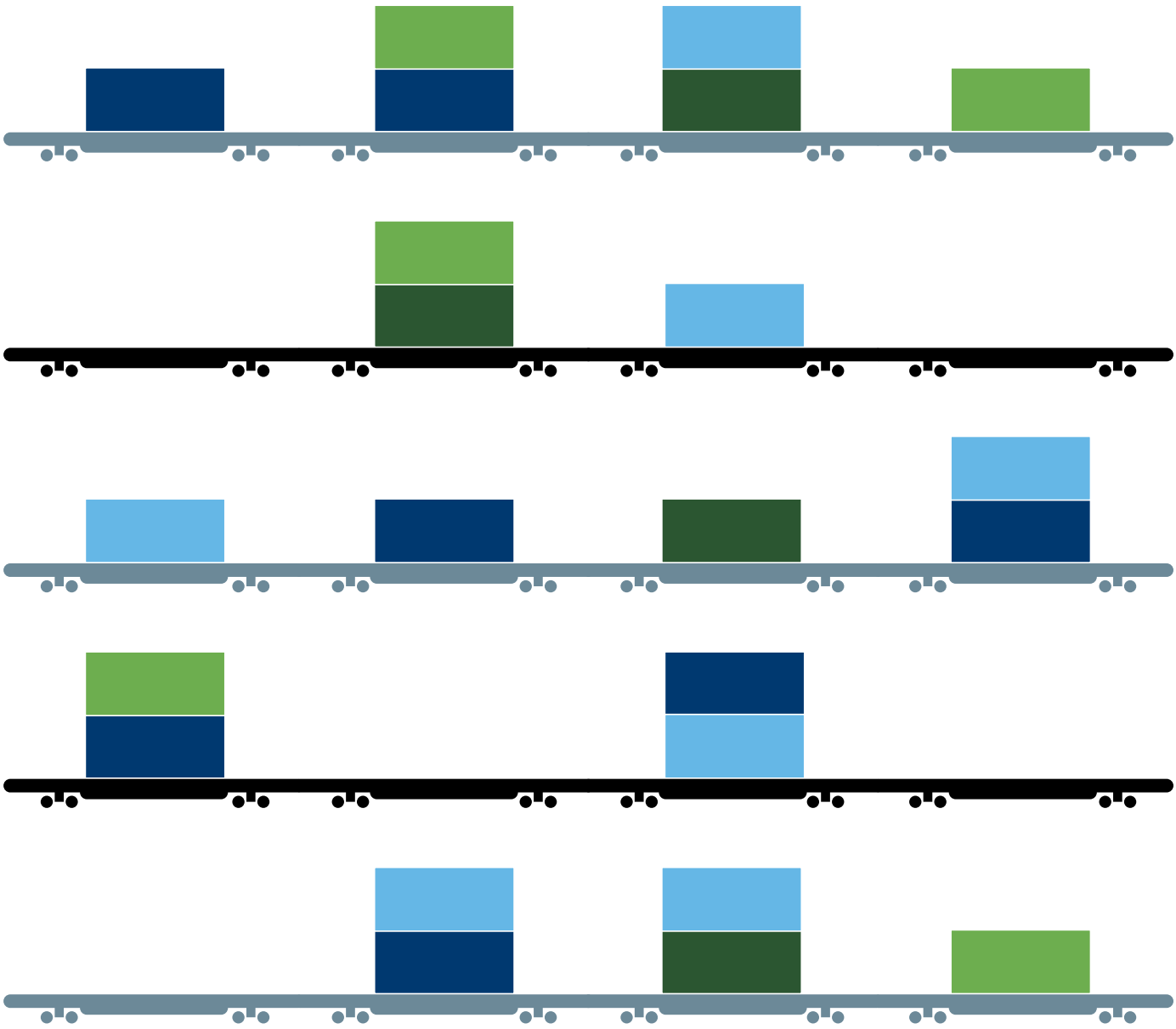
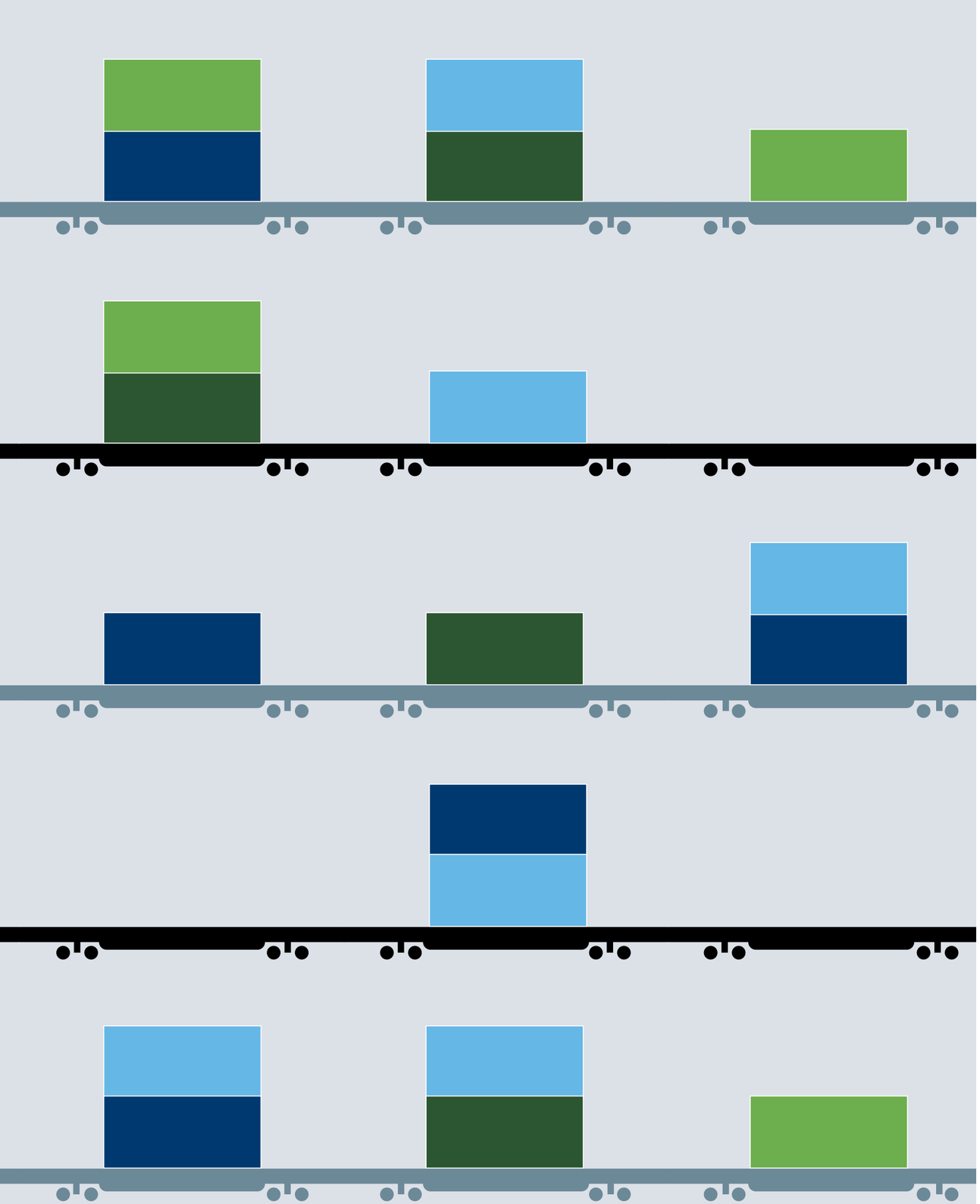
The Freight System

Leading the way



CMAP



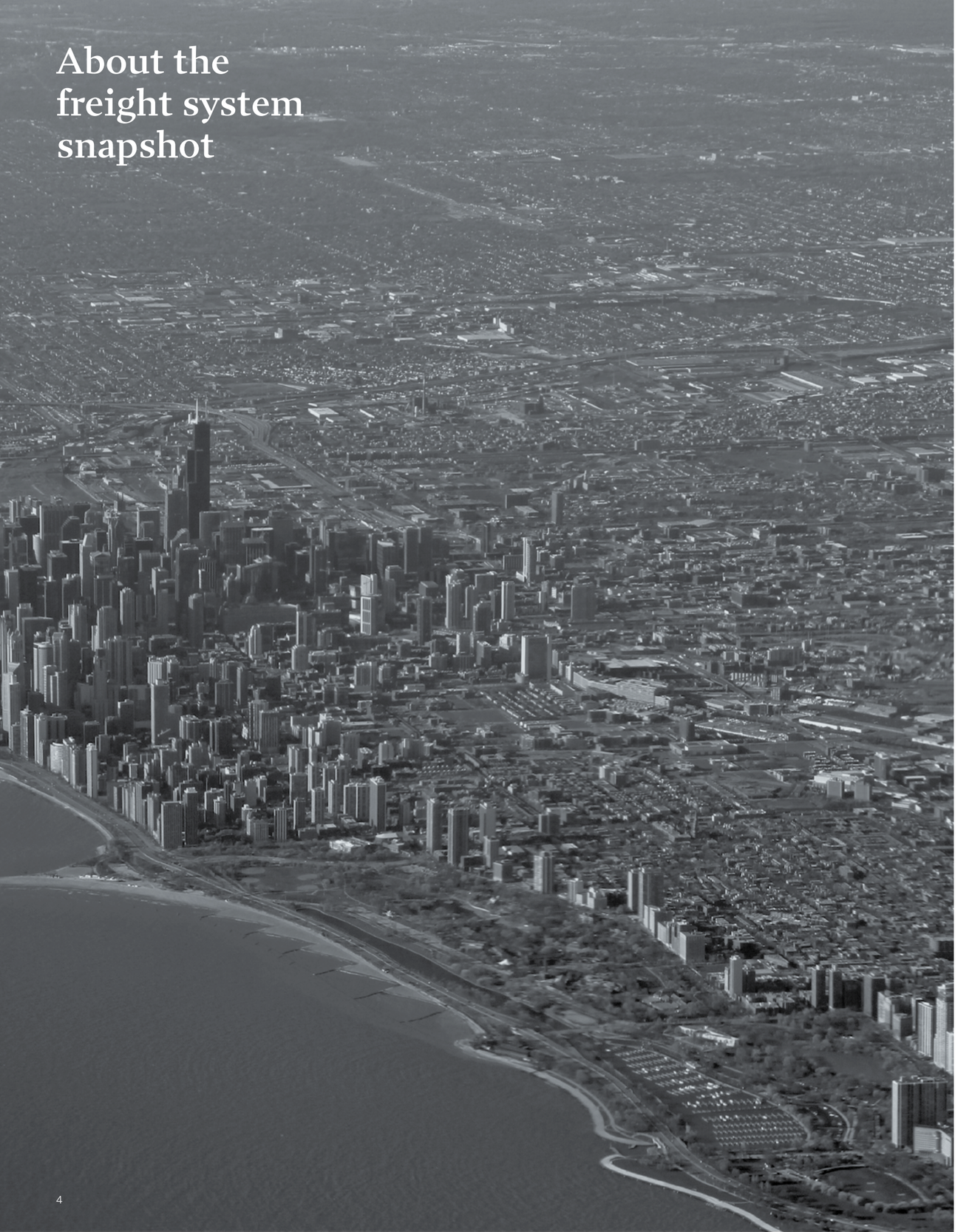
The Freight System

Leading the way

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CMAP

About the freight system snapshot



By almost any measure, the Chicago region is the nation's premier freight hub. Approximately 25 percent of all freight trains and 50 percent of all intermodal trains in the nation pass through metropolitan Chicago, which serves as the continent's main interchange point between western and eastern railroads. Trucks account for about one in seven vehicles on the urban Interstate highways in Illinois, and some facilities in metropolitan Chicago carry over 30,000 trucks each day. The region is also home to one of the nation's largest and fastest-growing air cargo hubs and the only direct maritime connection between the Great Lakes and Mississippi River basins. The CMAP region is one of the largest industrial markets in the nation, with approximately 1.1 billion square feet of industrial development supporting freight and manufacturing activity.

