



Acknowledgments

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Advisory Committee

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The strength of the report is due to the contributions of our partners. ICIC claims responsibility for all errors and omissions.

Cover image courtesy of the Duluth Seaway Port Authority.

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The Initiative for a Competitive Inner City (ICIC)

ICIC is a national, nonprofit research and advisory organization founded in 1994. Its mission is to drive economic prosperity in America's inner cities through private sector investment. For more information about ICIC, please visit www.icic.org.

Executive Summary

This study was commissioned by the Duluth Seaway Port Authority (DSPA), who engaged the Initiative for a Competitive Inner City (ICIC) to complete the study. ICIC is nationally recognized for its research on equitable economic development and was the lead consultant on the 2012 *Industrial Strategy for the City of Saint Paul*, which was prepared for the Saint Paul Port Authority.

The City of Duluth, Minnesota is a resurgent city that has garnered recent national attention for its vibrant maker districts, natural amenities, and start-ups that are revitalizing the city's image and economy. However, the city also faces significant challenges to achieving sustained, equitable growth. As measured by population and employment, Duluth lags behind the state and many of its peer cities, including Mankato, Rochester and St. Cloud. In terms of economic growth, Duluth was also outpaced by Mankato and Rochester. Persistent economic inequality is also an ongoing struggle, with poverty concentrated within several neighborhoods, including Lincoln Park and the Hillside neighborhoods.

The purpose of this report is to analyze the potential for industry in Duluth to spur greater economic growth and opportunity in the city and to better inform future economic development planning and actions. The DSPA has been a leading advocate for industry in the Twin Ports and Northeast Minnesota since its founding in 1955.

The report includes the following six sections:

1	Introduction (p. 4)	
2	Duluth's Industrial Legacy and Current Land Use Patterns (p. 9)	
3	The Economic and Fiscal Impact of Duluth's Aggregate Industrial Sector (p. 17)	
4	The Competitiveness of Duluth's Industrial Sector: A Cluster Analysis (p. 31)	
5	Lessons from Peer Cities in Catalyzing Industrial Growth (p. 45)	
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Key Findings

- 1. The industrial sector continues to drive significant economic growth in both Duluth and the surrounding region. In 2016, there were 9,449 industrial jobs, which supported an additional 7,353 jobs in Duluth. The industrial sector created a \$3.8 billion impact on Duluth's economy and generated \$236.4 million in state and local tax revenue. An estimated \$107.3 million of the tax revenue went to local government coffers.
- 2. While on the surface there seems to be a sufficient amount of vacant industrial zoned land in Duluth to support industrial sector growth, 20 percent of vacant industrial zoned land is not developable because of low elevation. Another 21 percent includes three large brownfield sites. Much of the remaining 1,600 vacant industrial acres is challenging to

redevelop due to known or suspected brownfield issues, limited parcel size, limited access, soil quality, and a host of other issues. If suitable industrial land is not readily available or is too costly to develop in the city, existing businesses that are expanding may feel forced to move out of the city. Likewise, without sufficient development-ready sites, Duluth will not be able to compete with other areas in attracting new industrial businesses to the area.

- 3. While the rest of the economy is five times larger than the industrial sector in Duluth, on a per job basis the industrial sector supports a proportionately higher share of jobs and generates three times more local tax revenue per job. Our analysis also suggests that maintaining industrial businesses on industrial zoned land would create more jobs and drive greater economic growth than most alternative uses, including housing, green space and retail or service-sector businesses.
- 4. Duluth has 10 strong and emerging competitive industrial clusters, which suggests that industry remains a competitive advantage for Duluth and the region and has the potential to continue to drive economic growth in the future. The clusters include Water Transportation, Aviation, and Transportation and Logistics. The majority of jobs in these clusters are accessible—requiring less than a Bachelor's degree—and offer competitive wages. The industrial sector also supports the growth of other business sectors in Duluth, including Health Care, Education and Tourism. If the industrial sector expands, these other sectors will grow as well.

Four Priorities for Catalyzing Industrial Growth in Duluth

- 1. Supporting and growing the industrial sector in Duluth will require **coordinated** economic development strategies that should recognize the importance of industry alongside other sectors of Duluth's economy.
- 2. Duluth is fortunate to have many industrial assets. **Targeted investment in "high-return" industrial assets** will spur growth in both the industrial sector as well as Duluth's overall economy.
- 3. While clusters (groups of closely related industries co-located in a specific geography) occur organically and reflect the unique assets and competitive advantages of a region, cluster growth can be accelerated and the impact maximized through strategic interventions to address issues such as workforce development, support of entrepreneurs, or zoning.
- 4. Finally, there is a **need to develop policies that create a more supportive business environment for industry**. Duluth needs to be competitive to attract, retain and expand industrial businesses. Local policies, from land use to wastewater and electricity rates, can have a significant impact on the industrial sector.

To generate and sustain buy-in for these priorities, DSPA is currently developing next steps to communicate and disseminate the key findings and insights from this report.

1. Introduction

The City of Duluth, Minnesota, a resurgent rust belt city nicknamed the Zenith City, finds itself at a critical juncture, forging a new vision for future economic growth. Duluth's resurgence has been profiled in national media and a book on the rise of small towns, which recognizes the growth of its craft breweries as well as the success of eco-friendly start-ups Loll Designs and Epicurean, and the aircraft maker Cirrus (Fallows & Fallows, 2018). The newly designated Lincoln Park Craft District actually builds on generations of "makers" in the city. In 2014, Duluth was voted the best place to live by Outside Magazine and it is often compared to trendy cities that are attracting more millennials such as Portland, Oregon.

And yet, Duluth has not achieved the growth of other peer cities. Duluth's population is growing only modestly, after a decline of 15 percent during 1970-1990. From 2010-2016, Duluth's population grew by less than one percent, lagging behind the state overall (four percent) and peer cities Mankato (seven percent), Rochester (seven percent) and St. Cloud (two percent). Employment and economic growth in the Duluth metro area have also been modest, falling behind the state overall and regional peer cities. From 2005-2015, employment in the Duluth metro area grew six percent, slightly less than Minnesota overall (seven percent), Mankato (eight percent) and St. Cloud (nine percent) and less than half the rate of Rochester (20 percent), Cedar Rapids (14 percent), Sioux Falls (20 percent) and Fargo (24 percent). During the same period, the economy grew 11 percent, more than Minnesota overall (nine percent) and St. Cloud (nine percent), but again lagging behind Mankato (21 percent), Rochester (15 percent), Cedar Rapids (28 percent), Sioux Falls (27 percent) and Fargo (43 percent).

As a result of this sluggish growth, the City of Duluth faces a relatively flat budget and limited tax base that is further constrained by a large share of tax forfeit or tax exempt land. From 2015 to 2018, City expenditures have increased by 17 percent while revenue has only increased by six percent (City of Duluth, 2018b). The City of Duluth's Community Planning Division estimated that, in 2016, 47 percent of all property in Duluth was either tax forfeit or tax exempt (City of Duluth Community Planning Division, 2016d).

Like so many other cities, Duluth also struggles with economic inequality. Recognizing that fifteen percent of Duluth's residents live below the poverty line, with poverty concentrated in some neighborhoods such as Lincoln Park and the Hillside neighborhoods, Duluth also wants to

¹ ICIC analysis using 1970-2010 U.S. Census Bureau Decennial Census data and 2016 U.S. Census Bureau American Community Survey 5-Year Estimates.

² ICIC analysis using 2010-2015 U.S. Census Bureau American Community Survey 5-Year Estimates. Population estimates are not available for 2005.

³ ICIC analysis using 2005-2015 U.S. Census Bureau County Business Patterns. Total employment is reported by the U.S. Census Bureau as the total employment for all sectors.

⁴ Economic growth is measured by Gross Metropolitan Product (GMP). ICIC analysis using 2005-2015 U.S. Department of Commerce Bureau of Economic Analysis Real Gross Metropolitan Product.

create equitable growth—not simply expanding the number of jobs, but creating high-quality jobs accessible to the broader community. The City's recently updated comprehensive plan, *Imagine Duluth 2035*, is guided by 14 Governing Principles, including one to "Integrate fairness into the fabric of the community," which will require that "investments and policies will advance and maximize equity in the city" (City of Duluth, 2018, p. G-6).

While the comprehensive plan recognizes the importance of the existing economic base as well as economic growth sectors for the future of Duluth, the specific potential of Duluth's industrial sector, which remains a pillar of Duluth's economy, is not well articulated. This may be due in part to the public attention garnered by craft businesses, start-ups and the growth of health care and tourism. The economic importance of the Port and other significant industrial assets are less visible to the public, less newsworthy and seem to be relegated to Duluth's past rather than its future. Since industry can be blamed for Duluth's initial economic downturn in the 1970s, it is understandable that the city may find it difficult to bet on the sector for revitalization. How can it be part of the solution if it was part of the problem?

The purpose of this report is to analyze the potential of Duluth's industrial sector to spur greater economic growth and economic opportunity in the city and region. The findings will be available to shape future economic development planning and actions. The research was commissioned by the Duluth Seaway Port Authority (DSPA), who engaged the Initiative for a Competitive Inner City (ICIC) to complete the study. ICIC is nationally recognized for its research on equitable economic development and was the lead consultant on the 2012 *Industrial Strategy for the City of Saint Paul*, which was prepared for the Saint Paul Port Authority.

The DSPA has been a leading advocate for industry in the region since its founding in 1955. It is a public agency (a subdivision of the State of Minnesota) with four primary objectives: (1) bring business to the port; (2) support economic development in Duluth and the surrounding region; (3) increase domestic and international trade; and (4) advocate for the maritime and transportation sectors on a local, state, and national level.

Approach

Following other studies, we defined an aggregate industrial sector that includes both traditional and contemporary industrial businesses (e.g., construction, manufacturing, transportation, publishing, telecommunications, data processing, aviation and breweries) represented within 27

⁵ The poverty threshold is an annual income of \$24,563 for a family of four. ICIC analysis using 2016 U.S. Census Bureau American Community Survey 5-Year Estimates. The poverty rate excludes student populations, which can skew poverty measures. The poverty threshold is from the U.S. Census Bureau for 2016 and is measured in 2016 dollars. The population data is ICIC analysis using 1970-2010 U.S. Census Bureau Decennial Census data. Decennial Census data is obtained from IPUMS National Historical Geographic Information System Database (Manson, Schroeder, Van Riper, & Ruggles, 2017).

North American Industry Classification System (NAICS) sectors (Table 1).⁶ This broad definition allows us to capture the impact of Cirrus, Epicurean, Loll, the breweries and other industrial "craft" businesses, as well as older, more traditional industrial businesses. A robust analysis of industrial land use in Duluth was used to show current land use patterns and surface any land use constraints on future industrial sector growth and competitiveness for business attraction, retention and expansion. IMPLAN was used to estimate the current economic and fiscal impact of the aggregate industrial sector, while a cluster analysis shows the competitive strength of the sector for future growth in Duluth and the region.

To better articulate the importance of the industrial economy to Duluth and the surrounding region, we also compare the performance of the aggregate industrial sector to the rest of the economy in our IMPLAN modeling and cluster analysis. This approach has been used in other studies and highlights the relative impact of the industrial sector to the broader economy, without unfairly (and incorrectly) comparing it to a single business sector (e.g., tourism)

The study also includes a close review of four peer cities—each chosen to reflect different dimensions of Duluth's economy—to help provide insight into policies and practices that could potentially be replicated in Duluth. While the study includes some analysis of the region's workforce, it does not offer a complete assessment, which was considered out of scope because of time and budget limitations.

The analysis relied on public and proprietary data, a broad literature review that included planning and economic development studies, and interviews with 51 experts from different economic sectors in the city. The study was guided by an advisory committee made up of the DSPA project team and 11 other community members representing diverse organizations from the public and private sectors (Appendix A). The committee met three times throughout the duration of the project.

Key Findings

The assessment finds that the city's aggregate industrial sector continues to drive significant economic growth in both Duluth and the surrounding region. On a per job basis, the aggregate industrial sector generates a proportionately higher share of jobs and tax revenue than the rest of the economy. Further, the sector supports accessible and quality jobs, offering high wages and benefits, which can create greater economic equality in the city. The cluster analysis shows that several industrial clusters remain strong or are emerging, which suggests that industry still represents a competitive advantage for the city and region and, therefore, should be included in future economic development plans. The cluster analysis also highlighted the integrated nature of the economy. The industrial sector supports the growth of other sectors in Duluth—notably

⁶ The aggregate industrial sector was defined using 2-digit to 6-digit NAICS codes. NAICS code descriptions are available from the U.S. Census Bureau website: https://www.census.gov/eos/www/naics/.

Professional, Scientific, and Technical Services; Wholesale Trade; Health Care and Social Assistance; Retail Trade; and Accommodation and Food Services. If the industrial sector expands, these other sectors will grow as well.

Supporting and growing the industrial sector in Duluth will require leadership from both the public and private sectors, and coordinated economic development strategies should recognize the importance of industry alongside other sectors of Duluth's economy—not one sector in lieu of others. The analysis also surfaced some constraints that need to be addressed to grow the industrial sector. Most importantly, there are significant limitations on vacant industrial land that restricts the pipeline of "shovel ready" sites, and which can limit future industrial business retention, expansion and attraction. This issue makes Duluth less competitive than peer cities. The study concludes by recommending a number of priorities for Duluth's industrial sector, including strengthening visibility of industry's impact in Duluth, investing in "high-return" industrial assets, targeting economic development to address industrial cluster gaps, and developing policies that create a more supportive business environment for industry. The study offers a set of illustrative suggestions that could help address these priorities.

