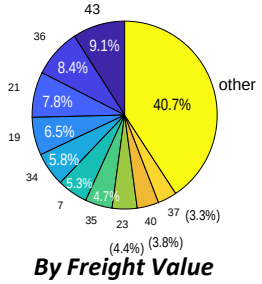


By Freight Value

Commodity Distribution



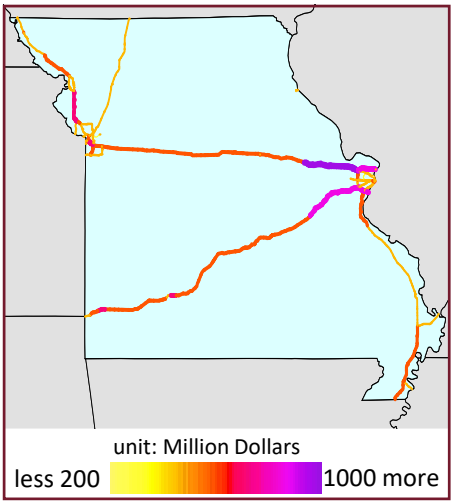
By Freight Weight



By Freight Value

* See the following page for code of commodity

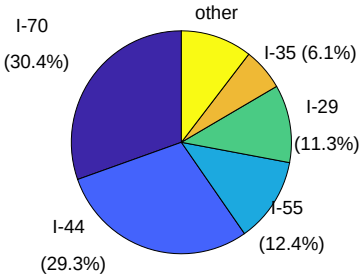
Corridor Value



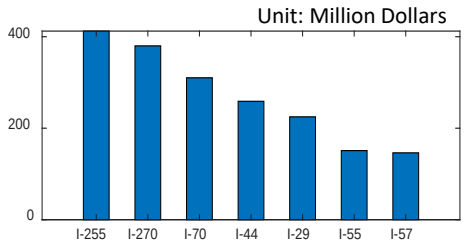
Corridor Value by TMC

Major Freight Corridors

Corridor	I-70	I-44	I-55	I-29	I-35
Value (Billion Dollar·Mile)	77.9	75.1	31.6	28.9	15.7



Corridor Value Distribution



Corridor Value per Unit Mile

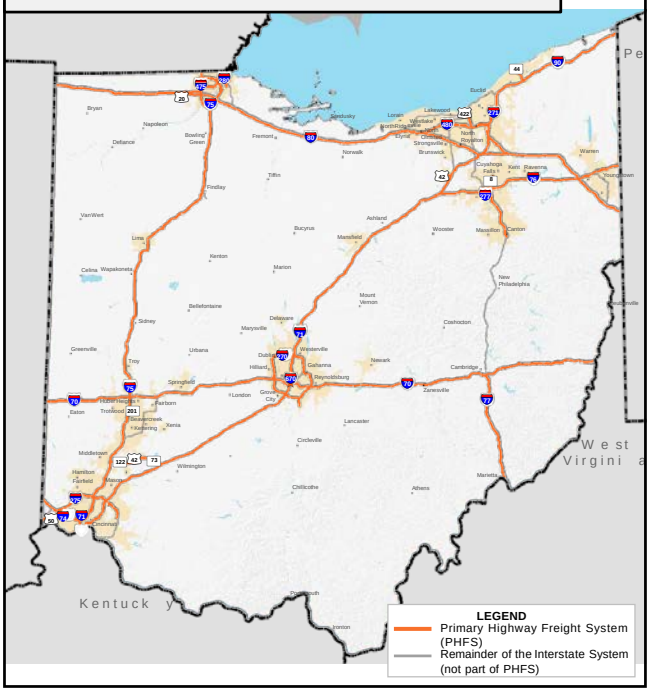
- In Missouri, the *Truck* mode has the largest portion at 66.7% and 74.7% based on the freight weight and value respectively.
- The major commodities are *Gravel/Stone* (15.4%), *Other Coal/Petroleum Products* (15.3%), and *Coal* (9.2%) by freight weight, and *Mixed Freight* (9.1%), *Vehicles* (8.4%), and *Pharmaceutical Products* (7.8%) by freight value.
- The top five freight corridors in terms of total economic value are I-70, I-44, I-55, I-29, and I-35.
- The top five freight corridors in terms of value per unit mile are I-255, I-270, I-70, I-44, and I-29.