This massive concentration of freight activity in northeastern Illinois provides a competitive advantage that helps to drive the regional economy. A robust freight network also ensures that residents and businesses get the goods they need in a timely manner. However, freight activity raises significant infrastructure challenges, including congestion on road and rail networks, as well as regulatory challenges related to truck operations and local land uses. Together, these challenges affect the quality of life for local communities. For example, congestion results in increased emissions, affecting local air quality and health for local communities.

This snapshot report explores the major trends and issues facing the region's freight system. It first describes the vast extent of the region's multimodal freight network—as illustrated by the series of maps over the next four pages, which orient the reader to locations where freight activity occurs in the region.

The following sections discuss the economic impacts of freight activity on the region, as well as the infrastructure needs and local regulatory challenges posed by goods movement. The final section points to the ongoing development of the Regional Strategic Freight Direction, a near-term freight policy agenda for northeastern Illinois.

Highway

The Chicago region is home to some 30,000 miles of highways, including the National Highway System (NHS), providing vital access to all parts of the region as well connections to the rest of the country. The NHS is made up of Interstate highways and other key routes, including both major arterial roads and local connections to other transportation facilities.



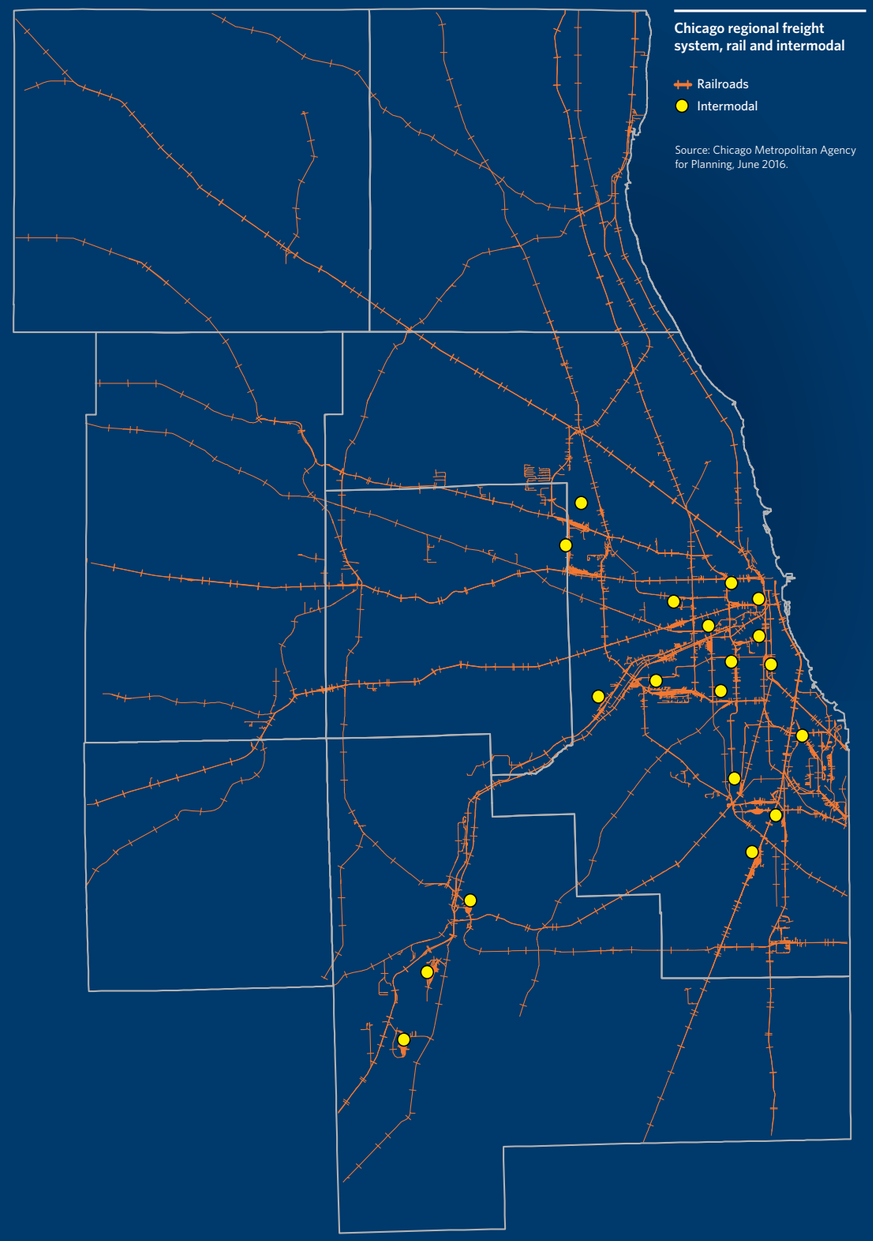
Chicago regional freight system, highway

- Interstate System
- Remainder of National Highway System
- NHS Intermodal Freight Connectors

Source: Chicago Metropolitan Agency for Planning, June 2016.

Rail and intermodal

The Chicago region is home to some 3,900 miles of rail lines, which radiate outward in all directions from a dense core located in the City of Chicago and nearby municipalities in Cook County. Intermodal facilities allow for transfers between rail and truck modes, and also tend to be located in the region's historic core. However, major new intermodal facilities have located toward the edge of the region.



Chicago regional freight system, rail and intermodal

- Railroads
- Intermodal

Source: Chicago Metropolitan Agency for Planning, June 2016.

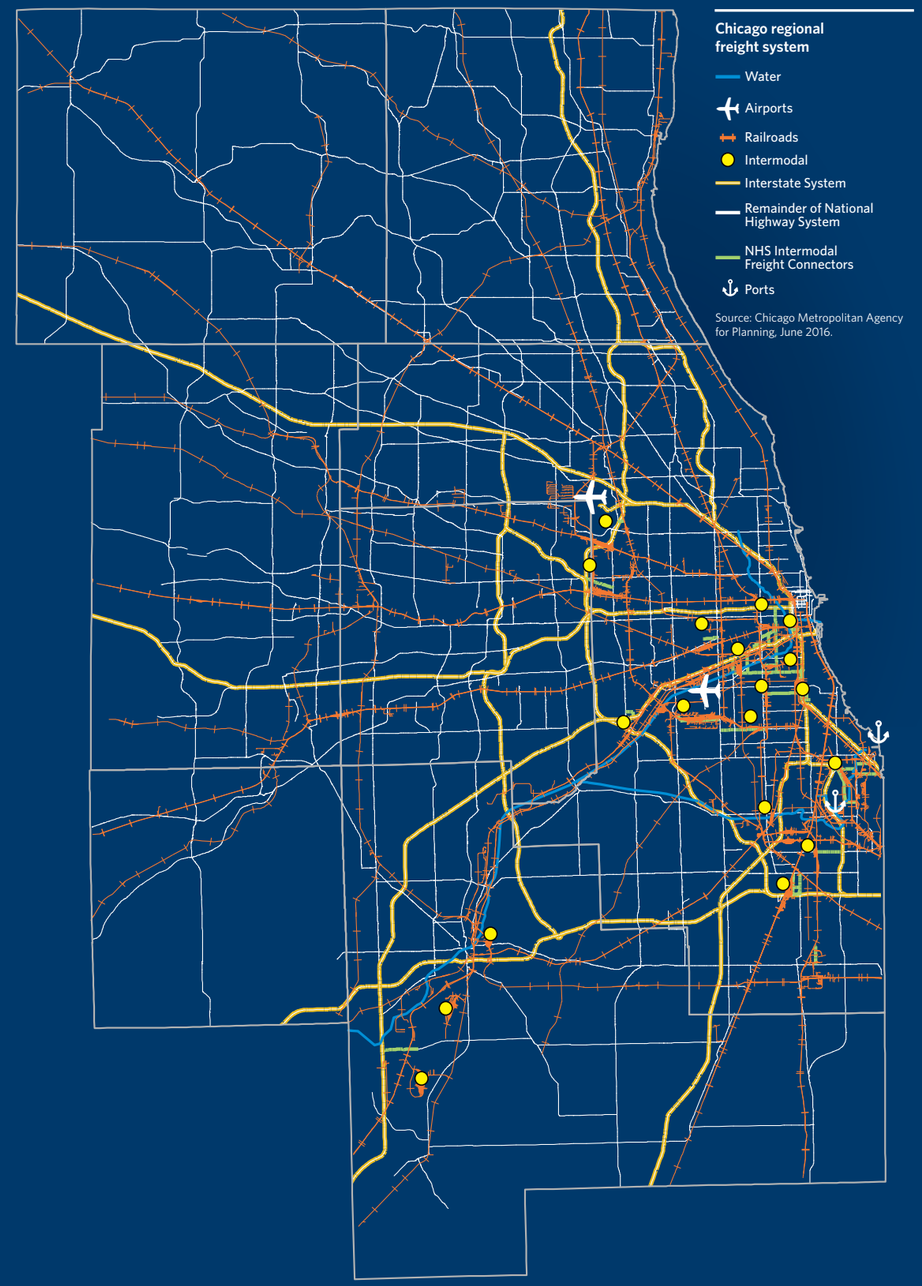
Air and water

The region is home to over 100 miles of navigable waterways, generally located in the central and southwest areas of the region, and two major airports located in Chicago.