The remainder of the report is broken into five sections:

- Duluth's Industrial Legacy and Current Land Use Patterns (p. 9);
- The Economic and Fiscal Impact of Duluth's Aggregate Industrial Sector (p. 17);
- The Competitiveness of Duluth's Industrial Sector: A Cluster Analysis (p. 31);
- Lessons from Peer Cities in Catalyzing Industrial Growth (p. 45); and
- Catalyzing Industrial Growth in Duluth: Four Priorities (p. 55).

Table 1. NAICS Codes Included in ICIC's Aggregate Industrial Sector Definition

	NAICS Titles	
112	Animal Production and Aquaculture	
115	Support Activities for Agriculture and Forestry	
21	Mining, Quarrying, and Oil and Gas Extraction	
22	Utilities	
23	Construction	
31-33	Manufacturing	
42	Wholesale Trade	
4542	Vending Machine Operators	
454310	Fuel Dealers	
48-49	Transportation and Warehousing	
511	Publishing Industries (except Internet)	
51211	Motion Picture and Video Production	
517	Telecommunications	
518210	Data Processing, Hosting, and Related Services	
53212	Truck, Utility Trailer, and RV (Recreational Vehicle) Rental and Leasing	
5324	Commercial and Industrial Machinery and Equipment Rental and Leasing	
54138	Testing Laboratories	
5417	Scientific Research and Development Services	
561612	Security Guards and Patrol Services	
56162	Security Systems Services	
56171	Exterminating and Pest Control Services	
56191	Packaging and Labeling Services	
562	Waste Management and Remediation Services	
81112	Automotive Body, Paint, Interior, and Glass Repair	
	Commercial and Industrial Machinery and Equipment (except Automotive	
8113	and Electronic) Repair and Maintenance	
811412	Appliance Repair and Maintenance	
81233	Linen and Uniform Supply	

Source: U.S. Census Bureau NAICS Codes (2012).

2. Duluth's Industrial Legacy and Current Land Use Patterns

The abundance of natural resources in the region, including iron ore and forests, combined with rail and shipping transportation options, helped Duluth grow into a prosperous industrial city at the turn of the twentieth century. Minnesota iron ore and other raw commodities used in the production of steel established the city as a major center for steel production. The city's location on Lake Superior and its large port gave it a competitive advantage in transporting these goods. In the early 1900s, the Aerial Lift Bridge was constructed, and the Twin Ports of Duluth and Superior were handling more tonnage annually than New York City. In 1959, the St. Lawrence Seaway was constructed, becoming the largest inland waterway in the world and opening up new trading opportunities for Duluth ("History and Area Information," n.d.).

In subsequent decades, the industrial sector declined in Duluth, as it did in other American "rust belt" cities. In 1971, the city's largest employer at the time, the U.S. Steel plant, closed, laying off 1,600 workers. At peak production, the plant employed between 3,000 and 4,000 workers ("U.S. Steel Shutdown Hits Duluth Hard," 1971). However, Duluth has retained major industrial assets as a Great Lakes port and leveraged its competitive assets to support new industrial clusters, such as aviation. The Port of Duluth-Superior is the largest tonnage port on the Great Lakes and continues to rank among the top 25 ports in the U.S., handling an average of 35 million short tons of cargo and hosting nearly 900 vessel visits each year. ("About Us", n.d.).

DSPA owns and operates multiple properties, including the Clure Public Marine Terminal, which is the only U.S. heavy-lift and general cargo terminal on the west end of Lake Superior. Its properties also include the Duluth Airpark, a 300-acre light industrial park located near the Duluth International Airport that is home to Cirrus facilities, GPM, ProPrint and more than 40 other companies. In March 2017, the Canadian National (CN) Duluth Intermodal Container Terminal opened on the Clure Public Marine Terminal, providing new opportunities to expand both domestic and international trade. Four major freight railroads also serve Duluth: Burlington Northern Santa Fe, Canadian National, Canadian Pacific and Union Pacific.⁷

The Geography of Industry in Duluth

Some land in Duluth is visibly industrial—the area surrounding the port, for example—while other land used by new industrial businesses may not be seen as "industrial" by the casual observer. Still other industrial land, such as rail yards, may appear to be vacant. We include a robust industrial land use analysis in this report to more accurately convey the geography and extent of industrial land use in Duluth. The analysis also explores whether there is sufficient land available to support the growth of industry in Duluth.

⁷ These are Class I Railroads, which, as of 2017, are defined as line haul freight railroads having operating revenues of, or exceeding, \$447,621,226 annually. Further information on Class I freight railroads is available from the U.S. Surface Transportation Board website: https://www.stb.gov/stb/faqs.html.

We analyzed four different land use patterns for an in-depth understanding of current industrial land supply and demand: (1) industrial zoned land, (2) industrial zoned land currently in use (by any business and by industrial businesses), (3) vacant and non-developable industrial zoned land and (4) all land in use by industrial businesses regardless of zoning. The last land use pattern is important to consider since some industrial businesses included in this report (e.g., publishing businesses, contractors, and some labs) are able to operate in areas not zoned for industrial use.

The City of Duluth's Industrial-General (I-G), Industrial-Waterfront (I-W), and Mixed Use-Business Park (MU-B) zones represent the primary industrial zoned areas where industrial business use is permitted under the City of Duluth Zoning Regulations (Table 2).⁸ We used ArcGIS to create all maps, which were reviewed and validated by representatives from DSPA, APEX—a regional nonprofit economic and development organization—and staff from the City of Duluth's Community Planning Division and Business and Economic Development departments. Additional methodology is provided in Table 3.

Table 2. Descriptions of Duluth's Industrial Zone Districts

Zone Districts	Description
Industrial-General	I-G zone districts are intended for "general to heavy-impact industrial,
(I-G)	processing, assembly, fabrication, and manufacturing uses." Office
	uses that support on-site industrial uses are also permitted. I-G zone
	districts are intentionally located close to major transportation corridors
	and active commercial centers, and away from residential
	development.
Industrial-	I-W zone districts are intended for "water-dependent and port-
Waterfront (I-W)	dependent industrial uses." Office uses that support on-site industrial
	uses are also permitted. I-W zone districts are located on the waterfront
	and away from residential development.
Mixed Use-Business	MU-B zone districts are intended for "modern light industrial and
Park (MU-B)	technology-based developments of attractive integrated design and
	function." Intended light industrial uses include wholesaling, industrial
	services, research laboratories, and light manufacturing. MU-B zone
	districts can be located near residential areas; however, development
	design standards ensure minimal impacts to surrounding uses,
	neighborhoods, and natural environment.

Sources: City of Duluth Community Planning Division (2016a, 2016b and 2016c).

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⁸ Parcels are plots of land of any size to be used or developed as a single unit. Parcels are designated by the Saint Louis County Assessor. Excluded land areas included roads, rights of ways, railroad rights of ways, un-surveyed land, unidentified parcels, common elements, and parcels with missing data. Both the Mixed Use-Neighborhood (MU-N) and Mixed Use-Waterfront (MU-W) zone districts include scattered marine-focused industrial use. Given the limited nature of industrial use, these zone districts were excluded from the calculation of industrial zoned land.

Table 3. Land Use Categories and Methodology Used For Land Use Analysis

Land Use Category	Definition		
Industrial zoned land	All parcels of land that are located in the City of Duluth's Industrial-General (I-G), Industrial-Waterfront (I-W), and Mixed Use-Business Park (MU-B) zones.		
Industrial zoned land currently in use by any business	All industrial zoned land parcels that have any type of business using the land. Dun & Bradstreet's Hoovers Database (2017) was used to identify businesses in Duluth and each business was matched to parcels by the physical addresses of the business and parcel.		
Industrial zoned land currently in use by industrial businesses	All industrial zoned land parcels that have an industrial business using the land. Dun & Bradstreet's Hoovers Database (2017) was used to identify businesses in Duluth in sectors included our aggregate industrial sector NAICS codes, and each business was matched to parcels by the physical addresses of the business and parcel.		
Vacant industrial zoned land	All industrial zoned land parcels that are not currently in use by any business.		
Industrial zoned land that is considered non-developable because of low elevation	Whole or partial industrial zoned land parcels that are below an elevation of 604 feet. Parcels below this elevation are considered non-developable by the City of Duluth's Community Planning Division because they are at risk of flooding.		
All land in use by industrial businesses regardless of zoning	All parcels of land in the city of Duluth being used by industrial businesses regardless of City of Duluth Zoning Regulations. Dun & Bradstreet's Hoovers Database (2017) was used to identify businesses in Duluth in sectors included our aggregate industrial sector NAICS codes, and each business was matched to parcels by the physical addresses of the business and parcel.		

Note: Zone boundaries were obtained from the City of Duluth. Parcel data was obtained from St. Louis County Assessor (2017). We included all adjacent parcels that had the same parcel ownership as the primary parcel identified using Dun & Bradstreet data. This was done in an effort not to exclude industrial land that may have secondary facilities or land without buildings that are still in active use by the business. This methodology may capture some parcels owned by an industrial business that are not actively in use and, thus, may over count industrial use. Elevation data was obtained from the Minnesota Department of Natural Resources.

1. Industrial zoned land areas

Industrial zoned land in Duluth encompasses 4,855 acres, 11 percent of Duluth's total land area (Table 4).⁹ It is concentrated in five areas (Appendix C: Map 1): (1) the Airpark, (2) Rice's Point/Lincoln Park, (3) Oneota, (4) Waseca/Irving and (5) the Atlas/U.S. Steel site. With the exception of the Airpark, which is located in northwest Duluth, the city's industrial land is located in close proximity to Lake Superior and the St. Louis River. These industrial areas closely align with the *Imagine Duluth 2035* Industry and Commerce Priority Areas, which are targeted for infrastructure investments and improved transportation corridors to spur private-sector investment and activity (City of Duluth, 2018).

Table 4. Industrial Zoned Land in Duluth

Land Use	Acres of Land	Share of Total Duluth Land Area
Total land area in Duluth	45,945	
Industrial zoned land	4,855	11%

Sources: City of Duluth Zoning (2016), St. Louis County Assessor parcels (2017), and U.S. Census Bureau Gazetteer Files (2017).

Rice's Point is the center of the maritime economy in Duluth and land use in the area remains almost exclusively industrial. Other industrial users include manufacturing business such as Altec and BendTec and several recycling facilities. Given that Rice's Point is essentially all industrial, residential and non-industrial traffic does not conflict with industrial traffic. The port terminal is located on Rice's Point, as are multiple dock facilities. Rice's Point extends up through the Compass Minerals site. The Compass Mineral site is adjacent to Lot D, a parcel currently planned for commercial development (Appendix C: Map 2) (Duluth Superior Metropolitan Interstate Council, 2016). Neighboring Rice's Point, Lincoln Park is home to a mix of unique, growing entrepreneurial businesses. The neighborhood is currently undergoing redevelopment and revitalization and was recently designated a craft district, with a growing number of craft breweries and light manufacturing companies (Ross, 2017).

The **Oneota** industrial area is located between Rice's Point/Lincoln Park and Waseca/Irving (Appendix C: Map 3). Industrial activity in the area includes Hallett Dock and the Erie Pier. The 89-acre Erie Pier is operated as a Placement and Reuse Facility run by U.S. Corps of Engineers and DSPA. In 2017, given the mixed-use nature of the neighborhood, the City of Duluth's Community Planning Division worked with community partners to update zoning in key locations throughout the neighborhood to help clarify buffers between industrial and non-industrial land use (Judd, 2016).

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⁹ ICIC analysis using City of Duluth Zoning Regulations (2016), Saint Louis County Assessor parcels (2017), and land area for the city of Duluth from U.S. Census Bureau Gazetteer Files (2017). Industrial land area is calculated as the sum of industrial parcels.

The **Waseca/Irving** industrial area is home to a range of growing light and heavy manufacturing businesses such as IPS Cranes, Loll Designs and Moline Machinery, as well as another Hallett Docks location, comprising a bulk commodities trans-loading facility (Appendix C: Map 4).

The **Atlas/U.S. Steel** area includes the 30-acre Atlas Industrial Park, currently owned by the Duluth Economic Development Authority (DEDA), and the St. Louis River-U.S. Steel Superfund site, which includes 509 acres of land area (Appendix C: Map 5). In 2010, DSPA approved a purchase agreement to acquire over 100 acres of the U.S. Steel site (the Target Site). Plans for redevelopment and delisting the Target Site from Superfund status are in progress.

Established in 1973, the **Airpark** is a 300-acre light manufacturing industrial park located next to the recently expanded Duluth International Airport (Appendix C: Map 6). It is home to 40 private companies, including printing, medical systems manufacturing, construction supply, aviation machining operations, and engineering and professional services. Airpark businesses employ over 800 employees ("Duluth Airpark," n.d.).

2. Industrial zoned land in use

Forty-four percent of industrial zoned land (2,128 acres) is currently in use by *any* business and 43 percent of industrial zoned land (2,062 acres) is currently in use by *industrial* businesses. In other words, industrial zoned land in Duluth is being used as intended—almost exclusively by industrial businesses (see Maps 7 and 8 in Appendix C).