Code	Commodity Description
1	Animals and Fish (live)
2	Cereal Grains (includes seed)
3	Agricultural Products (excludes Animal Feed, Cereal Grains, and Forage Products)
4	Animal Feed, Eggs, Honey, and Other Products of Animal Origin
5	Meat, Poultry, Fish, Seafood, and Their Preparations
6	Milled Grain Products and Preparations, and Bakery Products
7	Other Prepared Foodstuffs, Fats and Oils
8	Alcoholic Beverages and Denatured Alcohol
9	Tobacco Products
10	Monumental or Building Stone
11	Natural Sands
12	Gravel and Crushed Stone (excludes Dolomite and Slate)
13	Other Non-Metallic Minerals not elsewhere classified
14	Metallic Ores and Concentrates
15	Coal
16	Crude Petroleum
17	Gasoline, Aviation Turbine Fuel, and Ethanol (includes Kerosene, and Fuel Alcohols)
18	Fuel Oils (includes Diesel, Bunker C, and Biodiesel)
19	Other Coal and Petroleum Products, not elsewhere classified
20	Basic Chemicals
21	Pharmaceutical Products
22	Fertilizers
23	Other Chemical Products and Preparations
24	Plastics and Rubber
25	Logs and Other Wood in the Rough
26	Wood Products
27	Pulp, Newsprint, Paper, and Paperboard
28	Paper or Paperboard Articles
29	Printed Products
30	Textiles, Leather, and Articles of Textiles or Leather
31	Non-Metallic Mineral Products
32	Base Metal in Primary or Semi-Finished Forms and in Finished Basic Shapes
33	Articles of Base Metal
34	Machinery
35	Electronic and Other Electrical Equipment and Components, and Office Equipment
36	Motorized and Other Vehicles (includes parts)
37	Transportation Equipment, not elsewhere classified
38	Precision Instruments and Apparatus
39	Furniture, Mattresses and Mattress Supports, Lamps, Lighting Fittings, and Illuminated Signs
40	Miscellaneous Manufactured Products
41	Waste and Scrap (excludes of agriculture or food)
43	Mixed Freight
99	Commodity unknown