Chicago regional freight system

Taken together, each mode fits into a larger picture of a robust, multimodal freight network, moving massive volumes of goods and providing competitive options to shippers and receivers in the region.



Freight and the regional economy

Industries that rely on the frequent shipment of goods—manufacturing, construction, retail trade, and wholesale trade—collectively represent over one-quarter of all jobs in the region and add over $158 billion per year to the regional economy.

Metropolitan Chicago's freight system also provides substantial direct employment in regional transportation industries like trucking, rail, warehousing, and logistics.

Metropolitan Chicago in supply chains

The region is a major origin, destination, and distribution point for raw materials, intermediary products, and final goods. Over $564 billion in goods weighing some 269 million tons move into and out of metropolitan Chicago each year by truck, rail, water, and air freight.

Manufacturers consider customer needs, product value, time value, and weight to determine the mode by which goods are moved. For most shippers, trucks provide the optimal combination of speed, reliability, flexibility, and affordability. Due to its cost, air freight is generally used to transport goods that are lightweight or of high value, such as electronics, machinery, pharmaceuticals, or precision instruments. Rail and water freight operators specialize in serving industries that move heavy, low-value goods that depend on affordable transportation options.

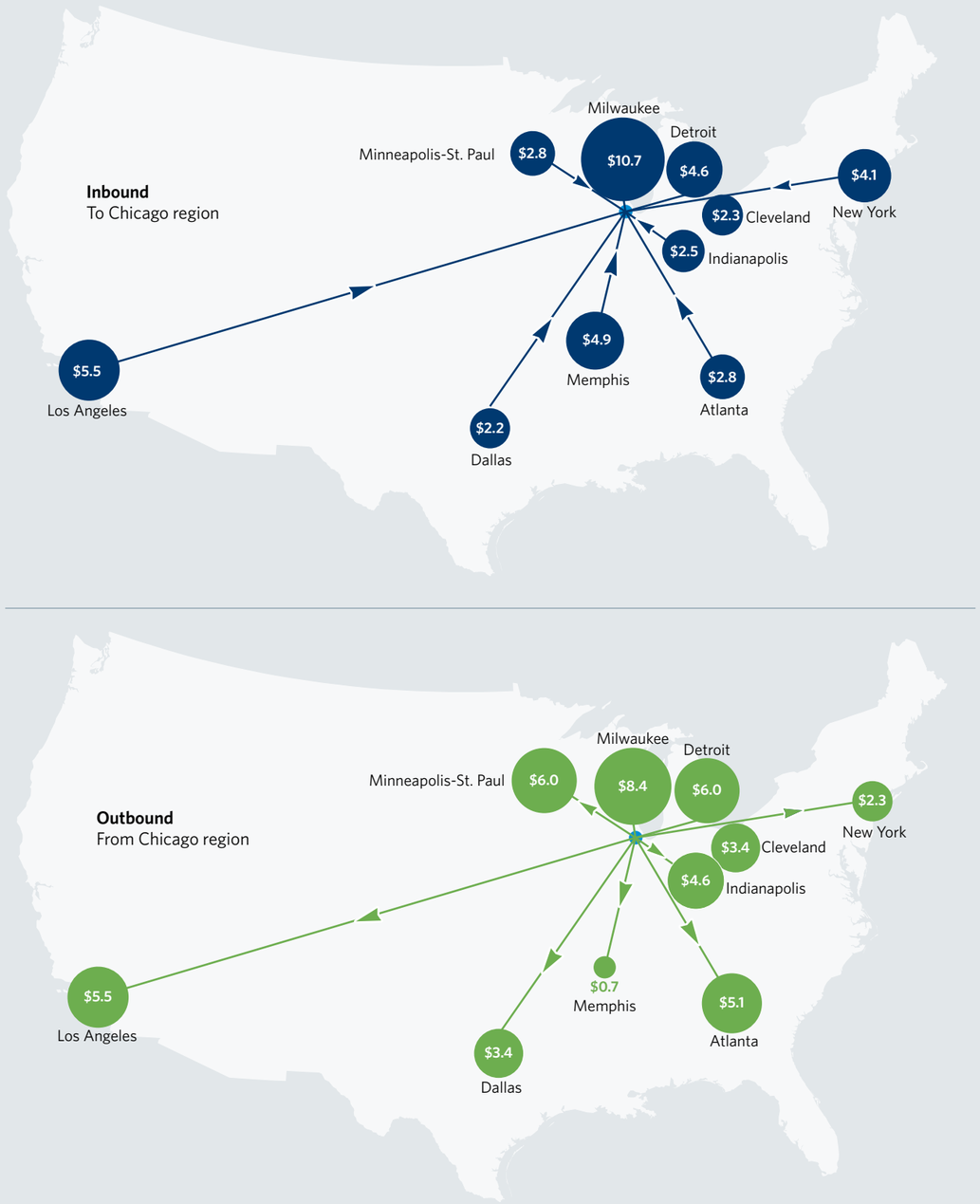
At the broadest level, the region's trade patterns can be split into three main categories: domestic, foreign, and in-region. The maps on the following page show the region's top domestic trading partners.

Most of the region's trade occurs with other U.S. states and metropolitan areas, including both Midwestern neighbors and major population centers across the country.

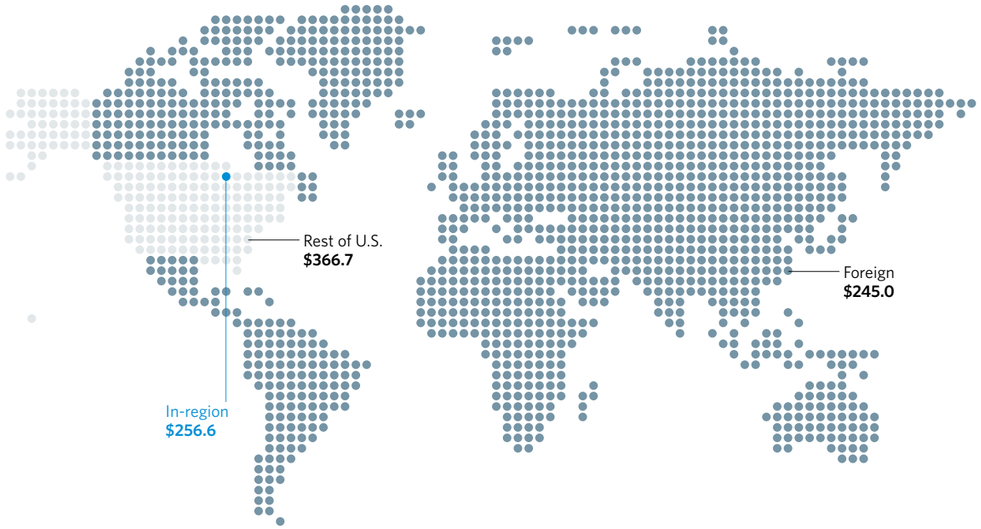
Top domestic trading partners by total value, 2012
in billions of dollars

Note: Analysis includes only urban Freight Analysis Framework zones. Freight modes include: air, truck, rail, and water.

Source: Chicago Metropolitan Agency for Planning analysis of Freight Analysis Framework data.



Chicago region total trade value by geography, 2012
in billions of dollars



Note: Analysis includes only urban Freight Analysis Framework zones. Freight modes include: air, truck, rail, and water.

Source: Chicago Metropolitan Agency for Planning analysis of Freight Analysis Framework data.

A significant portion of the region's trade occurs internally, underscoring the large and diverse regional economy in northeast Illinois, as well as with foreign partners. International trade involves relatively high-value goods and primarily occurs with trading partners in East Asia, Europe, and Canada.

The dataset used to analyze supply chains does not account for freight movements that simply pass through the region. Given the region's hub function across multiple modes of transportation, it is reasonable to assume that "through movements" account for a significant share of freight traffic in metropolitan Chicago. While this traffic uses the region's transportation infrastructure, it contributes less to the regional economy than traffic that serves local shippers and receivers.

However, new datasets have made it possible to learn more about truck trips in, out, within, and through the region.[1] Of all trucks making stops within the CMAP region, more than half of the stops were in Cook County, while another 22 percent were in Will County, and 9 percent were in DuPage County. Looking at sequences of complete truck trips, 33 percent of trips were intra-country, 17 percent traveled between two of the seven CMAP counties, and 37 percent were between CMAP and the external area. Some 13 percent of trips were identified that traveled through the region but did not stop in the region.

Intermodalism

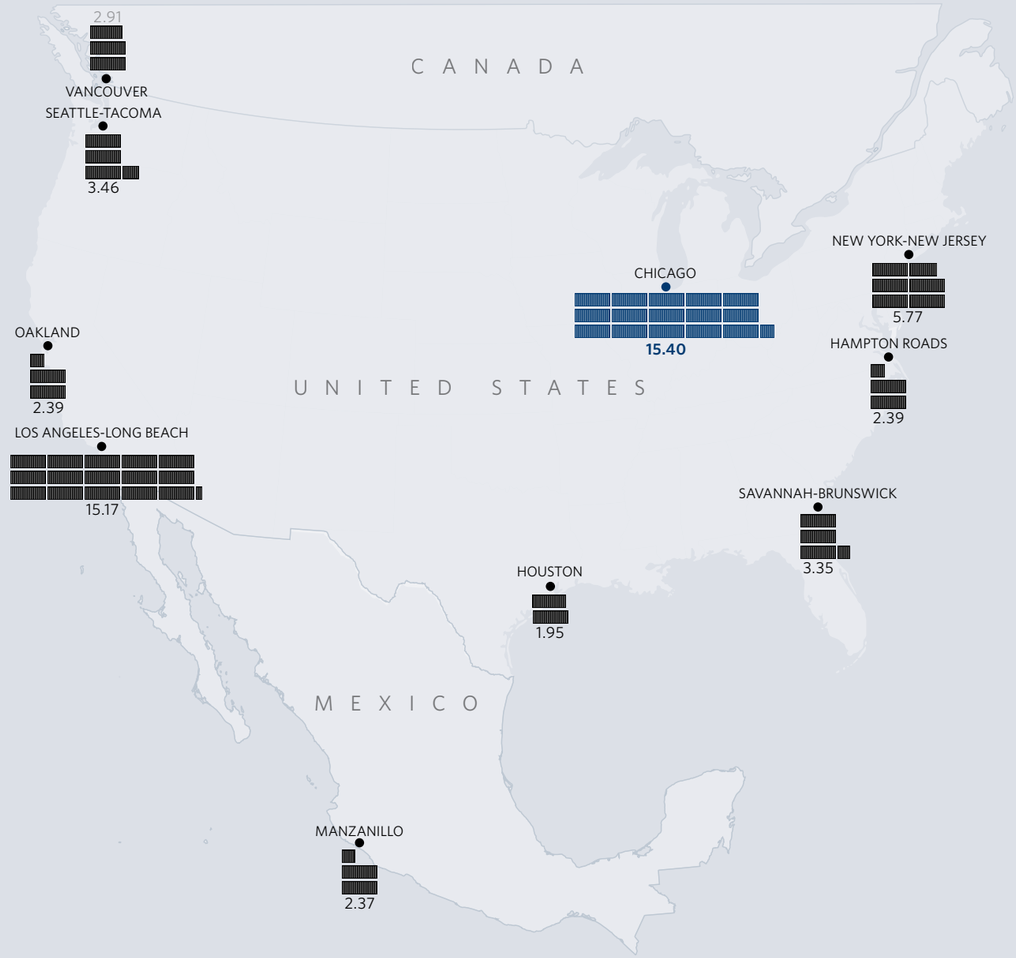
With its unparalleled access to transportation facilities, the Chicago region is one of the nation's preeminent hubs for intermodal freight—the movement of containerized cargo via multiple transport methods such as rail, trucks, planes, and ships. Intermodals match the universal access provided by trucks with the low long-distance hauling costs of rail transportation and have grown in importance over time for the freight industry.