3. Vacant and non-developable industrial zoned land

While there is a substantial amount of industrial zoned land in Duluth not currently in use (56 percent or 2,727 acres), much of it is not readily developable for industrial use (Table 5). Twenty percent of the acres are considered non-developable by the City of Duluth's Community Planning Division because of their low elevation (land below 604 feet is prone to flooding) (Appendix C: Map 9). Furthermore, there are many brownfield sites in Duluth that would require significant investment in site remediation before becoming developable. The U.S. Steel site alone comprises 509 acres. Current cost estimates for remediation of the entire U.S. Steel site range from \$61 million to \$84 million (Great Lakes Legacy Act Partnership, 2015). Two additional large brownfield sites, one on Rice's Point and one in the Waseca industrial area, account for an additional 62 acres. These three large brownfield sites alone account for 12

¹⁰ Superfund is a U.S. federal program intended to fund environmental site remediation, and authorizes the Environmental Protection Agency, and other federal agencies, to recover damages to support site cleanup. Further information on Superfund is available from the U.S. Environmental Protection Agency website: https://www.epa.gov/superfund/what-superfund.

¹¹ According to the U.S Environmental Protection Agency: "A Brownfield is a property, the expansion, redevelopment, or reuse of which may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant." Further information on Brownfields is available from the U.S. Environmental Protection Agency website: https://www.epa.gov/brownfields/overview-brownfields-program.

percent of all industrial zoned land in Duluth and represent 21 percent of vacant industrial zoned land.

It was beyond the scope our work to conduct a parcel-by-parcel inventory of vacant industrial zoned land that could be considered brownfield sites, but previous inventories have identified a number of additional sites. In 2014, the City of Duluth retained Bay West, an environmental consulting firm, to complete a Limited Area-Wide Brownfield Inventory in Gary-New Duluth, the Western Port Area Neighborhood and Lincoln Park/Rice's Point. In total, the study area encompassed 3,283 acres. The consultant inventoried 779 sites with current or historical non-residential use, and found that 276 (35 percent) of the sites appeared to meet the definition of a brownfield or potentially blighted property ("Duluth Brownfield Inventory Assessment," n.d.). In 2017, the City of Duluth, as part of the U.S. Environmental Protection Agency's Brownfields Area-Wide Planning program, released the Irving and Fairmount Brownfields Revitalization Plan (focused on the Western Port Area Neighborhood), which identified reuse plans for several brownfield catalyst sites (e.g., Waseca Industrial Road) (City of Duluth 2017b).

Accounting for the low-lying land and just three large brownfield sites (each over 25 acres in size), we estimate that the City of Duluth has just 1,600 acres of vacant industrial zoned land (33 percent of all industrial zoned land) that potentially could be available for new industrial businesses. However, this estimate overstates the amount of readily available land for industrial business, since anecdotal evidence from our interviews, and previous brownfield inventories, suggests that many of the vacant industrial zoned parcels have other challenges, including:

- they are not "shovel ready" (e.g., inadequate infrastructure and access),
- they have environmental constraints such as requiring geotechnical corrections, shoring of pier walls or assessment or remediation of environmental contamination,
- they do not meet the size or location requirements for larger industrial businesses, and in order to create sufficiently large sites, multiple parcels need to be purchased and assembled,
- they are difficult for developers and businesses to find, and
- they are challenging to purchase/lease because of complex or unclear land records, or land banking by current owners.

Overall, these barriers suggest that appropriate industrial sites could be a significant limitation for attracting and retaining industrial businesses, especially large businesses, and growing the broader industrial sector in Duluth.

Table 5. Vacant and Non-Developable Industrial Zoned Land

Land Use	Acres of Land	Share of
		Industrial Zoned
To deposit a large of the state		Land
Industrial zoned land that is vacant (not in	2,727	56%
use) Non-developable industrial zoned land	556	
(elevation below 604 feet)	(20% of vacant land)	11%
Three large brownfield sites (U.S. Steel, one	571	
on Rice's Point and one in the Waseca	(21% of vacant land)	12%
industrial area)	(21/3 01 (00000 10000)	
Industrial zoned land that is vacant and potentially developable (est.)	1,600	33%

Sources: City of Duluth Zoning (2016), Dun & Bradstreet Hoovers Database (2017), Minnesota Department of Natural Resources MnTOPO LiDAR digital elevation model (2012), and St. Louis County Assessor parcels (2017).

4. All land in use by industrial business regardless of zoning

Some of the businesses included in our aggregate industrial sector definition may be permitted to operate on land not zoned industrial. Our analysis finds that 53 percent of businesses included in our aggregate industrial sector definition operate on non-industrially zoned land. However, most of these businesses have small footprints and in total they operate on just 144 acres of land in the city (Appendix C: Map 10). Larger industrial businesses, which drive broader sector growth, require large parcels of industrial zoned land.

Future Industrial Land Use Projections

While *Imagine Duluth 2035* finds that there will likely be sufficient land available to support future industrial growth, it is conditional on remediation of contaminated land, including the U.S. Steel site. Indeed, the plan cites the lack of easy to develop greenfield sites (i.e., undeveloped vacant land) as one of the city's greatest development challenges, particularly among industrial zoned land along the St. Louis River (City of Duluth, 2018). In addition, some greenfield sites, which could be future sites for industrial businesses, are located away from the interstate system and rail transportation, or are currently zoned for residential use (City of Duluth, 2018). As one business manager we interviewed said, "We are pretty land locked here in our current location. Ultimately, I'd like to see our facility on a site where it can really grow...we could probably use ten times our current size, but finding that land is challenging especially with legacy environmental issues."

Imagine Duluth 2035 encourages higher-density construction and redevelopment of currently blighted and underutilized properties, and the creation of more flexible or mixed-use zoning to accommodate the growth of new types of businesses, including contemporary manufacturing. With regards to the city's waterfront, Imagine Duluth 2035 calls for continued communications

and partnership between City of Duluth, Duluth Economic Development Agency and DSPA to foster a "vibrant industrial economy in Duluth" (City of Duluth, 2018, p. 12).

The purpose of the 2016 Duluth-Superior Port Land Use Plan is to enhance the economic, ecological, and recreational value of the harbor, which includes the waterfront land from Canal Park to the start of the Atlas Industrial Park. The Plan is the official comprehensive port development plan, and was prepared by the Duluth-Superior Metropolitan Interstate Council. The Plan is focused on preserving the port's industrial land, which is critical for efficient operation of the port, as well as neighboring transportation and manufacturing facilities. It assumes, given current maritime transportation trends, that Duluth's port will continue to grow, making sufficient, readily available sites critical: "There is a large amount of waterfront within the general Duluth-Superior area and the small amount dedicated for industrial and maritime uses is vitally important to the local and regional economy" (Duluth Superior Metropolitan Interstate Council, 2016, p. 3). The Plan warns that "The encroachment of non-water dependent commercial and residential land use on industrial port land can lead to issues related to restricted operations and permanent disinvestment in business and infrastructure" (Duluth Superior Metropolitan Interstate Council, 2016, p. 4).

The *Plan* identifies a number of areas in the city that have the potential for redevelopment, but which are currently underutilized, including the U.S. Steel site. The *Plan* forecasts that a reduction in marine industrial land use would shift traffic from marine to road or rail, would slow and reduce cargo capacity, increase environmental consequences, and increase the impact on commute times for residents of Duluth (Duluth Superior Metropolitan Interstate Council, 2016).

Industrial Land Use Summary

According to our analysis, just 11 percent of the total land area in Duluth is zoned for industrial use and it is used almost exclusively by industrial businesses. While some industrial businesses are allowed to operate on non-industrial zoned land, relatively few do so, suggesting that industrial zoned land is necessary to support the growth of the industrial sector.

While on the surface there seems to be a sufficient amount of vacant industrial zoned land to support this growth, 20 percent is not developable because of low elevation and at least another 21 percent are brownfield sites that require expensive remediation. The remaining 1,600 acres may also include brownfield sites or face other challenges for business owners and developers. If suitable industrial land is not readily available or is too costly to develop in the city, existing businesses that are expanding may feel forced to move out of the city. Likewise, without sufficient development-ready sites, Duluth will not be able to compete with other areas in attracting new industrial businesses to the area.

3. The Economic and Fiscal Impact of Duluth's Aggregate Industrial Sector

While understanding current and future industrial land use is important for economic development planning, perhaps of greater significance is gaining insight into the potential impact of the aggregate industrial sector on economic growth in Duluth and the region. Our analysis quantifies the impact of the aggregate industrial sector on the city, county and region and thus shows the potential return from investing further in its growth, including return for the local workforce. We also examine the relative impact of the industrial sector by comparing its performance to that of the rest of the economy in Duluth. We chose to pull out the aggregate industrial sector from the rest of the economy in order to understand the relative impact of the aggregate industrial economy without creating specific comparisons between business sectors (e.g., Manufacturing versus Health Care). It would also be inconsistent to compare the impact of the entire aggregate industrial sector to a specific business sector.

Methodology

To measure economic and fiscal impact, we use an IMPLAN model to estimate the direct, indirect and induced impact of Duluth's aggregate industrial sector in Duluth, St. Louis County and the Duluth MN-WI Metropolitan Statistical Area (MSA) (Carlton County, MN; St. Louis County, MN; and Douglas County, WI). We specifically measure jobs, output (spending), and state and local tax revenue contributions. Indirect effects refer to the impact from businesses that supply goods and services to industry, while induced effects refer to the impact of employee spending on goods and services. IMPLAN modeling of nested geographies is inclusive, which means that the impact of Duluth's aggregate industrial sector on St. Louis County includes the impact in Duluth. Likewise, the impact of Duluth's aggregate industrial sector on the MSA includes the impact in Duluth and St. Louis County. The model uses 2016 economic data (the most recent available at the time of analysis), but outputs are reported in 2017 dollars.

Using the IMPLAN model, we examined different growth scenarios to analyze potential impact of (1) growth in the aggregate industrial sector, (2) growth in the rest of the economy, and (3) growth in the rest of the economy with a commensurate decline in the aggregate industrial sector. The third growth scenario also models the replacement of industrial jobs on industrial land with alternative jobs. Specifically, we assume the following to analyze the three scenarios:

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¹² The rest of the economy represents all other sectors in Duluth's economy and is formally defined as comprising 17 NAICS codes.

¹³ Duluth's borders include nearly the total area of most ZIP codes, but four ZIP codes (55803, 55804, 55810, and 55811) are only partially included within Duluth's county subdivision borders. We used Google Maps to determine that the partial ZIP codes should be included in the analysis. In each of these four ZIP codes, the densest sections already fell within or on the city's borders, and the areas outside of the city consisted mostly of forests and sparse residential communities. It is unlikely that including those geographies would have significantly changed the results, and excluding them would have removed some of the economic activity bordering the University of Minnesota-Duluth, Lakeside/Lester Park and Bayview, and along routes 61, 53 and 2.

- (1) Jobs in the aggregate industrial economy in Duluth increase by five percent, while the rest of the economy stays the same;
- (2) Jobs in the rest of the economy in Duluth increase by five percent, while the aggregate industrial sector stays the same; and
- (3) Jobs in the aggregate industrial sector on five percent of Duluth's industrial zoned land are replaced with new jobs from the rest of the economy, all else stays the same.

Scenario three is a modeling construct that helps us understand the potential net economic impact of changes in land use. As with other parts of our analysis, we do not isolate any specific sectors (e.g., retail) that may be more likely than others to replace industrial jobs. Additionally, while our model substitutes jobs in the aggregate industrial sector with those from the rest of the economy, if industrial land (and jobs) were replaced by residential or outdoor recreational uses, we would expect that the net loss of jobs, total output and tax revenue, to be more significant. Additional research, which is beyond the scope of this study, is needed to fully understand more specific scenarios of replacing certain industrial businesses with retail or other types of businesses.

Current Economic and Fiscal Impact of Duluth's Aggregate Industrial Sector

<u>Jobs</u>

In 2016, there were 9,449 jobs in the aggregate industrial sector (about 16 percent of all jobs in the city), which supported an additional 3,820 indirect and 3,533 induced jobs (16,802 total jobs) (Figure 1). The Manufacturing; Construction; Transportation and Warehousing; Wholesale Trade; Information; and Utilities sectors were the largest employers, accounting for 94 percent of direct aggregate industrial jobs in Duluth. (highlighted in Table 6). Jobs in the Professional, Scientific, and Technical Services; Wholesale Trade; and Administrative and Support and Waste Management and Remediation Services account for the highest number of indirect jobs. As would be expected because it represents employee spending, Health Care and Social Assistance; Retail Trade; and Accommodation and Food Services account for the majority of the induced effect of the aggregate industrial sector. The indirect and induced job effects demonstrate the ripple effects of the aggregate industrial sector throughout Duluth's economy. Industrial sector job growth supports growth in non-industrial sectors.

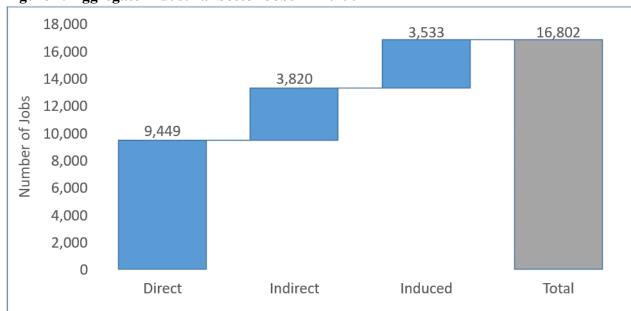


Figure 1. Aggregate Industrial Sector Jobs in Duluth

Source: Quarterly Census of Employment and Wages' (QCEW).