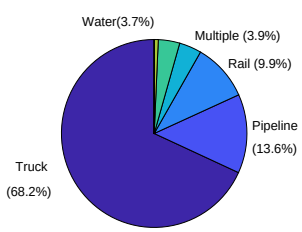
MID-AMERICA FREIGHT COALITION

Identification and Characterization of the Freight Network in Ohio

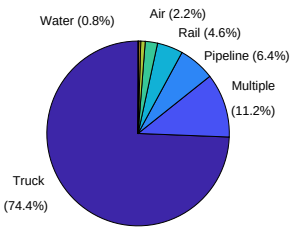
National Highway Freight Network



Mode Distribution

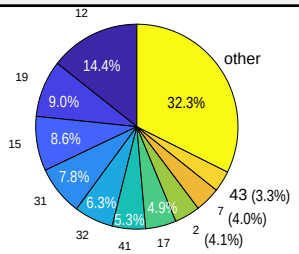


By Freight Weight

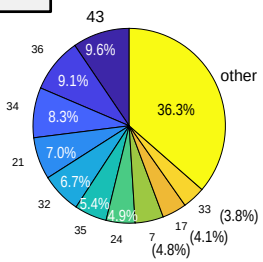


By Freight Value

Commodity Distribution



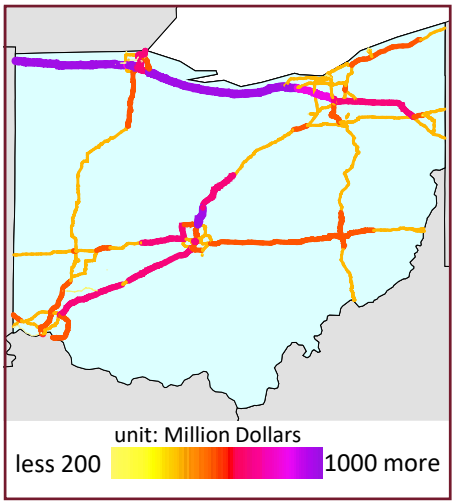
By Freight Weight



By Freight Value

* See the following page for code of commodity

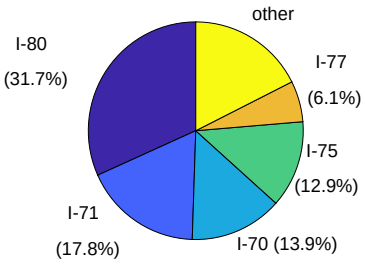
Corridor Value



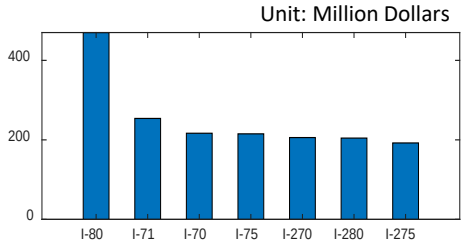
Corridor Value by TMC

Major Freight Corridors

Corridor	80	71	70	75	77
Value (Billion Dollar·Mile)	111.5	62.5	49.0	45.5	21.4



Corridor Value Distribution



Corridor Value per Unit Mile

- In Ohio, the *Truck* mode has the largest portion at 68.2% and 74.4% based on the freight weight and value respectively.
- The major commodities are *Gravel/Stone* (14.4%), *Other Coal/Petroleum Products* (9.0%), and *Coal* (8.6%) by freight weight, and *Mixed Freight* (9.6%), *Vehicles* (9.1%), and *Machinery* (8.3%) by value.
- The top five Ohio freight corridors in terms of total economic value are I-80, I-71, I-70, I-75, and I-77.
- The top five Ohio freight corridors in terms of value per unit mile are I-80, I-71, I-70, I-75, and I-270.

Code	Commodity Description
1	Animals and Fish (live)
2	Cereal Grains (includes seed)
3	Agricultural Products (excludes Animal Feed, Cereal Grains, and Forage Products)
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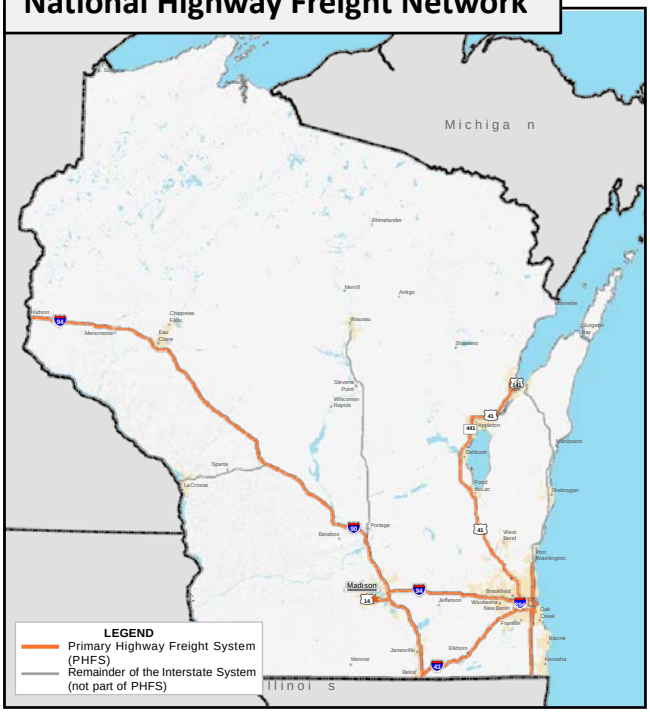
5	Meat, Poultry, Fish, Seafood, and Their Preparations
6	Milled Grain Products and Preparations, and Bakery Products
7	Other Prepared Foodstuffs, Fats and Oils
8	Alcoholic Beverages and Denatured Alcohol
9	Tobacco Products
10	Monumental or Building Stone
11	Natural Sands
12	Gravel and Crushed Stone (excludes Dolomite and Slate)
13	Other Non-Metallic Minerals not elsewhere classified
14	Metallic Ores and Concentrates
15	Coal
16	Crude Petroleum
17	Gasoline, Aviation Turbine Fuel, and Ethanol (includes Kerosene, and Fuel Alcohols)
18	Fuel Oils (includes Diesel, Bunker C, and Biodiesel)
19	Other Coal and Petroleum Products, not elsewhere classified
20	Basic Chemicals
21	Pharmaceutical Products
22	Fertilizers
23	Other Chemical Products and Preparations
24	Plastics and Rubber
25	Logs and Other Wood in the Rough
26	Wood Products
27	Pulp, Newsprint, Paper, and Paperboard
28	Paper or Paperboard Articles
29	Printed Products
30	Textiles, Leather, and Articles of Textiles or Leather
31	Non-Metallic Mineral Products
32	Base Metal in Primary or Semi-Finished Forms and in Finished Basic Shapes
33	Articles of Base Metal
34	Machinery
35	Electronic and Other Electrical Equipment and Components, and Office Equipment
36	Motorized and Other Vehicles (includes parts)
37	Transportation Equipment, not elsewhere classified
38	Precision Instruments and Apparatus
39	Furniture, Mattresses and Mattress Supports, Lamps, Lighting Fittings, and Illuminated Signs
40	Miscellaneous Manufactured Products
41	Waste and Scrap (excludes of agriculture or food)
43	Mixed Freight
99	Commodity unknown