The Chicago area accounts for about half of all domestic intermodal container traffic in the U.S. Over 15 million freight cargo containers originated or terminated in the Chicago area in 2014, making the region the nation's largest point of origin and termination for intermodal shipments, outpacing other large freight hubs such as the Los Angeles, New York, and Seattle areas. While intermodal freight volumes fell during the last recession, they have since experienced a significant rebound, growing some 30 percent between 2009-14.

Busiest North American ports, 2014
in millions of TEUs

Notes: Twenty-foot Equivalent Unit (TEU) is a 20-foot equivalent freight cargo container. Chicago region TEU estimate includes lifts at UP Global III in Rochelle.

Sources: Chicago Metropolitan Agency for Planning estimates of regional intermodal activity; American Association of Port Authorities port statistics.

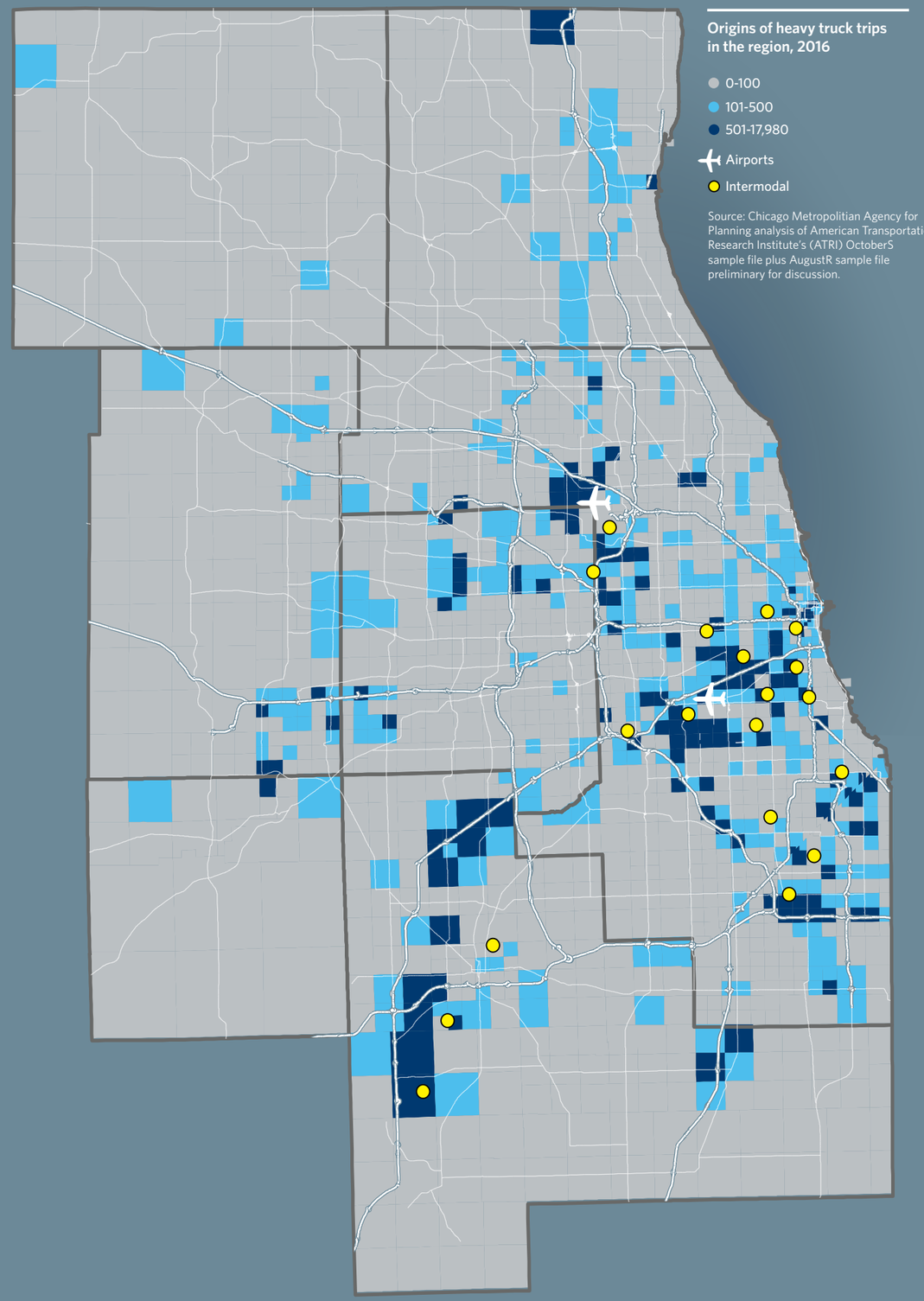


Infrastructure needs

The high levels of freight activity in the Chicago area lead to regional infrastructure challenges such as increased congestion, decreased safety, poor reliability, and damaged pavements and bridges. These concerns affect not only goods movement but also passenger travel, and freight and passenger movements directly conflict at many locations across the region. A well-maintained system that addresses the needs of all modes can broadly support the region's economic success, reduce congestion, and improve quality of life.

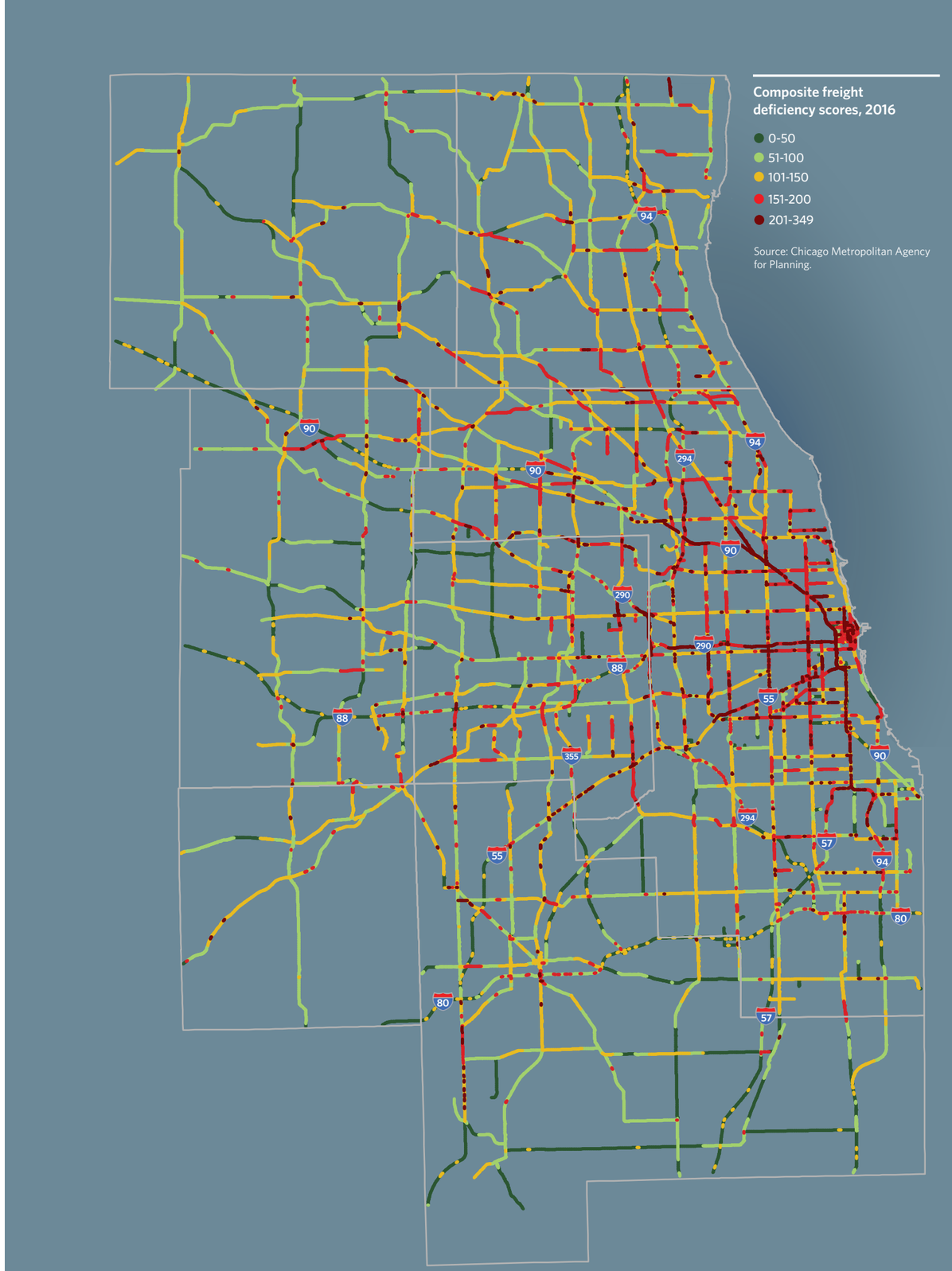
Highway

Because of their flexibility and point-to-point coverage, trucks travel across all of northeastern Illinois. However, the heaviest trucks[2] tend to be concentrated in far fewer areas. Based on recent data tracking truck trips in the region, areas that generate the most heavy-truck trips tend to be located in the region's major industrial centers and transportation centers on the south and west sides of Chicago, around O'Hare International Airport, in south Cook County, and in Will County. These areas generate over 500 heavy-truck trips per square mile, and some generate even more truck trips—over 1,000 or 10,000 heavy-truck trips per square mile.