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¹⁴ Employment data from the QCEW were available for Duluth only at the 2-digit NAICS level. The UMass Donahue Institute consulted the QCEW for St. Louis County to adjust the data to deconstruct aggregated industries into their 3-, 4- and 6-digit components. Once we had Duluth employment assigned to more detailed NAICS, we then allocated those employment numbers to IMPLAN codes using a crosswalk created by IMPLAN.

Table 6. Duluth's Aggregate Industrial Sector Contributions by Business Sector

Business Sector	Direct	Indirect	Induced	Total
	Jobs	Jobs	Jobs	Jobs
Accommodation and Food Services	0	171	517	688
Administrative and Support and Waste	190	398	119	707
Management and Remediation Services				
Agriculture, Forestry, Fishing and Hunting	17	41	4	63
Arts, Entertainment, and Recreation	0	95	99	195
Construction	1,973	99	43	2,115
Educational Services	0	5	176	182
Finance and Insurance	0	235	216	450
Health Care and Social Assistance	0	0	734	734
Information	828	174	38	1,039
Management of Companies and Enterprises	0	276	26	302
Manufacturing	2,804	84	29	2,917
Mining, Quarrying, Oil and Gas Extraction	0	2	0	2
Other Services (except Public Admin.)	221	111	308	640
Professional, Scientific, & Tech. Services	146	582	119	847
Public Administration	0	78	43	121
Real Estate and Rental and Leasing	32	244	184	460
Retail Trade	0	300	686	986
Transportation and Warehousing	1,351	362	65	1,778
Utilities	727	42	6	776
Wholesale Trade	1,160	522	120	1,803
Total	9,449	3,820	3,533	16,802

Sources: Quarterly Census of Employment and Wages (QCEW) (2016), IMPLAN Professional 3.1. **Note:** Listed business sectors are all 2-digit NAICS codes. Columns may not sum to totals due to rounding. Highlighted business sectors account for 94 percent of the total direct aggregate industrial jobs in Duluth.

In terms of impact on St. Louis County, the aggregate industrial sector in Duluth supported 4,171 indirect and 4,248 induced jobs (nine percent of all jobs in the county). ¹⁵ Jobs in the Wholesale Trade; Professional, Scientific, and Technical Services; and Transportation and Warehousing account for the three largest numbers of indirect jobs (40 percent of all indirect jobs and highlighted in blue in Table 7). As in Duluth, Health Care and Social Assistance; Retail Trade; and Accommodation and Food Services have the largest induced effect from the aggregate

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¹⁵ U.S. Bureau of Labor Statistics Quarterly Census of Employment and Wages (QCEW) annual 2016 employment data was used to estimate the share of indirect and induced jobs supported by Duluth's aggregate industrial sector in St. Louis County. QCEW data for St. Louis County was obtained from the Minnesota Department of Employment and Economic Development website: https://mn.gov/deed/data/.

industrial sector, accounting for 56 percent of induced jobs in St. Louis County (highlighted in green in Table 7). The indirect and induced job effects demonstrate the ripple effects of the aggregate industrial sector throughout the St. Louis County economy.

Table 7. Duluth's Aggregate Industrial Sector Contributions by Business Sector in St.

Louis County

Business Sector	Indirect	Induced	Total Jobs
	Jobs	Jobs	
Accommodation and Food Services	171	592	763
Administrative and Support and Waste	382	129	511
Management and Remediation Services			
Agriculture, Forestry, Fishing and Hunting	124	7	131
Arts, Entertainment, and Recreation	156	153	309
Construction	103	48	151
Educational Services	5	185	190
Finance and Insurance	237	254	491
Health Care and Social Assistance	0	952	952
Information	207	56	263
Management of Companies and Enterprises	162	18	180
Manufacturing	33	6	39
Mining, Quarrying, Oil and Gas Extraction	31	1	32
Other Services (except Public Admin.)	115	385	500
Professional, Scientific, & Technical	563	134	697
Services			
Public Administration	91	49	140
Real Estate and Rental and Leasing	202	178	380
Retail Trade	305	815	1,120
Transportation and Warehousing	470	100	570
Utilities	184	12	196
Wholesale Trade	632	173	805
Total	4,171	4,248	8,419

Sources: Quarterly Census of Employment and Wages (QCEW) (2016), IMPLAN Professional 3.1. **Note:** Listed business sectors are all 2-digit NAICS codes. Columns may not sum to totals due to rounding. Business sectors highlighted in blue account for 40 percent of indirect jobs in St. Louis County. Business sectors highlighted in green account for 55 percent of induced jobs in St. Louis County.

In terms of the MSA, the aggregate industrial sector in Duluth supported 4,033 indirect and 4,137 induced jobs (six percent of all jobs in the MSA). ¹⁶ As in St. Louis County, jobs in the Wholesale Trade; Professional, Scientific, and Technical Services; and Transportation and Warehousing represent the largest number of indirect jobs, accounting for 39 percent of all indirect jobs created in the MSA (highlighted in blue in Table 8). As in both Duluth and St. Louis County, Health Care and Social Assistance, Retail Trade, and Accommodation and Food Services include the most induced jobs, accounting for 56 percent of all induced jobs in the MSA (highlighted in green in Table 8). Again, the indirect and induced job effects demonstrate the ripple effects of the aggregate industrial sector throughout the region's non-industrial economy.

Indirect and induced jobs supported by the aggregate industrial sector in Duluth are lower in the MSA than the county due to differences in how IMPLAN captures sub-county multipliers of supply and demand.

¹⁶ U.S. Bureau of Labor Statistics Quarterly Census of Employment and Wages (QCEW) annual 2016 employment data. QCEW data for the Duluth MN-WI MSA was obtained from the Minnesota Department of Employment and Economic Development website: https://mn.gov/deed/data/.

Table 8. Duluth's Aggregate Industrial Sector Contributions by Business Sector in the Duluth MSA

Business Sector	Indirect Jobs	Induced Jobs	Total Jobs
Accommodation and Food Services	165	604	769
Administrative and Support and Waste Management and Remediation Services	354	119	473
Agriculture, Forestry, Fishing and Hunting	175	11	186
Arts, Entertainment, and Recreation	138	142	280
Construction	93	46	139
Educational Services	4	149	153
Finance and Insurance	239	249	488
Health Care and Social Assistance	0	908	908
Information	176	49	225
Management of Companies and Enterprises	164	18	182
Manufacturing	73	9	82
Mining, Quarrying, Oil and Gas Extraction	23	2	25
Other Services (except Public Admin.)	118	397	515
Professional, Scientific & Technical	522	127	649
Services			
Public Administration	100	55	155
Real Estate and Rental and Leasing	195	176	371
Retail Trade	286	805	1,091
Transportation and Warehousing	517	111	628
Utilities	156	12	168
Wholesale Trade	534	148	682
Total	4,033	4,137	8,170

Sources: Quarterly Census of Employment and Wages (QCEW) (2016), IMPLAN Professional 3.1. **Note:** Listed business sectors are all 2-digit NAICS codes. Columns may not sum to totals due to rounding. Business sectors highlighted in blue account for 39 percent of indirect jobs in the MSA. Business sectors highlighted in green account for 56 percent of induced jobs in the MSA.

Output (spending) and tax revenue

The direct output of the aggregate industrial sector in Duluth in 2016 was \$2.9 billion, with a total output (direct, indirect and induced) of \$3.8 billion. The direct, indirect and induced effects of the sector also contributed \$236.4 million in state and local tax revenue. **An estimated \$107.3** million of the tax revenue went to local government. As a point of comparison, the City of Duluth's share of property tax revenue in 2016 was \$24.3 million and the City's one percent Sales and Use Tax in 2016 generated \$13.2 million in revenue (City of Duluth 2018b).

In St. Louis County, the total output of Duluth's aggregate industrial sector (direct, indirect and induced) was \$4.1 billion and the sector contributed \$254.2 million in state and local tax revenue. In the MSA, the total output (direct, indirect and induced) was \$4.1 billion with state and local tax revenues of \$253.5 million. The total output and tax revenues are lower in the MSA than the county due to differences in how IMPLAN captures sub-county multipliers of supply and demand.

Current Economic and Fiscal Impact of the Rest of Economy in Duluth

There were 49,167 jobs in the rest of the economy (roughly 84 percent of all jobs in Duluth), which supported an additional 11,534 indirect and 12,512 induced jobs (73,213 total jobs) (Figure 2). In terms of jobs, in 2016, the rest of the economy was over five times larger than the industrial sector.

The sum of the direct jobs in the rest of economy and those in the aggregate industrial sector is equal to the total number of jobs in Duluth (58,616 in 2016). It should be noted that the IMPLAN estimates for the total number of jobs supported by the rest of the economy (direct, indirect and induced) are greater than the total number of jobs in the city in 2016. This is because IMPLAN *estimates* the additional jobs *generated* from the direct job numbers and does not adjust for actual total job numbers in the economy.

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¹⁷ To divide the state and local tax revenues estimated from IMPLAN, which reports only the combined value, we used the ratios of state and local taxes reported in the State and Local Government Finances series in the Census: 54.6% for state government and 45.4% for local government. In IMPLAN, local taxes measure the taxes that each area would be expected to pay to local government(s) that have jurisdiction in the given area. This includes county, municipal, township, special district, and school district governments.

¹⁸ We use 2016 employment data from the Quarterly Census of Employment and Wages (QCEW) to estimate employment for the aggregate industrial sector and rest of the economy in Duluth. QCEW data was used because it is the underlying employment data source used by IMPLAN. The 17 2-digit NAICS codes which comprise the rest of the economy include some of the more detailed NAICS codes (i.e., 3-, 4- and 6-digit NAICS codes) used to define the industrial sector. Our analysis removed those industrial NAICS codes from the 17 2-digit NAICS used to define the rest of the economy to avoid double counting employment. Total jobs in Duluth was estimated by aggregating the detail employment by sector (i.e., 3-, 4-, and 6-digit NAICS codes). Total employment in Duluth from the QCEW reported by the Minnesota Department of Employment and Economic Development is 58,595 in 2016. The difference between the two numbers is due to rounding in our modeling.

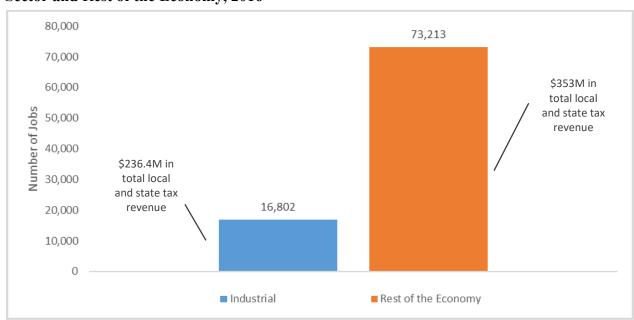


Figure 2. IMPLAN Estimates of Total Jobs and Taxes Supported by Aggregate Industrial Sector and Rest of the Economy, 2016

Source: Quarterly Census of Employment and Wages' (QCEW) (2016), IMPLAN Professional 3.1.

The direct output of the rest of the economy in Duluth was \$5.1 billion, with a total output (direct, indirect and induced effects) of \$8.1 billion, about double the output of the aggregate industrial sector. The rest of the economy (direct, indirect and induced effects) contributed \$353.0 million in total state and local tax revenue in 2016. An estimated \$160.3 million of the tax revenue went to local government.

The IMPLAN analysis found that the aggregate industrial sector is associated with a higher job multiplier (1.78) than for the rest of the economy (1.49) due to higher wages and productivity within the aggregate industrial sector.¹⁹ Therefore, on a per job basis, a job in the aggregate industrial sector supports more additional jobs in the city. Jobs in the rest of the economy generate more output (spending) than the aggregate industrial sector, but despite being five times larger, the output is only about double that of the aggregate industrial sector. Our analysis found that the aggregate industrial sector had a lower output multiplier because a smaller share of materials and services used in the sector are sourced locally. For example, a manufacturing business typically requires more imported raw materials such as steel and uses fewer local

¹⁹ Multipliers are the basis of input-output analysis modeling (i.e., IMPLAN models). Expressed as a rate of change, a multiplier describes how a given change in a particular industry leads to change in the overall economy (e.g., for every dollar spent in the economy an additional \$0.25 of economic activity is generated, implying a multiplier of 1.25).

services than a service sector business. For every dollar generated by the aggregate industrial sector, an additional \$0.34 of output is generated, compared to \$0.60 for the rest of the economy. Likewise, in terms of tax revenue, despite being five times larger than the industrial sector, the rest of the economy generated only one and a half times the tax revenue for local government (defined by IMPLAN as county, municipal, township, special district, and school district governments) than that generated by the aggregate industrial sector. On a per job basis, a job in the aggregate industrial sector generated almost three times more tax revenue for local government than in the rest of the economy—\$6,388 in tax revenue per job in the industrial sector, versus \$2,190 in tax revenue per job in the rest of the economy (Figure 3).

Finally, jobs in the aggregate industrial sector are also generally considered to be high quality jobs. For example, the average annual wage for the aggregate industrial sector in Duluth in 2017 was \$61,202. The average annual wage for the rest of the economy was \$42,990, and \$46,946 for the city overall.²⁰ Wages are only one measure of job quality. Typically, jobs in the industrial sector also offer benefits such as health insurance and many offer training for career advancement.