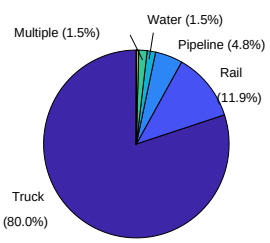
MID-AMERICA FREIGHT COALITION

Identification and Characterization of the Freight Network in Wisconsin

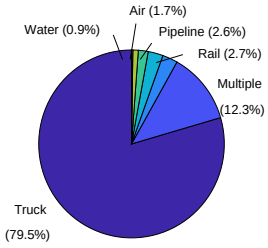
National Highway Freight Network



Mode Distribution

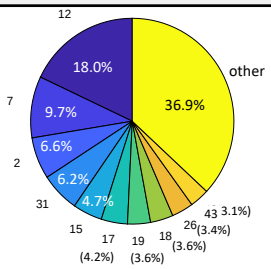


By Freight Weight

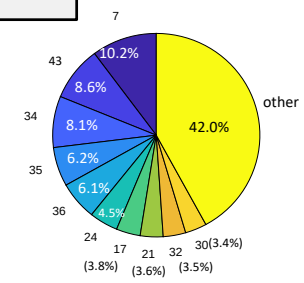


By Freight Value

Commodity Distribution



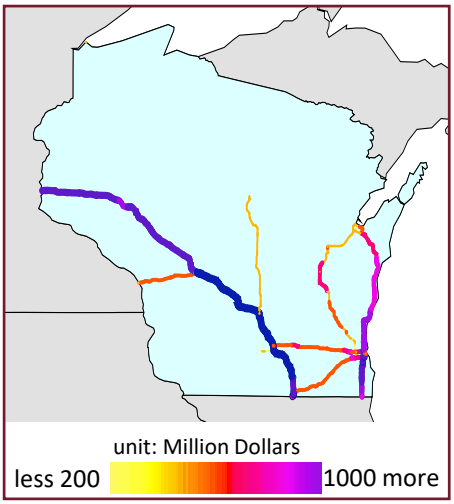
By Freight Weight



By Freight Value

* See the following page for code of commodity

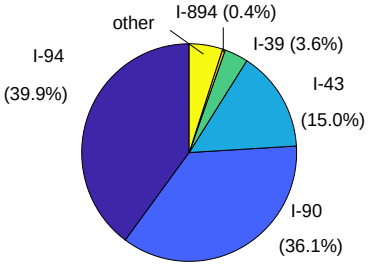
Corridor Value



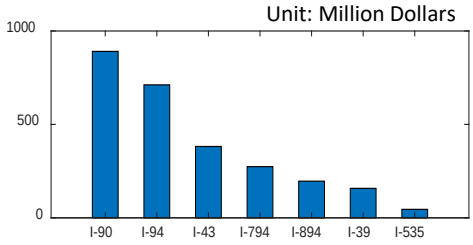
Corridor Value by TMC

Major Freight Corridors

Corridor	I-94	I-90	I-43	I-39	I-894
Value (Billion Dollar·Mile)	182.3	164.9	68.7	16.3	1.9



Corridor Value Distribution



Corridor Value per Unit Mile

- In Wisconsin, the *Truck* mode has the largest portion at 80.0% and 79.5% based on the freight weight and value respectively.
- The major commodities are *Gravel/Stone* (18.0%), *Other Prepared Foodstuffs* (9.7%), and *Grains* (6.6%) by freight weight, and *Fats/Oils* (10.2%), *Mixed Freight* (8.6%), and *Machinery* (8.1%) by freight value.
- The top five freight corridors in terms of total economic value are I-94, I-90, I-43, I-39, and I-894.
- The top five freight corridors in terms of unit mile are I-90, I-94, I-43, I-794, and I-894.

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Mid-America Freight Coalition
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