Trucks are affected by, and also contribute to, highway operations and condition. Identifying the locations most in need of improvement would contribute not only to improved transportation system performance, but would also support the region's economic base. To help understand the relative needs of the highway network, CMAP staff developed a score incorporating condition, congestion, reliability, and safety data for the National Highway System, a network of some of the most important highways in the region.

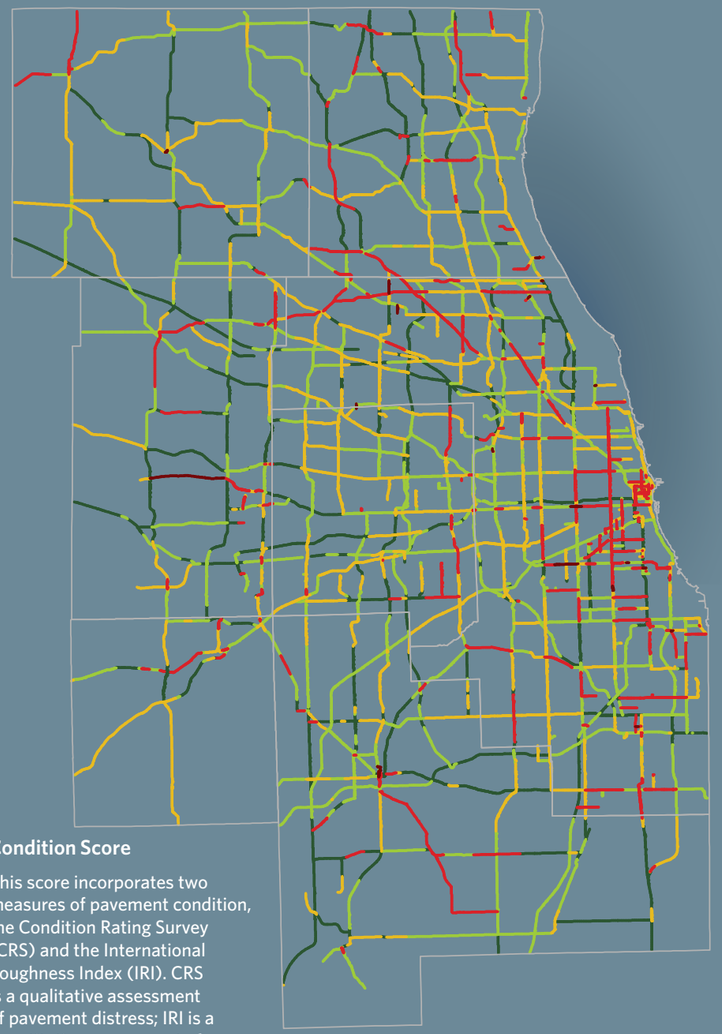
As the following map indicates, the locations with the highest need scores are located in the core of the region, particularly on major Interstate highways in Chicago and Cook County. Arterial highways across the region also have relatively high need scores. Improvements—ranging from operational improvements to strategic expansions of the system—focused in these areas promise to hold significant benefits for truck and passenger vehicle movements alike.



The following panel of maps shows each of the individual components of the composite need score. The high-need congestion and reliability locations tend to occur in the same areas—generally at the highly-developed core of the region—although poor reliability is experienced across a larger number of facilities than is poor mobility. In contrast, high-need condition and safety locations tend to be located throughout the region.

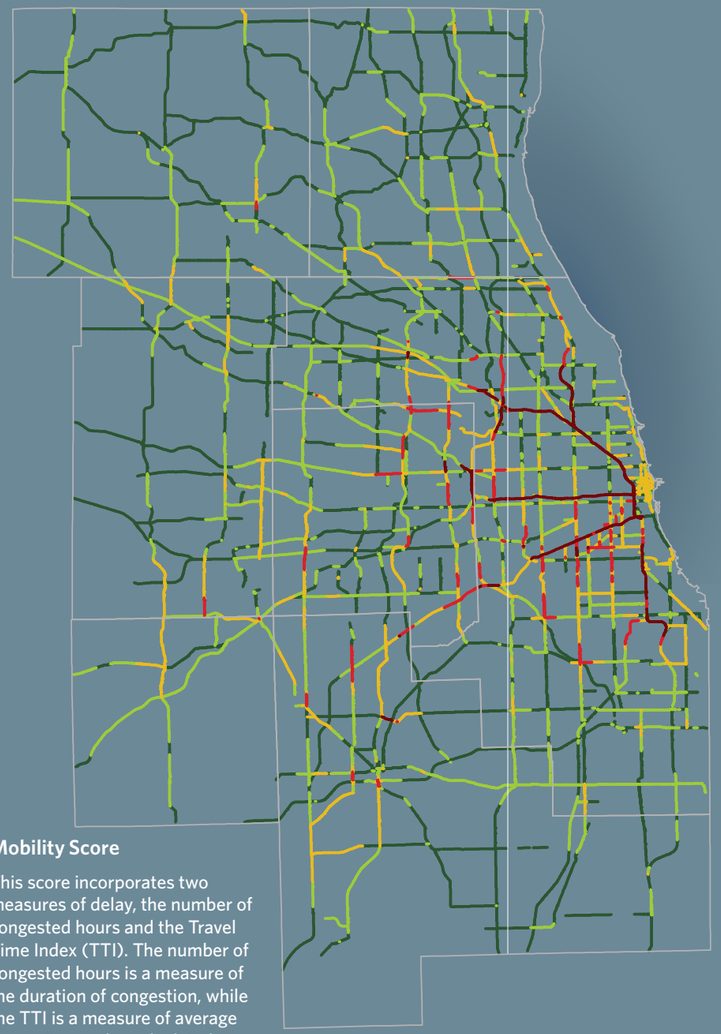
Freight deficiency score components, 2016 Source: Chicago Metropolitan Agency for Planning.





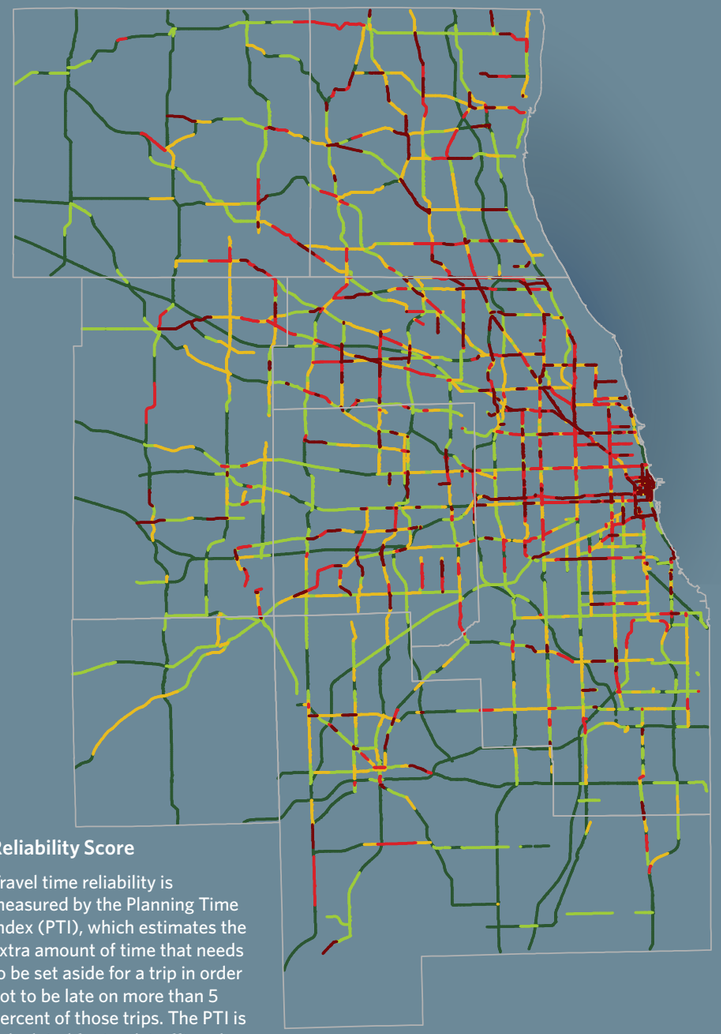
Condition Score

This score incorporates two measures of pavement condition, the Condition Rating Survey (CRS) and the International Roughness Index (IRI). CRS is a qualitative assessment of pavement distress; IRI is a quantitative assessment of pavement roughness.



Mobility Score

This score incorporates two measures of delay, the number of congested hours and the Travel Time Index (TTI). The number of congested hours is a measure of the duration of congestion, while the TTI is a measure of average congestion and is calculated as a ratio of peak-period travel times to free-flow travel times. Both are calculated for truck traffic only.