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²⁰ U.S. Bureau of Labor Statistics Quarterly Census of Employment and Wages (QCEW) 2017 annual payroll and employment data was used to estimate overall average annual wage and average annual wages for the aggregate industrial sector and the rest of the economy in Duluth. Annual wages are in 2017 dollars. QCEW annual payroll and employment data is only available for 2-digit NAICS codes. To estimate average annual wages for the aggregate industrial sector and the rest of the economy, we classified each 2-digit NAICS code as industrial or non-industrial using the share of industrial employment in each 2-digit NAICS code. Two-digit NAICS codes with 65 percent or more industrial employment were classified as industrial and 2-digit NAICS codes with less than 65 percent industrial employment were classified as part of the rest of the economy. The 65 percent cut-off ensured that we captured only 2-digit NAICS codes with significant industrial employment and it represented a natural break in the data (i.e., the share of 2-digit NAICS code employment classified as industrial had a gap at this point).

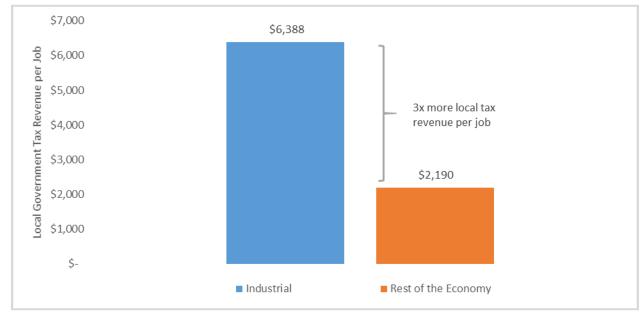


Figure 3. Local Government Tax Revenue per Job, 2016

Source: Quarterly Census of Employment and Wages' (QCEW) (2016), IMPLAN Professional 3.1.

Potential Economic Impact under Three Different Growth Scenarios

In the first growth scenario, we project growth only in Duluth's aggregate industrial sector. Five percent growth in jobs in the aggregate industrial sector would lead to a total of 840 new jobs in the city and 893 in the region (direct, indirect and induced jobs), \$192.1 million in total output in Duluth, and an additional \$11.8 million in state and local tax revenue. An estimated \$5.4 million of the tax revenue would go to local government.

In the second scenario, five percent growth in the rest of the economy would lead to a total of 3,661 new jobs in the city and 3,735 in the region (direct, indirect and induced jobs), \$405.8 million in total output in Duluth, and an additional \$17.7 million in state and local tax revenue. An estimated \$8 million of the tax revenue would go to local government.

The significant difference in the number of aggregate industrial sector jobs versus jobs in the rest of the economy explains the dramatic difference in growth outcomes. However, as discussed above, on a per job basis, industrial sector jobs support more additional jobs and more tax revenue for Duluth. Based on recent economic trends, five percent growth in the aggregate industrial sector is more likely to be achieved than five percent growth in the non-industrial sector. During 2011-2015, Duluth's aggregate industrial sector grew 25 percent (adding 1,969)

jobs), while the rest of the economy in Duluth grew just three percent (adding 1,386 jobs).²¹ Construction growth largely drove the aggregate industrial sector expansion.

Finally, in our last scenario, we model the economic, fiscal and land use impact if aggregate industrial sector jobs were replaced by jobs from the rest of the economy on five percent of Duluth's industrial zoned land currently in use by industrial businesses (103 acres).

We assume that industrial jobs are spread evenly across all land they use. Therefore, five percent of industrial zoned land currently in use by industrial businesses represents five percent of all aggregate industrial sector jobs (472 jobs). We estimate that the 472 jobs accounted for 284,011 square feet of industrial business space.²² The same business space would support 536 jobs from the rest of the economy because of greater employment density (e.g., think of employees in a hospital or retail outlet versus employees in a light manufacturing business with a similar physical footprint).

The 472 aggregate industrial sector jobs would have created 368 additional indirect and induced jobs in the city (840 total jobs), while the 536 new non-industrial jobs would create an additional 262 indirect and induced jobs in the city (798 total jobs). As a result, when considering total impact, the land use shift would result in a net loss of 42 total jobs.

While the shift in land use would lead to a relatively minimal loss of total jobs in Duluth, the output and tax revenue implications of the shift are more significant. In terms of output, the aggregate industrial sector jobs would have generated \$192.1 million in total output in Duluth (direct, indirect and induced), while the new jobs from the rest of the economy would generate \$88.4 million. *Thus, the land use shift would result in a net loss of \$103.7 million in total output.*

Further, in terms of state and local tax revenues, the aggregate industrial sector jobs would have generated \$11.8 million in total tax revenues (direct, indirect and induced), while the new jobs from the rest of the economy would generate \$3.8 million. *Therefore, the land use shift would result in a net loss of \$8.0 million in tax revenues.*

²¹ ICIC analysis using U.S. Census Bureau ZIP Business Patterns from 2011 to 2015 (the latest available data) to estimate job growth in Duluth for the aggregate industrial sector and the rest of the economy. The aggregate industrial sector and rest of the economy are defined by ICIC.

²² To calculate square feet per employee in Duluth for both the aggregate industrial sector and the rest of the economy (601.1 and 530.2, respectively), we used the number of employees from both components of the economy-industrial and the number of square feet that those firms occupy, using 2017 data from the Dun & Bradstreet Million Dollar Database. The database is available at Million Dollar Database website: http://www.mergentmddi.com/. For the aggregate industrial sector, 6,973 employees occupied 4,191,618 square feet of space. For the rest of the economy, 13,719 employees occupied 7,273,399 square feet of space. The ratios were applied to the number of employees in the aggregate industrial sectors and the rest of the economy, respectively, from the QCEW and employment was matched to IMPLAN industry codes using IMPLAN's industry crosswalk.

The number of total jobs (798), total output (\$88.4 million) and total taxes (\$3.8 million) created if aggregate industrial sector jobs were replaced by jobs from the rest of the economy is actually less than the total jobs (840), total output (\$192.1 million) and total taxes (\$11.8 million) generated when we modeled five percent growth in the aggregate industrial sector. *This suggests that maintaining industrial businesses on industrial land would create more jobs and drive greater economic growth than alternative uses*. In addition, since we assume the land would be used by other businesses, the findings may underestimate the impact of lost industrial land (and corresponding jobs) if in fact the industrial land was repurposed for housing, parks or other non-commercial activity.

Economic Impact Summary

While the rest of the economy is five times larger than the aggregate industrial sector in Duluth, on a per job basis, the aggregate industrial sector supports a proportionately higher share of jobs and generates more local tax revenue. Each aggregate industrial sector job generates almost three times more tax revenue for local government—\$6,388 in tax revenue per job—than a job in the rest of the economy. The revenue generated by the aggregate industrial sector for local government, including the City of Duluth, could be used for infrastructure investments in the city, including road improvements, a priority in the 2018 Annual Budget (City of Duluth 2018b).

The aggregate industrial sector as a whole contributed an estimated \$107.3 million of tax revenue to local government. A modest five percent growth in the aggregate industrial sector, which may be more likely to be achieved than similar growth in the rest of the economy, would create 893 new jobs in the region, \$192.1 million in total output in Duluth, and contribute \$5.4 million in taxes to local government. On average, aggregate industrial sector jobs, like those found in the healthcare sector, are also quality jobs, offering relatively high wages, benefits and career advancement opportunities.

The indirect and induced impact of the aggregate industrial sector in Duluth on St. Louis County and the MSA reflect the importance of Duluth's industry not only to the city, but to the regional economy. The 9,449 aggregate industrial sector jobs in Duluth support an additional 8,419 jobs in the region. Many of these jobs are in Professional, Scientific, and Technical Services, Wholesale Trade, Transportation and Warehousing, Health Care and Social Assistance, Accommodation and Food Services and Retail Trade. The aggregate industrial sector in Duluth also contributes \$4.1 billion in total spending in the regional economy and \$254.2 million in state and local tax revenues.

A majority of the land being used by industrial business (71 percent) generates property tax revenue for the City of Duluth. While publicly owned land is tax exempt, some industrial businesses located on tax-exempt public property pay personal property tax. For example, 38 percent (62.5 acres) of DSPA owned land is leased and generates personal property tax. The

remainder is owned and operated by DSPA, or is currently undeveloped, including some non-developable land.²³

Ultimately, strategies to create economic growth should not focus on a single sector in the economy at the expense of others. However, the analysis used here isolates the industrial sector to illustrate its potential for growth. Overall, as our analysis shows, continuing to support and grow the aggregate industrial sector in Duluth will drive economic growth in both the city and region. The aggregate industrial sector has a disproportionate impact on the economy relative to its size. Maximizing the city's industrial land base by supporting its use for industrial businesses will create comparatively more jobs, output and tax revenue than rezoning it for most other purposes. We recognize, however, that future development plans for Duluth must also balance economic objectives with social and environmental goals when considering the best use of specific parcels. In some cases, parcels may need to be swapped to meet all objectives.

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²³ Data provided by email by Deb Deluca, Government & Environmental Affairs Director at Duluth Seaway Port Authority on June 6, 2018.

4. The Competitiveness of Duluth's Industrial Sector: A Cluster Analysis

Our analysis presented thus far shows that the aggregate industrial sector in Duluth drives economic growth in the city and region, generates substantial state and local tax revenue, and creates quality jobs for Duluth residents. While this provides a compelling rationale for including industry in future economic development plans for the city, it fails to address whether industry remains a competitive advantage for the city and region. We use a cluster analysis to determine the competitiveness of the aggregate industrial sector for Duluth and the region.

The importance of clusters for regional competitiveness and economic performance was first recognized in the 1990s (Porter, 1998). Clusters include closely related and interconnected businesses operating within a specific geography. Clusters of businesses arise organically and, therefore, reflect the unique assets and core competencies of a given region that create unique competitive advantages for certain business sectors (Delgado, Porter, & Stern, 2014). For example, the Oil and Gas Production and Transportation cluster in Houston or the Footwear cluster in Portland, Oregon. The companies operating within a cluster are connected by a shared workforce, supply chains, customers and technologies. Every cluster includes core businesses as well as other businesses that form a mutually beneficial business ecosystem. An illustrative diagram of a food cluster is provided in Figure 4.

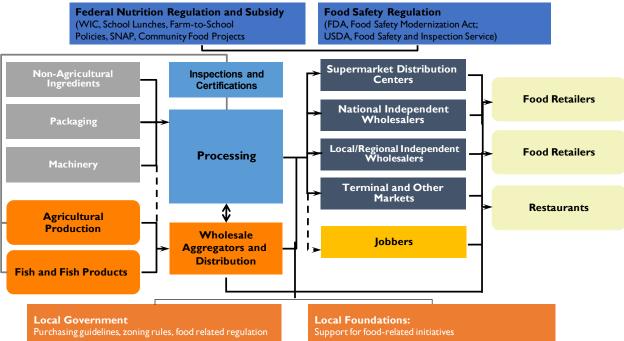


Figure 4. Illustrative Cluster Diagram, Boston Food Cluster

Source: U.S. Cluster Mapping Website, Institute for Strategy and Competitiveness, Harvard Business School. Copyright © 2018 Professor Michael E. Porter.

Methodology

The cluster analysis uses data and standardized 2014 cluster definitions from the U.S. Cluster Mapping website, a project led by Harvard Business School's Institute for Strategy and Competitiveness, and 2011-2015 employment and business data from the U.S. Census Bureau ZIP and County Business Patterns (2011-2015).²⁴ Cluster wage data is from the U.S. Cluster Mapping Website 2015 Average Cluster Wages for Minnesota and cluster education data is calculated using U.S. Bureau of Labor Statistics 2015 Occupational Employment Survey and Employment Projections Program occupation data for the U.S.²⁵

We analyze both traded and local clusters. Traded clusters include businesses that primarily sell products and services outside of the local economic area, across regions and countries, and are more likely to differ by region. Examples of traded clusters include Transportation and Logistics and Food Processing and Manufacturing. Local clusters include businesses that mainly sell products and services within their local economic area and are common in most local markets. Examples of local clusters include Local Utilities and Local Logistical Services (Delgado, Bryden, & Zyontz, n.d.). Traded clusters are associated with higher average wages and higher average productivity compared to local clusters, while local clusters play an important supporting role in the overall economic growth of the region (Delgado et al., n.d.; Porter, 2003).

The U.S. Cluster Mapping website identifies 51 traded clusters and 16 local clusters in the U.S. We further segmented clusters into industrial and non-industrial categories. Industrial clusters are defined as clusters with a significant share of employment in the aggregate industrial sector (85 percent or more for traded clusters and 74 percent or more for local clusters). Using this definition, there are 34 traded industrial clusters and four local industrial clusters in the U.S.

²⁴ The U.S. Cluster Mapping website is a national economic initiative based at the Institute for Strategy and Competitiveness at Harvard Business School. Additional information can be accessed at its website: http://clustermapping.us/.

²⁵ Cluster wage data from the U.S. Cluster Mapping website uses U.S. Census Bureau County Business Patterns 2015 annual payroll and employment data (the most recent as of the time of analysis) as its underlying data source. Annual wages are in 2015 dollars. Average cluster wages are calculated by aggregating 6-digit NAICS code payroll and employment data for each cluster. Minimum cluster wages are the minimum six-digit NAICS code average wage within each cluster. Maximum cluster wages are the maximum six-digit NAICS code average wage within each cluster. We are unable to calculate average cluster wages using the Quarterly Census of Employment and Wages (QCEW) for Duluth because the QCEW only contains payroll and employment data for 2-digit NAICS codes.

²⁶ For traded clusters, the 85 percent cut-off ensured that we captured only clusters with significant industrial employment and it represented a natural break in the data (i.e., the share of cluster employment classified as industrial had a gap at this point). There are an additional four traded clusters with a share of cluster employment classified as industrial between one percent and 33 percent. For local clusters, the 74 percent cut-off ensured we only captured clusters with significant industrial employment and it represented a natural break in the data. There are an additional five clusters with a share of cluster employment classified as industrial between seven percent and 34 percent.

Competitive Clusters in Duluth

If industrial clusters in Duluth represent a competitive advantage, they will be strong in both the city and MSA. Strong clusters have a higher *share of cluster employment* in Duluth or the MSA than the U.S. average and meet a minimum employment threshold (but otherwise total employment numbers are not considered when determining the strength of a cluster).²⁷ For example, the Water Transportation cluster is considered strong in Duluth because it represents 0.7 percent of Duluth's total employment, compared to 0.2 percent of total employment in the nation overall. This means that the cluster in Duluth outperforms the cluster on average in the U.S.

This analysis has important policy implications. The presence of a strong cluster in a given location will improve regional performance (Delgado, Porter, et al., 2014). Businesses in strong clusters are characterized by greater employment growth as well as greater growth of new businesses, innovation, and wages (Delgado, Porter, & Stern, 2010, 2012; Kuah, 2002). Further, businesses in clusters that are strong in both the city and region will grow faster than the same businesses in a cluster that is "disconnected" (i.e., only strong in one of the areas) (Delgado & Zeuli, 2016).

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²⁷ Strong clusters are those with a location quotient (LQ) > 1 and a minimum level of employment in the city of Duluth. LQ measures the specialization or concentration of a cluster in a particular location (e.g., city, MSA) relative to the U.S. average. LQ is calculated as the share of total (traded or local) employment in the cluster in the specific location divided by the share of total U.S. (traded or local) employment in the national cluster. A minimum level of employment for clusters in Duluth must be met because some clusters with an LQ>1 can have very small employment numbers, which makes them insignificant. The minimum level of employment is defined as the maximum of 20 employees or the number of employees that ranks as the 25th percentile across all cities with population greater than 75,000.

We identified three industrial clusters that are strong in both Duluth and the MSA. They are described below, with tables that list the business sectors included in the cluster, as defined by the U.S. Cluster Mapping website, and one example of a Duluth business in each sector. Each cluster includes a different number of business sectors. For a complete explanation of how clusters are formally defined, please visit the U.S. Cluster Mapping Website (http://clustermapping.us/).

1. Water Transportation: Businesses in the Water Transportation cluster include those involved in transporting people and goods over water, including boat building, transportation, operations and other support services (Delgado et al., 2014).

Table 9. Examples of Businesses within the Water Transportation Cluster

Business Sectors Included in the Cluster	Name of Example Duluth Business
Boat Building	Julian Boatworks
Deep Sea Freight Transportation	Great Lakes Fleet/Key Lakes
Coastal and Great Lakes Freight Transportation	Picklands Mather – Lake Services
Port and Harbor Operations	Hallett Dock Company
Marine Cargo Handling	Lake Superior Warehousing
Other Support Activities for Water Transportation	National Cargo Bureau

Note: Businesses listed are from Dun & Bradstreet's Hoovers Database or publicly available business listings.

2. End User Chemical Products: Businesses in the cluster manufacture chemical products for end users. ²⁸ Examples of products include adhesives, beauty products, soaps, cleaners, film processing chemicals, dyes, paints, explosives, and lubricating oils (Delgado et al., 2014).

Table 10. Examples of Businesses within the End User Chemical Products Cluster

Business Sectors Included in the Cluster	Name of Example Duluth Business
Paint and Coating Manufacturing	Arrowhead Paint Products
Photographic Film, Paper, Plate, and Chemical	Ikonics Corporation
Manufacturing	

Note: Businesses listed are from Dun & Bradstreet's Hoovers Database or publicly available business listings.

3. Leather and Related Products: Businesses in the Leather and Related Products cluster include businesses that manufacture luggage and handbags made of leather and fabric. The cluster also includes businesses that produce personal and other leather goods, textile bags and

²⁸ End User Chemical Products refers to the Downstream Chemical Products cluster as defined by the U.S. Cluster Mapping website.

related products made from canvas (Delgado et al., 2014). It should be noted that Aerostitch, which manufactures leather products among a broad range of products, is included in the Apparel Cluster.

Table 11. Examples of Businesses within the Leather and Related Products Cluster

Business Sectors Included in the Cluster	Name of Example Duluth Business
Textile Bag and Canvas Mills	Empire Canvas Work
All Other Leather Good and Allied Product	Duluth Pack
Manufacturing	

Note: Businesses listed are from Dun & Bradstreet's Hoovers Database or publicly available business listings.

There are four additional industrial clusters that represent a competitive advantage only in Duluth (i.e., are strong), but not in the MSA:²⁹

1. Local Utilities: Businesses in the cluster provide local communications services, energy distribution, and sanitary services for sewage and waste treatment (Delgado et al., 2014).

Table 12. Examples of Businesses within the Local Utilities Cluster

Business Sectors Included in the Cluster	Name of Example Duluth Business
Electric Power Distribution	Minnesota Power
Sewage Treatment Facilities	Western Lake Superior Sanitary District
Fuel Dealers	Harbor City Oil and Propane
Wired Telecommunications Carriers	Spectrum
Telecommunications Resellers	Qwest Corporation
Solid Waste Landfill	Western Lake Superior Sanitary District
Remediation Services	Bay West LLC

Note: Businesses listed are from Dun & Bradstreet's Hoovers Database or publicly available business listings.

²⁹ We also identified Footwear as a strong traded cluster in Duluth, but did not include it because of data inconsistencies. We could not identify any company in this cluster in the city using the Dun & Bradstreet's Hoovers Database or publicly available business listings.

2. Aviation: Businesses in the cluster manufacture aircraft, space vehicles, guided missiles, and related parts.³⁰ The cluster also includes businesses that manufacture the necessary search and navigation equipment used by these products (Delgado et al., 2014).

Table 13. Examples of Businesses within the Aviation Cluster

Business Sectors Included in the Cluster	Name of Example Duluth Business
Search, Detection, Navigation, Guidance,	Sextant Sailing Society, Ltd.
Aeronautical, and Nautical System and	
Instrument Manufacturing	
Aircraft Manufacturing	Cirrus Aircraft
Aircraft Engine and Engine Parts Manufacturing	AAR
Other Aircraft Parts and Auxiliary Equipment	Northstar Machine & Tool Company, Inc.
Manufacturing	

Note: Businesses listed are from Dun & Bradstreet's Hoovers Database or publicly available business listings.

3. Paper and Packaging: Businesses in the cluster include paper mills and manufacturers of paper products used for shipping, packaging, containers, office supplies, personal products, and similar products (Delgado et al., 2014).

Table 14. Examples of Businesses within the Paper and Packaging Cluster

Business Sectors Included in the Cluster	Name of Example Duluth Business
Paper (except Newsprint) Mills	Verso Corporation
Corrugated and Solid Fiber Box Manufacturing	Superior Packaging Company

Note: Businesses listed are from Dun & Bradstreet's Hoovers Database or publicly available business listings.

4. Printing Services: Businesses in the cluster are primarily engaged in commercial printing, digital printing, and binding and providing products and services necessary for printing (e.g., ink and prepress services) (Delgado et al., 2014).

Table 15. Examples of Businesses within the Printing Services Cluster

Business Sectors Included in the Cluster	Name of Example Duluth Business
Commercial Gravure Printing	Arrowhead Printing, Inc.
Commercial Screen Printing	On The Limit
Support Activities for Printing	Pro Print

Note: Businesses listed are from Dun & Bradstreet's Hoovers Database or publicly available business listings.

³⁰ Aviation refers to the Aerospace Vehicles and Defense cluster as defined by the U.S. Cluster Mapping website.

Employment Trends within Duluth's Strong Industrial Clusters

Of the seven industrial clusters that represent a competitive advantage for Duluth, Water Transportation, Aviation, Paper and Packaging and Local Utilities are currently major employers in the city (Table 18). Aviation is the most vibrant, with a 10 percent growth rate in employees during 2011-2015.

Table 16: Duluth's Strong Industrial Cluster Employment, 2011-2015

Strong Industrial Clusters	Number of Employees in Duluth (2015)	Employment Growth 2011-2015
Local Utilities	839	1%
Aviation	400-1,400*	10%
Paper and Packaging	387	-5%
Water Transportation	382	-24%
Printing Services	162	<1%
Downstream Chemical Products	89	-5%
Leather and Related Products	38	181%

Note: ICIC analysis using U.S. Census Bureau ZIP Business Patterns (2011, 2015) and U.S. Cluster Mapping Website 2014 Benchmark Definitions. *The employee range is due to data discrepancies between various sources. Our primary analysis uses data from the U.S. Census Bureau, which draws from administrative records. For this particular cluster, the Census estimate (404 employees) appears to underestimate employment within the cluster. For example, in 2015, the Minnesota Department of Employment and Economic Development reported that Cirrus Aircraft employed 675 employees in Duluth (Minnesota Department of Employment and Economic Development, 2015). In 2014, the University of Minnesota Extension estimated that there were 1,400 jobs in the aviation industry in Duluth-Superior (University of Minnesota Extension, 2014).

It should be noted that manufacturing is not a specific cluster and instead manufacturing businesses are included in several clusters. While some manufacturing businesses are included in the strong clusters listed above (e.g., Cirrus Aircraft within the Aviation cluster), others operate within other clusters. For example, Altec Industries and Moline Machinery are captured by the Production Technology and Heavy Machinery cluster, Loll Designs in the Furniture cluster, and BendTec in the Construction Products and Services cluster.

Emerging Competitive Clusters

We also analyzed emerging competitive clusters in Duluth and the MSA to understand future competitive opportunities for the city (Table 22). We define emerging competitive clusters as clusters that (1) are related to strong clusters in Duluth (through shared employment, supply chains, and output), (2) are strong in the rest of the MSA, but not currently strong in the city, (3)

have grown in Duluth during 2011-2015 (employment numbers and location quotient), and (4) meet a minimum level of employment in Duluth.³¹

We identified three emerging competitive industrial clusters:

1. Local Logistical Services: Businesses in the Local Logistical Services cluster include businesses that offer local passenger transportation, local transportation of freight and goods, storage facilities, and car, truck and RV rental and leasing services (Delgado, Porter, & Stern, 2014).

Table 17. Examples of Businesses within the Local Logistical Services Cluster

Business Sectors Included in the Cluster	Name of Example Duluth Business
General Freight Trucking, Local	Lakehead Trucking, Inc.
General Freight Trucking, Long-Distance, Less	XPO Logistics
Than Truckload	
Used Household and Office Goods Moving	The Building Relocators
Specialized Freight (except Used Goods)	Mission Earthwork and Environmental,
Trucking, Local	Inc.
Bus and Other Motor Vehicle Transit Systems	Duluth Transit Authority
School and Employee Bus Transportation	Metropolitan School & Charter Bus
	Service Inc.
Special Needs Transportation	Northern Access
Couriers	Zoom Courier
Local Messengers and Local Delivery	Northland Delivery
Lessors of Miniwarehouses and Self-Storage Units	Lake Region Storage
Passenger Car Rental	Avis Rent-A-Car
Truck, Utility Trailer, and RV (Recreational	Ryder Truck Rental, Inc.
Vehicle) Rental and Leasing	
Solid Waste Collection	Pat Kunst Delivery
Ambulance Services	Gold Cross Ambulance Service

Note: Businesses listed are from Dun & Bradstreet's Hoovers Database or publicly available business listings.

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³¹ The employment threshold is defined as the maximum of 20 employees or the number of employees that ranks as the 25th percentile across all cities with population greater than 75,000.

2. Transportation and Logistics: Businesses in the Transportation and Logistics cluster includes businesses that provide air, rail, bus, or freight transportation services, as well as businesses that provide related operation services and support activities, such as inspections, maintenance, repairs, security and loading (Delgado, Porter, & Stern, 2014).

Table 18. Examples of Businesses within the Transportation and Logistics Cluster

Business Sectors Included in the Cluster	Name of Example Duluth Business
Scheduled Passenger Air Transportation	Delta Airlines
Scheduled Freight Air Transportation	Delta Airlines Air Cargo
General Freight Trucking, Long-Distance,	Northwoods Trucking
Truckload	
Specialized Freight (except Used Goods)	Lohse Transfer
Trucking, Long-Distance	
Interurban and Rural Bus Transportation	Jefferson Lines
Charter Bus Industry	Voyageur Bus Company
Air Traffic Control	Federal Aviation Administration
Other Airport Operations	Duluth Aviation Institute
Other Support Activities for Air Transportation	Hudyma and Hudyma, Inc.
Support Activities for Rail Transportation	North Shore Rail
Other Support Activities for Road Transportation	Premier Companies, Inc.
Freight Transportation Arrangement	CN Railway
All Other Support Activities for Transportation	Duluth Cargo Connect

Note: Businesses listed are from Dun & Bradstreet's Hoovers Database or publicly available business listings.

3. Synthetic Polymers: Businesses in this cluster includes businesses that manufacture plastic materials, components, and products, such as packaging, pipes, floor coverings, and related plastic products.³² The cluster includes businesses that manufacture plastics as well as industrial machinery used to manufacture plastics (Delgado et al., 2014).

The Synthetic Polymers cluster includes only one business sector. Given this unique situation, we have added three examples of businesses in Duluth in the table to show that, in spite of the single business sector, it is a robust cluster that encompasses several businesses.

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³² Synthetic Polymers refers to the Plastics cluster as defined by the U.S. Cluster Mapping website.