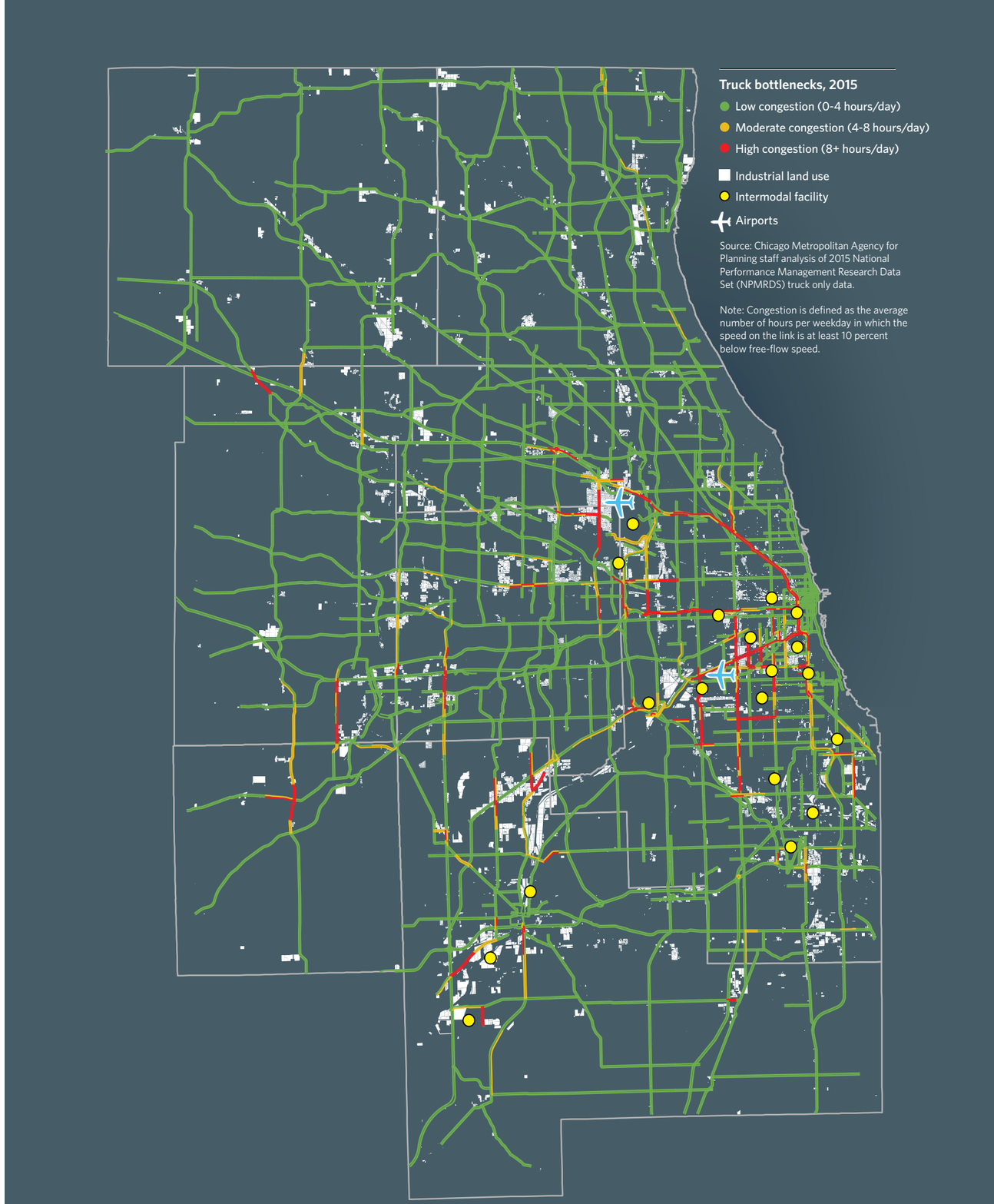


Reliability Score

Travel time reliability is measured by the Planning Time Index (PTI), which estimates the extra amount of time that needs to be set aside for a trip in order not to be late on more than 5 percent of those trips. The PTI is calculated for truck traffic only.

Bottlenecks—that is, locations with consistently low travel speeds due to an operational or network deficiency—are one particularly visible component of this deficiency analysis.[3] Some of the most severe bottlenecks in the region occur on the Interstate network within the City of Chicago, but several arterials also experience high levels of congestion, including those near O'Hare International Airport, the southwest side of Chicago, and the southwest part of the region in Will County. Improving conditions at these locations would help improve freight fluidity in the region, creating a more efficient regional freight system.

A number of operational issues and network deficiencies could lead to a truck bottleneck along a corridor. Lane drops, geometric issues, and signal timing are a few examples of deficiencies that potentially cause truck bottlenecks in the region, in addition to persistent passenger vehicle congestion in an area.



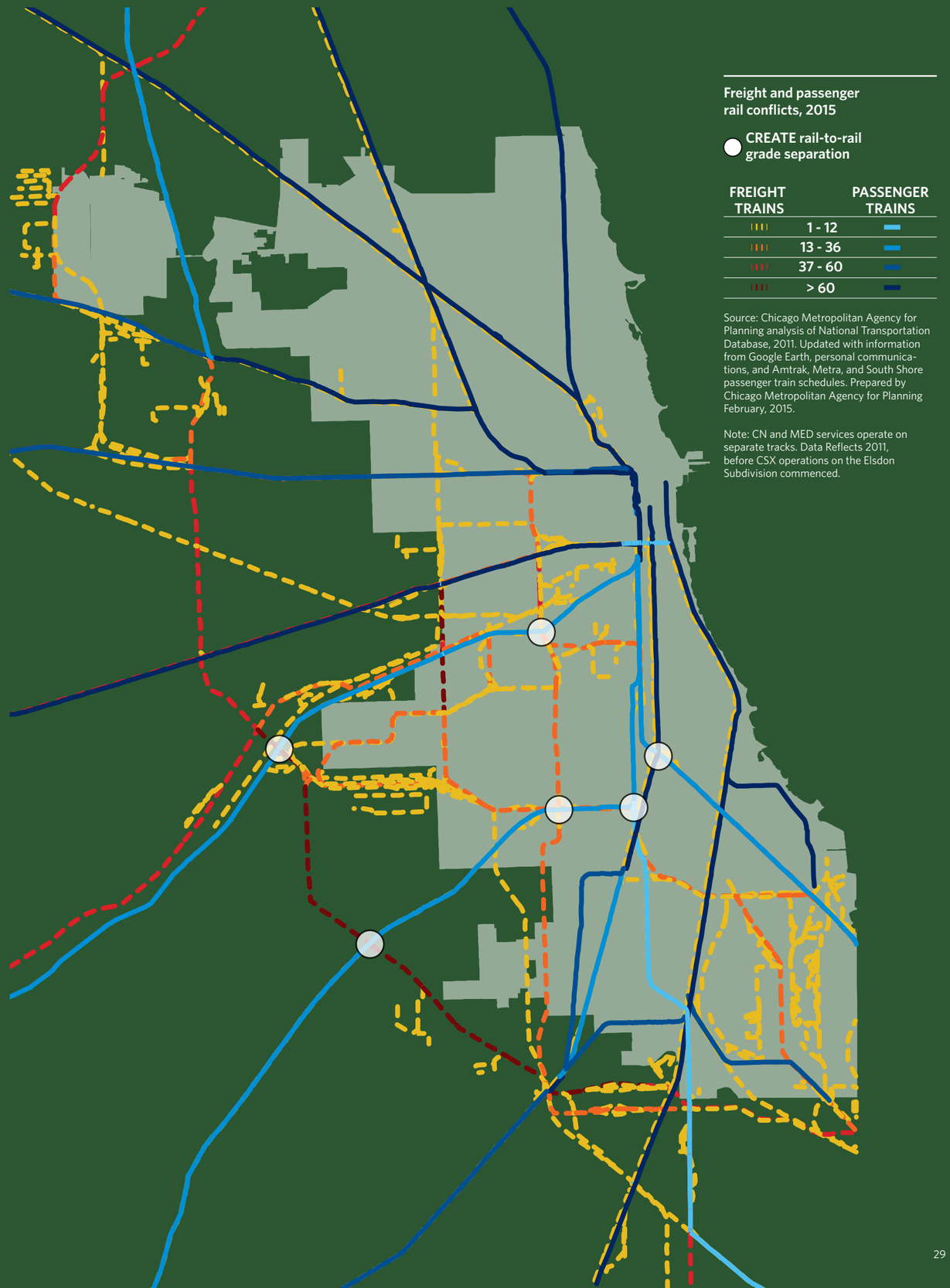
Rail

The Chicago region handles the movement of 500 freight trains each day, accounting for about 25 percent of all freight trains in the nation. Rail delays are common, given the density of the rail network, the age of the system and switching machinery, the number of at-grade rail crossings between busy lines, and the substantial conflict between freight and passenger rail in the Chicago region. As the nation's rail hub, delays in metropolitan Chicago can cause nationwide ripple effects in supply chains.

The Chicago Region Environmental and Transportation Efficiency (CREATE) program is a public-private partnership[4] designed to address many of these issues. First announced in 2003 after several years of study, the CREATE program today consists of 70 projects spanning a range of rail infrastructure improvements. The program's major goals are to provide additional rail capacity to accommodate heavy traffic volumes, improve connections between rail lines, and separate highway-rail grade crossings at critical locations.

Additionally, the CREATE program is designed to untangle freight and passenger rail operations. There is substantial conflict between freight and passenger rail in the Chicago region, particularly to the south and west of the city. Passenger trains tend to move from the edge of the region toward the center, while freight trains tend to move from the southeast to the west or northwest, across the passenger flows. Passenger rail is entitled to operational priority, but this reduces freight speeds at locations where passenger and freight lines cross or share tracks. In addition, unplanned interference with freight trains can reduce on-time performance for passenger services.

As of January 2017, 28 CREATE projects have been completed, and an additional six are under construction. Seventeen projects are in various design stages, and the remaining 19 projects will begin upon identification of funding resources. The CREATE projects completed to date have already made a significant impact on the performance of the transportation system. A 2014 study commissioned by the CREATE partners estimates reduced travel times ranging from one-quarter to one-third for a train to pass through the heart of the region's rail network. The same study estimates CREATE's total economic impacts to date at $28.3 billion, including benefits from reduced travel times, fuel savings, and safety improvements, among others.



Freight and passenger rail conflicts, 2015

CREATE rail-to-rail grade separation

FREIGHT TRAINS	PASSENGER TRAINS
1 - 12	
13 - 36	
37 - 60	
> 60	

Source: Chicago Metropolitan Agency for Planning analysis of National Transportation Database, 2011. Updated with information from Google Earth, personal communications, and Amtrak, Metra, and South Shore passenger train schedules. Prepared by Chicago Metropolitan Agency for Planning February, 2015.

Note: CN and MED services operate on separate tracks. Data Reflects 2011, before CSX operations on the Elsdon Subdivision commenced.

Modal conflicts

One key type of conflict between modes occurs at the region's nearly 1,500 highway-rail grade crossings. Delays can be particularly long just outside rail yards, where freight trains often back up waiting for access to crowded terminals. The amount of delay that trains cause at any particular crossing varies, but in some cases exceeds an hour.

Average delay is highly concentrated among a few grade crossings in the region. Out of roughly 1,500 crossings included in the report, the top 100 represented over 60 percent of the total delay. The top 10 locations[5] represented almost 20 percent of the total delay. Only five percent of the region's grade crossings account for half the delay, and 10 percent of the grade crossings account for about two-thirds of the delay. Average motorist delay is heavily concentrated in the City of Chicago and neighboring Cook County communities, according to data.