Table 19. Examples of Businesses within the Synthetic Polymers Cluster

Business Sectors Included in the Cluster	Name of Example Duluth Business
All Other Plastics Product Manufacturing	Metem Plastics
	Seelye-Eller Plastics
	LDH Landing Nets

Note: Businesses listed are from Dun & Bradstreet's Hoovers Database or publicly available business listings.

Employment Trends within Duluth's Emerging Competitive Industrial Clusters

Of the three emerging clusters that represent a new competitive advantage for Duluth, only Local Logistical Services is a major employer in the city (Table 20). While the number of employees in Local Logistical Services is greater than most of the strong clusters, it is not deemed strong because its *share* of employment in the cluster is not greater than the share nationally. Synthetic Polymers is the most vibrant of the emerging clusters, with a 41 percent growth rate in employees during 2011-2015.

Table 20. Duluth's Emerging Industrial Cluster Employment, 2011-2015

Emerging Industrial Clusters	Number of Employees in Duluth (2015)	Employment Growth 2011-2015
Local Logistical Services	633	11%
Transportation and Logistics	130	13%
Synthetic Polymers	45	41%

Note: ICIC analysis using U.S. Census Bureau ZIP Business Patterns (2011, 2015) and U.S. Cluster Mapping Website 2014 Benchmark Definitions.

The Importance of Industrial Clusters to Other Sectors of the Economy in Duluth

Industrial clusters also support the growth of other related clusters through shared employment, supply chains, and output.³³ A formal cluster analysis identifies four clusters directly linked to industrial clusters:

 Business Services (e.g., consulting, legal services, facilities support services, computer services, engineering and architectural services, and placement services). Examples in Duluth include Duluth Entertainment Convention Center, LHB, Park Bank Corporation of Duluth, and Saturn Systems Software Engineering.

³³ Cluster relatedness is measured by the U.S. Cluster Mapping website and measured for traded clusters, but not local clusters. The listed clusters include only those that have a minimum level of employment (the maximum of 20 employees or the number of employees that ranks as the 25th percentile across all cities with population greater than 75,000) and are related to one or more traded non-industrial cluster.

- Education and Knowledge Creation (e.g., colleges and universities, research organizations, and training programs). Examples in Duluth include University of Minnesota Duluth, College of St. Scholastica and Lake Superior College.
- **Insurance Services** (e.g., businesses that provide a range of insurance types and support services, including reinsurance and claims adjustment). Examples in Duluth include Cartier Agency, Duluth Insurance Agency, and Superior Insurance Services.
- Marketing, Design, and Publishing (e.g., advertising, marketing research, media buying and public relations). Examples in Duluth include Aimclear, Media Partners, Inc., and Premier Master Agent.

A specific example of the interconnectedness of the aggregate industrial sector to other parts of Duluth's economy is its relationship to the healthcare sector—a key driver in Duluth's economy. Duluth's two major health systems—Essentia Health and St. Luke's Health System—employ close to 10,000 people in both Duluth and Superior ("About Us," 2016; B. Johnson & Lundy, 2017). The *Imagine Duluth 2035* comprehensive plan projects that 31 percent of jobs created in Duluth between 2014 and 2024 will be in the healthcare sector (City of Duluth, 2018).

Yet, healthcare providers rely on private insurance to sustain their operational model, as they are reimbursed at higher rates for gross charges to private insurance than for Medicare and Medicaid. For example, in 2016, the mix of payments at St. Luke's was approximately two-thirds public and one-third private. The reimbursement received by St. Luke's from government payers (Medicare & Medicaid) was \$50 million lower than the cost to serve those patients.³⁴ According to St. Luke's staff, patients with private insurance play a vital role in allowing St. Luke's to remain financially viable as an organization. St. Luke's private insurance market consists primarily of Duluth's employers, including both large and small industrial businesses. As one senior leader at the hospital pointed out, the low unemployment rate in Duluth means that even small businesses have to offer insurance to their employees to compete for talent. As a result, he noted this adds to the bottom line of the hospital. He said, "We're especially excited for additional growth in Duluth. Having more insured patients helps us to be more profitable."

Educational Requirements for Strong and Emerging Competitive Industrial Clusters

Of the 10 strong and emerging competitive industrial clusters, the majority of jobs in each cluster in the U.S. require less than a Bachelor's degree. The share of jobs that require less than a Bachelor's degree ranges between 61 and 86 percent (Table 21). Local Logistical Services has the largest share of jobs that require less than a Bachelor's degree (86 percent). Note that occupation data is only available for the U.S. and not available for sub-national geographies such as Duluth or Minnesota.

³⁵ Cluster education data calculated using U.S. Bureau of Labor Statistics 2015 Occupational Employment Survey and Employment Projections Program.

³⁴ Data provided by email from St. Luke's Hospital System on February 22, 2018 and March 7, 2018.

Table 21. Educational Requirements for Duluth's Strong and Emerging Competitive Industrial Clusters

Industrial Clusters	Share of U.S. Jobs that Require Less Than
	a Bachelor's Degree
Local Logistical Services	86%
Leather and Related Products	85%
Paper and Packaging	85%
Water Transportation	83%
Synthetic Polymers	83%
Printing Services	79%
Transportation and Logistics	78%
End User Chemical Products	76%
Local Utilities	68%
Aviation	61%

Sources: U.S. Bureau of Labor Statistics Occupational Employment Survey and Employment Projections Program occupation data (2015) and U.S. Cluster Mapping Website 2014 Benchmark Definitions.

Competitive Wages for Industrial Clusters

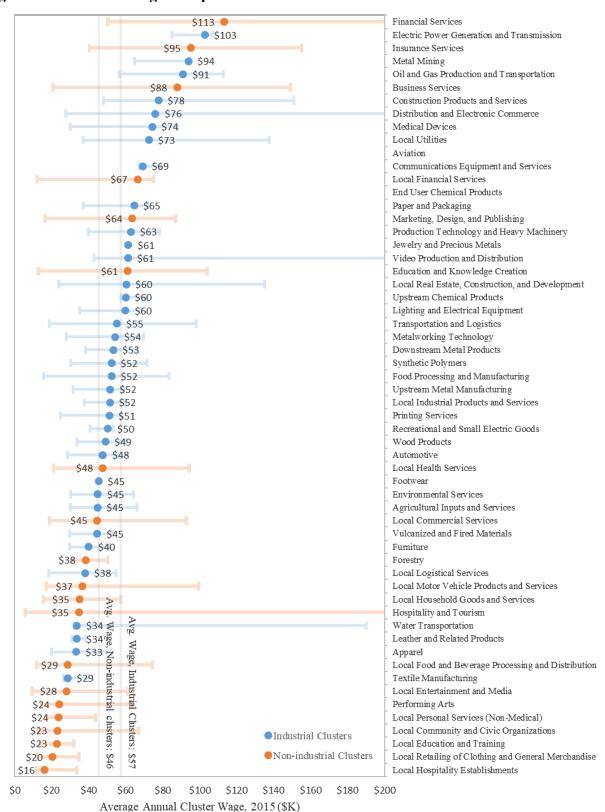
Industrial clusters typically pay higher wages than non-industrial clusters in Minnesota (cluster wage data is not available for Duluth or St. Louis County). The average annual wage for industrial clusters in Minnesota in 2015 was \$57,382 compared to \$45,599 for non-industrial clusters (Figure 5). The average annual wage for all industries in Minnesota in 2015 was \$50,948. Minimum and maximum cluster wages are the minimum and maximum six-digit NAICS code average wage within each cluster. Maximum annual wages for Distribution and Electronic Commerce (\$326 thousand), Financial Services (\$272 thousand), Hospitality and Tourism (\$334 thousand), and Video Production and Distribution (\$244 thousand) are not shown in Figure 5 and the wage ranges were truncated at \$200,000.

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³⁶ Cluster wage data is from the U.S. Cluster Mapping website, which uses U.S. Census Bureau County Business Patterns 2015 annual payroll and employment data (the most recent as of the time of analysis). Annual wages are estimated for all 58 traded and local clusters with non-zero employment in Duluth (out of 67 total clusters).

³⁷ Average annual wage for Minnesota is the overall annual average wage (all industries) and uses U.S. Census Bureau County Business Patterns 2015 annual payroll and employment data.

Figure 5. Minnesota Wage Comparison for Industrial and Non-Industrial Clusters



Cluster Analysis Insights

Our cluster analysis finds several strong industrial clusters, which suggests that industry remains a competitive advantage for Duluth and the region and has the potential to continue to drive economic growth in the future. Business in these strong industrial clusters should experience higher employment growth, higher wages, and more innovation than in clusters that are not strong. We also find several emerging competitive industrial clusters that represent potential future growth opportunities for the city and region. These findings imply that future economic development plans for the city should recognize the strategic advantage of investing in industry. Although clusters emerge organically, strengthening clusters to maximize growth requires strong public-private partnerships.

5. Lessons from Peer Cities in Catalyzing Industrial Growth

Leveraging industrial assets to drive industrial sector growth in any city requires a broad base of support (and comprehensive plans that prioritize industry), strategic investments in industrial assets, targeted economic development, and a supportive business environment. To better understand how Duluth might address these four requirements for industrial sector growth, we looked to the experiences of four peer cities—Baton Rouge, Louisiana, the sister cities of Fargo, North Dakota and Moorhead, Minnesota, and Toledo, Ohio. The cities, selected in collaboration with DSPA, were chosen because each recognizes the strategic advantage of industry to their local economy and are actively supporting its growth. Baton Rouge and Toledo represent ports in economies similar to Duluth's. Fargo and Moorhead represent regional distribution hubs, or "inland ports," with growing economies and populations.

Baton Rouge, LA

The capital of Louisiana, Baton Rouge is a major petrochemical, industrial and port center located on the Mississippi River. Similar to Duluth, Baton Rouge has a strong industrial legacy because of its port. As one city official from Baton Rouge articulated, industry plays a fundamental role in Baton Rouge: "It is still the bread and butter of the city. Everyone is connected to someone in industry and manufacturing." The Port of Baton Rouge is the northernmost access point to the Gulf Intracoastal Waterway on the Mississippi. In 2016, the port was ranked ninth largest in the U.S., shipping nearly 73 million tons of total cargo, more than double that of the Twin Ports of Duluth and Superior. As the city and state's economy remains sluggish, industry remains a strategic economic priority and significant investments have been made to support its growth, particularly in port infrastructure.

Baton Rouge, like Duluth, is a smaller city (population of 228,694 in 2016).³⁹ It is also located in an MSA that is mostly rural (just 28 percent of the MSA population resides in the city).⁴⁰ Employment has grown at a slower rate than in Duluth (one percent between 2011 and 2015) and, between 2011 and 2015, Baton Rouge's metro area economy declined two percent.⁴¹ Industry represents a similar share of employment (17 percent) as in Duluth and the industrial economy is largely focused on petrochemical production and distribution, heavy construction and engineering, and water transportation (East Baton Rouge Planning Commission, 2017).⁴²

³⁸ U.S. Army Corps of Engineers Waterborne Commerce Statistics Center.

³⁹ ICIC analysis using 2016 U.S. Census Bureau American Community Survey 5-Year Estimates.

⁴⁰ ICIC analysis using 2016 U.S. Census Bureau American Community Survey 5-Year Estimates. Baton Rouge's MSA is the Baton Rouge, LA MSA.

⁴¹ Economic growth is measured by Gross Metropolitan Product (GMP). ICIC analysis using 2011-2015 U.S. Department of Commerce Bureau of Economic Analysis Real Gross Metropolitan Product. In comparison, Duluth's metro area declined three percent during the same period.

⁴² ICIC analysis using 2011-2015 U.S. Census Bureau ZIP Business Patterns. Aggregate industrial sector defined by ICIC using 2-digit to 6-digit NAICS codes. In comparison, employment growth in Duluth was six percent in the same time period. Seventeen percent of Duluth's employment is in the aggregate industrial sector.

While Baton Rouge's tourism economy is somewhat diminished by its proximity to New Orleans, the city still draws visitors to its entertainment options along the Mississippi River, in particular the riverboat casinos which are moored along the waterfront. There are also a series of walking and biking trails along the river levees. Baton Rouge is home to a number of higher educational institutions, including Louisiana State University, Southern University and several trade schools. In total, these institutions graduate 5,000 to 7,000 students each year, and, like Duluth, the institutions support research and innovation in Baton Rouge's business community (East Baton Rouge Planning Commission, 2017).

Prioritizing Industry

The industrial sector in Baton Rouge benefits from the fact that the city is the state capital and there are a number of industry-focused associations and advocacy organizations located in the city. These organizations are well positioned to advocate and support their respective constituencies within the industrial economy. Industrial advocates identify opportunities to reinforce community understanding of the industry's economic impact. As part of broader efforts to market the impact of the industrial economy in Baton Rouge, the higher-than-average wages associated with the industry, particularly in the energy sector, have been highlighted. A recent study by Grow Louisiana Coalition, a nonprofit coalition with a mission to support the oil and gas industry in Louisiana, found that in both East Baton Rouge Parish (the parish which encompasses Baton Rouge) and neighboring West Baton Rouge Parish, the average annual income associated with an energy industry job was more than double the median income in each of the parishes, respectively (Grow Louisiana Coalition, 2018).

The current comprehensive plan for Baton Rouge, *FUTUREBR*, reflects the strong support enjoyed by industrial businesses and identifies the city's stable industrial base, and water and freight transportation infrastructure, as two key economic development opportunities and assets (East Baton Rouge Planning Commission, 2017).