Cars and trucks are delayed more than 7,800 hours each weekday at highway-rail grade crossings in the region, totaling more than 2 million hours of delay per year.[6]

Grade crossings are an important planning topic for a number of reasons, not just motorist delay. Safety is a particular concern because rail operations are in direct conflict with highway, pedestrian, and bicycle traffic. There were 283 collisions at public highway-rail grade crossings in the seven-county Chicago region between 2009-14, resulting in 65 fatalities and 146 injuries.[7] Even in cases that do not result in serious injury or loss of life, crashes still have a high impact on delayed passenger and freight rail operations. An additional safety impact is the delay faced by emergency response vehicles at blocked grade crossings. Finally, some freight trains transport hazardous materials, so the consequences of a potential accident with a release of hazardous materials could have environmental and safety impacts on local communities.

Conflicts between highway and rail networks can also occur when large new rail yards, particularly intermodal yards, are located in previously undeveloped areas. The large increases in train and truck volumes may exceed the capacity of local infrastructure, requiring new highway-rail grade separations for some crossings. Further, the increase in truck traffic could also require improvements to create more truck-friendly designs for existing roads, along with new road capacity to provide more direct routing and access to major highways.

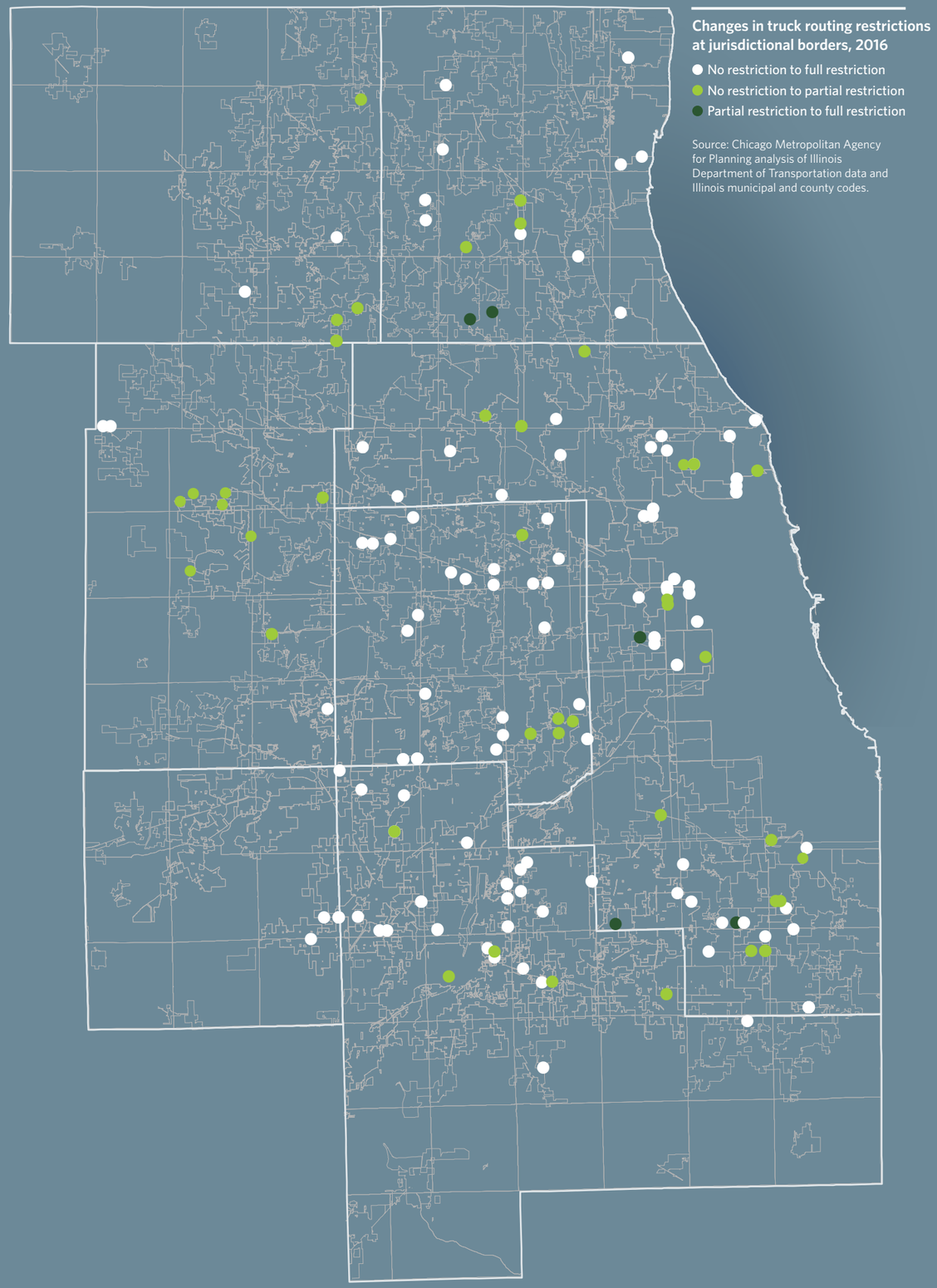
Local regulatory challenges

Local jurisdictions in northeastern Illinois—including counties, municipalities, and townships—regulate freight activity to protect the public health, safety, and welfare. While these decisions reflect local preferences, they can impede interjurisdictional travel, as illustrated by the disjointed truck routing and permitting in the region. Further, freight-related land uses create challenges at both the local and regional scales.

Truck routing and permitting

While state law allows local governments to designate truck routes or determine locally preferred truck routes, many communities instead designate where trucks cannot go.[8] These local truck restrictions are based on truck type, weight, and dimensions, and often change at jurisdictional borders. These changes in restriction type add complexity to truck routes, generating turns and diversions to alternate routes as trucks move between municipalities. Drivers must individually verify each jurisdiction's truck restrictions, as these local restrictions are not reported to a centralized public or private database.

A truck restriction can change in many ways at jurisdictional borders, including different restrictions based on the type or weight of the vehicle. The following map shows locations where trucking restrictions change at municipal, township, or county borders, and indicates that these locations are distributed fairly evenly across the region. Changes from no restrictions on trucks to full restrictions on trucks are the most common in the region.



Changes in truck routing restrictions at jurisdictional borders, 2016

- No restriction to full restriction
- No restriction to partial restriction
- Partial restriction to full restriction

Source: Chicago Metropolitan Agency for Planning analysis of Illinois Department of Transportation data and Illinois municipal and county codes.

Further, the truck permitting system for oversized and overweight loads is similarly fragmented among local jurisdictions in the region. To illustrate, CMAP has documented 223 truck restriction ordinances addressing both regular and oversize/overweight truck movement, many with separate permit processes. The process and technical sophistication of submitting, reviewing, and issuing permits also varies substantially across the region.

While truckers report that they are willing to pay for permits, securing multiple permits is time-consuming. Some truckers ignore the permit system, which risks damaging roads and bridges and endangering public safety. Intergovernmental coordination is at the core of addressing these challenges in freight efficiency, and near-term opportunities may exist in disseminating information and standardizing permit forms.

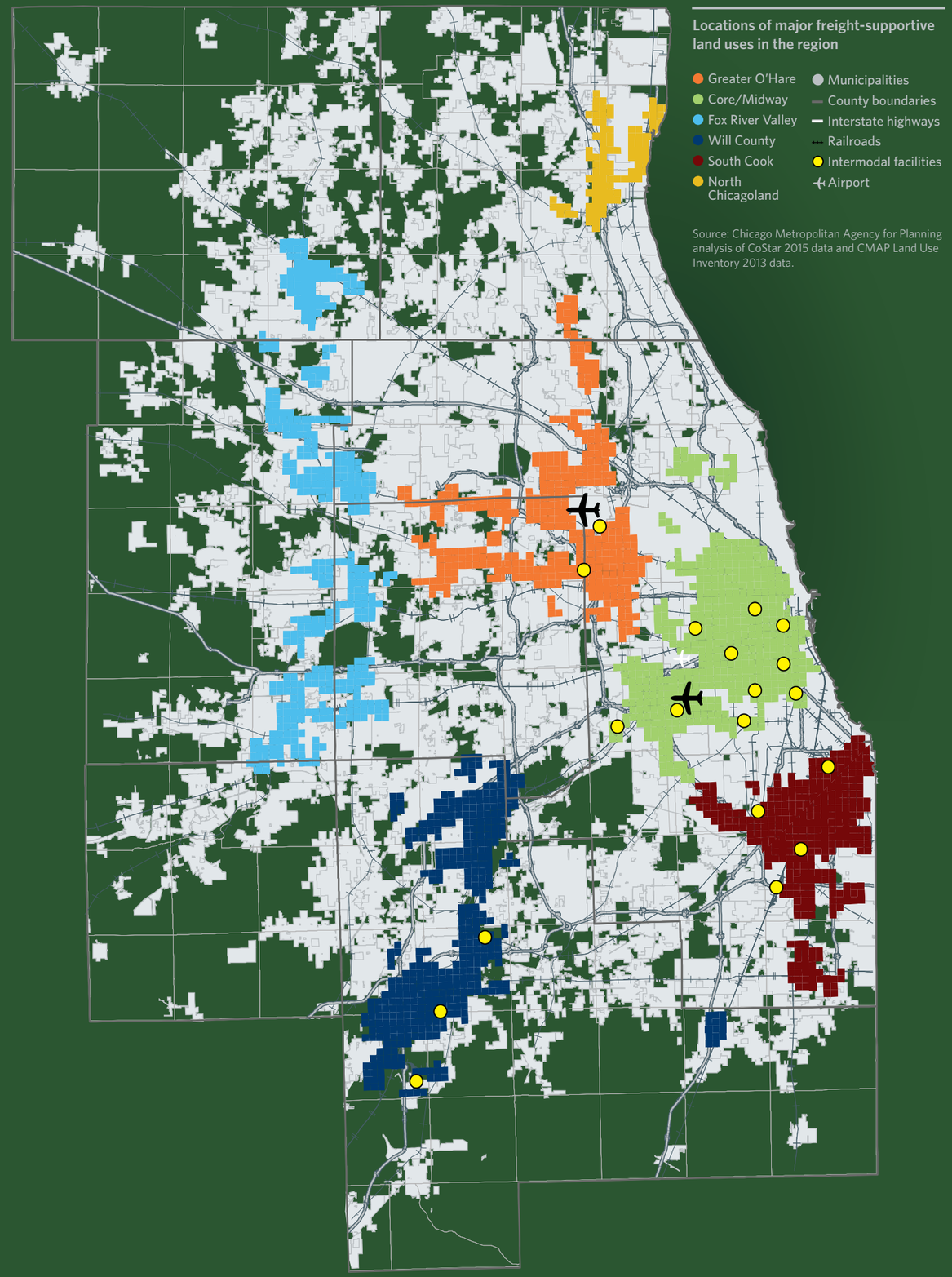
A recent study initiated by the leaders of the seven counties in northeastern Illinois, the City of Chicago, and the Illinois Department of Transportation investigated these issues, resulting in the Regional Truck Permitting Plan.[9] Today, the region's permitting agencies vary tremendously in the scale and sophistication of their operations, which makes a "one-size fits all" solution impractical. Rather, the plan identifies a set of recommendations to provide a common foundation for all permitting agencies, complemented with tailored recommendations on how best to apply technological solutions to low-volume, medium-volume, and high-volume permitting agencies. Improved communications and access to data—for example, easily accessed, publicly available information on jurisdictional ownership of roads, common application forms, and appropriate points of contact for permitting agencies—represent near-term improvements to harmonize the region's permitting systems.



Land use challenges and opportunities

Land use conflicts can occur in areas where freight facilities, freight-supportive facilities, and industrial lands interact with sensitive land uses. At the local level, these conflicts raise numerous safety, livability, and environmental concerns such as pollution and associated impacts on public health, traffic congestion, infrastructure damage, and accidents. Land-use conflicts can also reduce the efficiency of freight operations, for example by encouraging localities to impose truck-routing restrictions.

At the regional level, freight-supportive and freight-dependent land uses have an impact on the transportation system and larger economic success. The majority of the region's industrial land uses, which are major generators of freight demand, are located in developed communities near the center of the region, particularly in the City of Chicago and Cook County. These locations are close to existing transportation facilities like O'Hare International Airport and a skilled local workforce, and include a mix of manufacturing, warehousing, distribution, and other industrial uses. But, many industrial sites in this area are older and smaller. The following map shows the location of major freight clusters in the region, as defined by preliminary CMAP staff research using business-location and parcel-based land use datasets.



Over time, new industrial development has moved outward from the core of the region toward the periphery, where land is less expensive and larger sites are available. These large sites are necessary to accommodate the increasing square footage requirements of modern industrial buildings. The shift to online ordering of goods has pushed new types of distribution buildings and goods movement strategies. To illustrate, the average square footage per building of the region's existing stock of distribution buildings grew by 30 percent between 2000-15. However, development at the edge of the region raises concerns about the loss of agricultural and natural resources, potential pollution of sensitive aquifers, lack of appropriate public infrastructure and utilities, and local zoning changes required to mitigate land use conflicts. While major companies such as Amazon and FedEx have recently focused on creating smaller distribution hubs within or near Chicago, expansion of large distribution facilities at the edge of the region is also continuing.

Preserving areas dedicated to freight-supportive activity ensures efficient movement of freight, promotes reinvestment in areas with existing freight infrastructure, supports environmental and land conservation goals, and supports the economic base for the region. However, local jurisdictions may have little incentive to modify regulations to facilitate freight-supportive land uses, in part because of the relatively low level of tax revenues they generate compared to the costs of providing public services to industrial land uses. For example, local jurisdictions may shoulder increased road maintenance costs due to heavy truck traffic. Further, some areas have strong market pressures to convert freight-supportive land uses to other purposes, such as residential or office, which could result in the loss of prime industrial areas accessible to existing infrastructure and workforce.



ON TO 2050 and the Regional Strategic Freight Direction

The region's freight system ties together various transportation, land use, and economic development strands, resulting in significant impacts on the region's long-term prosperity and quality of life. Given the importance of freight to metropolitan Chicago, as well as emerging planning and programming opportunities under federal law, CMAP will develop a separate Regional Strategic Freight Direction concurrent with the ON TO 2050 process. This Regional Strategic Freight Direction will address these interconnected issues through both policy-level and technical recommendations to improve the region's freight system.

Endnotes

1 CMAP recently purchased new probe-based datasets from the American Transportation Research Institute, allowing analysis of the stops within each truck's tour for two two-week periods in 2014. More than 906,000 stops have been identified in the files covering the CMAP travel model area, of which 395,000 were within the seven-county CMAP region.

2 "Heavy trucks" are Class 7 and Class 8 trucks under the Federal Highway Administration classification system. Class 7 trucks are single units with four or more axles. Class 8 trucks have four or fewer axles and a single trailer. Available at https://www.fhwa.dot.gov/publications/research/infrastructure/pavements/ltpp/13091/002.cfm.

3 Truck bottlenecks were identified on the National Highway System (NHS) using a truck vehicle probe dataset from 2015. For this analysis, truck bottlenecks were identified by the average number of hours per weekday in which the speed on the road segment was at least 10 percent below the road segment's free-flow speed.

4 The CREATE partners include freight railroads, the U.S. Department of Transportation, Illinois Department of Transportation, City of Chicago, Metra, and Amtrak. More information is available at http://createprogram.org

5 http://www.cmap.illinois.gov/mobility/explore#/topic/freight/crossing-delay

6 Illinois Commerce Commission, Motorist Delay at Public Highway-Rail Grade Crossings in Northeastern Illinois: 2011 Update. Available at http://www.cmap.illinois.gov/documents/10180/29236/2011-1004-Motorist-Delay_20111121_final.pdf/192e6a37-d50e-4fc7-aca8-d996e057b0c2

7 Data on highway-rail grade crossings and related casualties are available from the Illinois Commerce Commission (ICC) and the Federal Railroad Administration (FRA), respectively. ICC data are available at https://www.icc.illinois.gov/railroad/crossingmap.aspx. FRA data are available at http://safetydata.fra.dot.gov/OfficeofSafety/publicsite/on_the_fly_download.aspx.

8 Illinois has three primary classes of designated truck routes: Class I, Class II, and Locally Preferred Truck Routes. Class I truck routes generally consist of the expressway system. Class II routes include major state highways as well as local roads that have been designated by local ordinance as truck routes. Class I and Class II truck routes are associated with certain restrictions on the size and weight of trucks. Finally, Locally Preferred Truck Routes include only truck routes administratively identified by local governments and are not considered a designated truck route; they have no effect on permitted truck size and weight.

9 The full report is available at http://www.cmap.illinois.gov/programs-and-resources/lta/regional-truck-permitting.

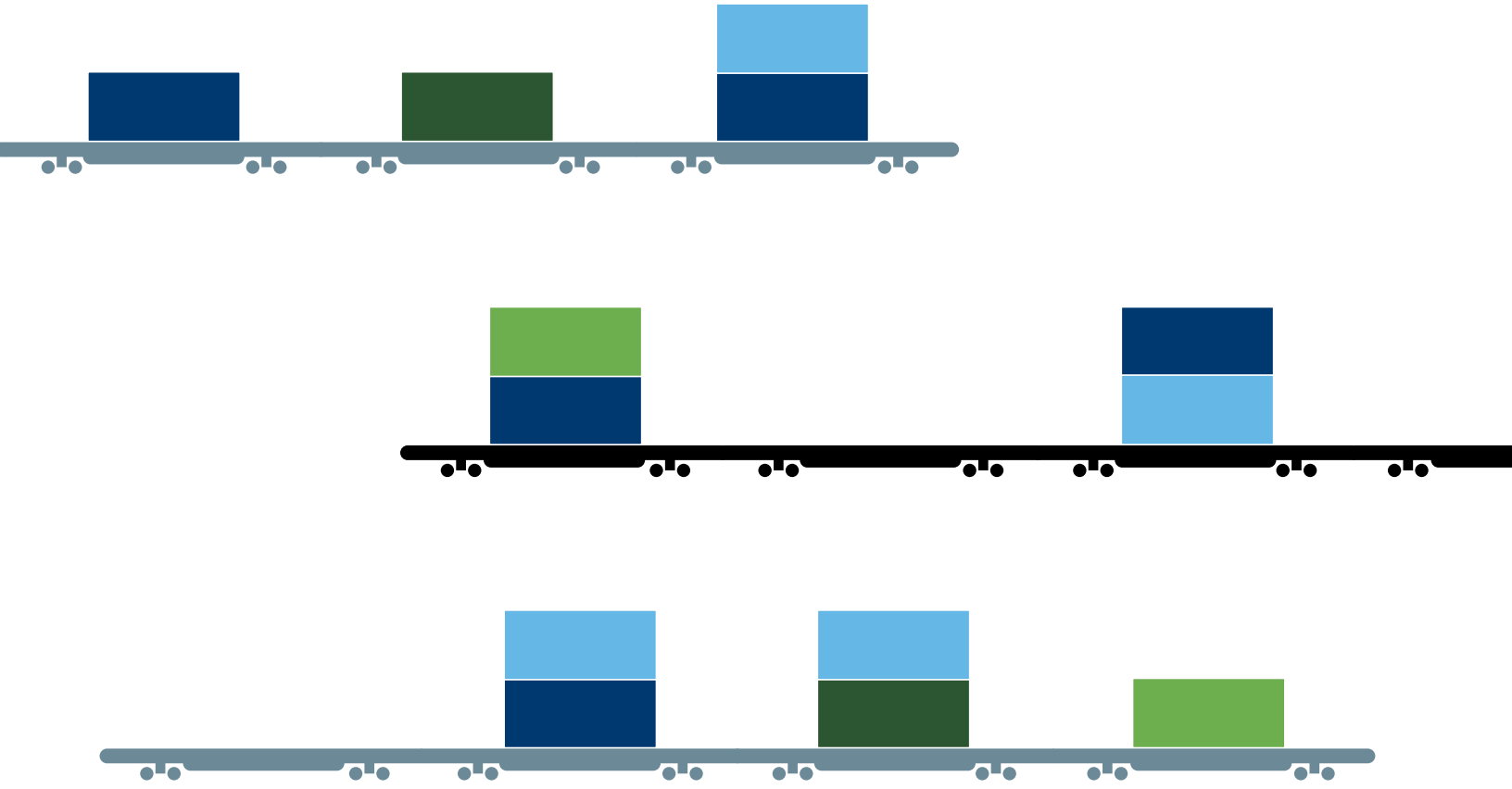
Selected data used in the development of this report can be found at https://datahub.cmap.illinois.gov/group/on-to-2050-report-data.

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The Chicago Metropolitan Agency for Planning (CMAP) is our region's comprehensive planning organization. The agency and its partners are developing ON TO 2050, a new comprehensive regional plan to help the seven counties and 284 communities of northeastern Illinois implement strategies that address transportation, housing, economic development, open space, the environment, and other quality-of-life issues. See www.cmap.illinois.gov for more information.

ON TO 2050 snapshot reports will offer data-driven summaries of regional trends and current conditions. These documents—as well as strategy papers—will define further research needs as the plan is being developed prior to adoption in October 2018.



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