Strategic Investment in Industrial Assets

Baton Rouge recognizes the importance of investing in adequate infrastructure, especially in the Port, for attracting industrial development (East Baton Rouge Planning Commission, 2017). Union Pacific, a major railroad, is investing in the port's rail capacity, nearly doubling the maximum size of railcar trains allowable at the port from 45 to 80 cars (Louisiana Economic Development, 2018). In 2016, the port launched a container-on-barge service, which is an intermodal transport method by which containers are stacked and transported by barge, thereby relieving pressure on road networks ("Container on Barge Services", n.d.). The port also has \$10 million in dock enhancement projects underway, which will allow for improved facilitation of larger vessels.

In addition, the City and State are working on addressing other freight transportation challenges facing the industrial economy. Currently, only two bridges in the city cross the Mississippi River. Both bridges are outdated in design, which leads to frequent trucking bottlenecks. Overall, the transportation system lacks the capacity, connectivity and service needed to adequately support growth in truck freight movement, and this has become a priority for the Parish and State. The Louisiana Department of Transportation and Development has been exploring public-private partnerships to identify funding strategies to address the transportation challenges posed by the bridges. The State has a goal of beginning expansion and improvements on one of the bridges in 2019 ("I-10 Capital Corridor Improvements P3", n.d.). In addition, as part of a new Capital Region Mobility Strategy, a coalition of regional leaders has outlined a series of transportation-related recommendations, including several strategies to remedy the bridge bottlenecks. These strategies include incremental improvements, in line with previous public planning, but also a preferred option of the development of a third river crossing (Capital Regional Planning Commission, 2018).

Targeted Economic Development

Given the important relationship between the industrial economy in Baton Rouge and the Mississippi River, protecting industrial land use is an important economic development goal for the port and City. Much of Baton Rouge's petrochemical industry is located along the river, and the waterfront is heavily industrial both north and south of downtown. Industry along the river is largely separated from non-industrial land use by the levees along the river. This buffering has broadly prevented non-industrial uses from encroaching on industrial areas. However, there have been some recent cases where industrial development in traditionally industrial areas has raised community concerns. A city official noted that the failed development of a barge-cleaning facility, which was rejected after receiving significant community feedback, is indicative of the need for clearer buffers between industrial and residential districts, and clarified planning in areas where industrial and residential land uses co-exist.

One of the challenges that limits industrial development in Baton Rouge is the length of time required to prepare prospective sites for development, in part because of a lengthy permitting process. The Louisiana Economic Development Certified Site program was created to address this issue. The program, which is managed by Louisiana Economic Development, identifies specific sites in Louisiana that are ready for industrial development. Certified sites undergo a rigorous review process by third-party engineers that assess and authenticate zoning, title, and environmental remediation. The benefits of certification include official acknowledgement of a site's suitability for industrial development and a significant reduction in the site selection process timing. One city official noted that the development of Certified Sites are a priority for Baton Rouge, and requires a close partnership between the Louisiana Economic Development, Baton Rouge Metro Council and the Baton Rouge Area Chamber. The same official noted that the goal is to process two to three new industrial sites in Baton Rouge annually. A leading

industry advocate noted that the use of the program has been increasingly important in incentivizing business relocation, given that the struggling economy in Louisiana might otherwise make the state less attractive to larger firms.

Supportive Business Environment Policies

A key tool used to support industrial development in Baton Rouge is the Louisiana Industrial Ad Valorem Tax Exemption Program (ITEP), which exempts manufacturers from paying property taxes to local districts for an initial term of five years, with the option to renew up to ten years. Use of the program within Louisiana has been concentrated along Louisiana's manufacturing corridor, including Baton Rouge ("Industrial Tax Exemption," n.d.). For better oversight, and to address public concerns around overuse of the program, control over the program was recently transferred from state to local governing authorities. Local oversight and decision-making structures for the program are still being developed, but industrial leaders and business owners in Baton Rouge are advocating for a "one-stop shop" to streamline the application process (City of Baton Rouge, 2017). Ongoing dialogue and negotiations around program oversight is indicative of the difficulty, but also importance of, finding the right balance between providing the necessary support for development, while also ensuring local control and broad community understanding and support for industry incentives.

Fargo, ND-Moorhead, MN

Fargo, North Dakota and Moorhead, Minnesota are sister cities located in the Red River Valley. Fargo is the largest city in North Dakota and together they are one of the fastest growing metropolitan regions in the country. We were interested in Fargo-Moorhead because the cities have been able to drive growth in the industrial economy and the rest of the economy. As a result, the area enjoys burgeoning downtown districts *and* thriving industry. Located at the intersection of two interstate highways (I-29 and I-94), in close proximity to the Canadian border, and with significant railroad access, Fargo-Moorhead has leveraged its competitive advantage as a distribution hub, or "inland port." High-tech business sectors are driving part of the region's revitalization, but the area continues to benefit from a strong legacy of agricultural processing and distribution.

Fargo-Moorhead had a joint population of 157,271 in 2016, similar to Duluth's, but its population continues to grow—Fargo's county (Cass) is driving population in North Dakota and continues to attract people from across the region. Unlike Duluth, a majority of the MSA population is located in Fargo-Moorhead (69 percent). However, the area is located in a largely rural region. Employment has grown at a faster rate than in Duluth (12 percent) and industry

⁴³ ICIC analysis using 2016 U.S. Census Bureau American Community Survey 5-Year Estimates.

⁴⁴ ICIC analysis using 2016 U.S. Census Bureau American Community Survey 5-Year Estimates. Fargo-Moorhead's MSA is the Fargo, ND-MN MSA.

represents a higher share of employment (24 percent). ⁴⁵ Between 2011 and 2015, Fargo-Moorhead's metro area economy grew 19 percent. ⁴⁶

Like Duluth, both Fargo and Moorhead are home to large higher educational institutions, including North Dakota State University (NDSU) in Fargo, and a campus of the Minnesota State University system in Moorhead. One city official discussed how the location of NDSU in downtown Fargo has helped spur economic activity, while, in comparison, the University of Minnesota Duluth's campus is more separated from the downtown area.

Prioritizing Industry

As a visible and historical driver of growth, the industrial economy in Fargo-Moorhead is given strong support. It benefits from a strong interest in supporting the agricultural sector. Greater Fargo Moorhead Economic Development Corporation (GFMEDC), a nonprofit regional economic development organization, has identified six targeted business sectors for accelerating job and wealth creation in the region: Information Technology, Data Centers, Unmanned Aerial Systems, Advanced Manufacturing, Value Added Agriculture and Food Processing and Distribution ("Targeted Industries," n.d). *Go2030*, the City of Fargo's Comprehensive Plan, also states that Fargo will continue to build on its agricultural and manufacturing heritage (City of Fargo, 2012).

GFMEDC also works to maintain recognition of industry's importance by convening regular summits between higher educational institutions and different business sectors, including the manufacturing sector, working in partnership to identify challenges and opportunities for further industrial growth. As one participant in the summits shared, in recent years there has been increased attention on ensuring that these summits are more focused on actionable policy.

Strategic Investment in Industrial Assets

Not surprisingly, the region is focused on strengthening the transportation and logistics corridor between Fargo-Moorhead and Winnipeg, Manitoba by providing freight companies with more efficient and consolidated transportation options (Fargo-Moorhead Metropolitan Council of Governments, 2017b). Increasingly, business leaders have also identified a need for increased rail container services and inland barge transport. As part of this investment in the transportation and logistics sector, business leaders have begun to explore the potential for intermodal facilities that could help expand Fargo-Moorhead's capacity to serve additional markets, including Duluth (R. Johnson, 2017).

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⁴⁵ ICIC analysis using 2011-2015 U.S. Census Bureau ZIP Business Patterns. Aggregate industrial sector defined by ICIC using 2-digit tto 6-digit NAICS codes. In comparison, employment growth in Duluth was six percent in the same time period. Seventeen percent of Duluth's employment is in the aggregate industrial sector.

⁴⁶ Economic growth is measured by Gross Metropolitan Product (GMP). ICIC analysis using 2011-2015 U.S. Department of Commerce Bureau of Economic Analysis Real Gross Metropolitan Product. In comparison, Duluth's metro area declined three percent during the same time period.

In Fargo, the role of the Bank of North Dakota is significant. A unique institution—the only state-owned banked in the U.S.—the bank is a critical source of funding for both industrial and non-industrial enterprises. As part of its 2018-2020 strategic plan, the bank has added initiatives to strengthen its ability to finance large development projects, as well as expand its role in financing municipal infrastructure projects. The bank has also expanded the flexibility of its lending products to be accommodating to the needs of start-up businesses, including both those in the industrial and non-industrial segments of the economy (Bank of North Dakota, 2017).

Targeted Economic Development

According to one business owner, the regional approach to economic development has allowed industrial land development to be a key asset of the industrial economy. According to an analysis of land use patterns completed by the Fargo-Moorhead Metropolitan Council of Governments, industrial land use has grown in the Fargo, ND-MN MSA over the last four decades in both land area and share of total land. In 1977, industrial land covered 535 acres (three percent of total land). In 2010, it had increased to 3,106 acres (six percent of total land) (Fargo-Moorhead Metropolitan Council of Governments, 2017a). As one business owner shared, part of this expansion is driven by the success in Fargo in establishing industrial parks using tax increment financing (TIF). The TIFs are used to encourage redevelopment of commercial and industrial areas and sites that would be cost prohibitive to redevelop without the incentive program.

Supportive Business Environment Policies

As in Duluth, workforce attraction, and in particular the ability to recruit experienced talent, is critical for economic growth in Fargo-Moorhead. A 2015 regional workforce study, released by GFMEDC and the United Way of Cass-Clay, focused on strategies to attract and retain workforce, with a focus on the manufacturing sector. This included expanding the use of "Manufacturing Days" at local high schools and colleges to provide opportunities for career exploration, as well as direct connections to regional employers. It also called for the development of a train-to-hire program to better align training with employment opportunities. The program is in the process of being rolled out, with a focus on the manufacturing and construction sectors. The study also highlighted the importance and impact of the Manufacturing Committee, which is convened by GFMEDC, and is comprised of representatives from the business community, higher education, K-12 education and workforce development organizations. The Committee is one of several sector-specific committees (two others are information technology and healthcare) formed by GFMEDC to strengthen interactions between industry and education (United Way of Cass-Clay, 2015).

Toledo, OH

Toledo is located in northwest Ohio, at the western tip of Lake Erie. Like Duluth, this rust belt city has a strong industrial legacy based around its great lake port. The Toledo-Lucas County Port Authority was founded in 1955, and was the first port authority formed in Ohio. In 2016, the port shipped 8.5 million tons of total cargo, less than one-third that of the Twin Ports. ⁴⁷ In 2016, the port's five largest commodity groups are coal and lignite, iron ore, soybeans, limestone and corn, which is similar to that of the Twin Ports (U.S. Department of Transportation, 2017). Industry in Toledo has traditionally been focused around automobile and glass manufacturing.

Like Duluth, Toledo is a smaller city (population of 280,854 in 2016) that has experienced a significant decline in population since the 1970s.⁴⁸ Toledo is located in an MSA that is nearly equally urban and rural (with 46 percent of the MSA population in the city).⁴⁹ Employment has grown at a slower rate than in Duluth (one percent between 2011 and 2015), but industry represents a larger share of employment (25 percent) than Duluth.⁵⁰ Between 2011 and 2015, Toledo's metro area economy grew by five percent.⁵¹

As a city official shared, tourism has not traditionally been a large part of Toledo's economy, but the tourism sector, and its economic impact, have been growing over the past few years. In addition, as part of its *Downtown Toledo Master Plan*, released in 2017 to guide investment and growth in the city's downtown, the City of Toledo committed to additional investments to expand recreational opportunities along the Maumee River, including pedestrian and bicycle-friendly connectivity (22nd Century Committee, 2017). The University of Toledo, the largest university in northwest Ohio, anchors Toledo's higher educational institutions (University of Toledo, 2017). As is detailed below, the University supports research and innovation with several industrial sectors, including the growing photovoltaic sector.

Prioritizing Industry

Even during periods of economic retrenchment, such as the Great Recession, both public and private sectors in Toledo have understood the importance of continuing to support and strengthen industry, while also focusing on leveraging existing assets to diversify the industrial economy. Multiple interviewees from Toledo stated that there was limited tension between the industrial

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⁴⁷ Data on tonnage for selected U.S. ports is available using the U.S. Army Corps of Engineers Waterborne Commerce Statistics Center. More information is available at the U.S. Army Corps of Engineers Navigation Data Center website: http://www.navigationdatacenter.us/wcsc/wcsc.html.

⁴⁸ ICIC analysis using 2016 U.S. Census Bureau American Community Survey 5-Year Estimates.

⁴⁹ ICIC analysis using 2016 U.S. Census Bureau American Community Survey 5-Year Estimates. Toledo's MSA is the Toledo, OH MSA.

⁵⁰ ICIC analysis using 2011-2015 U.S. Census Bureau ZIP Business Patterns. Aggregate industrial sector defined by ICIC using 2-digit to 6-digit NAICS codes. In comparison, employment growth in Duluth was six percent in the same time period. Seventeen percent of Duluth's employment is in the aggregate industrial sector.

⁵¹ Economic growth is measured by Gross Metropolitan Product (GMP). ICIC analysis using 2011-2015 U.S. Department of Commerce Bureau of Economic Analysis Real Gross Metropolitan Product. In comparison, Duluth's metro area declined three percent during the same period.

and non-industrial sectors, citing the continued importance of manufacturing to the "DNA" of the community. As one city official framed the issue, "We've always believed that manufacturing, and particular automobile production, is our core competency." The same official discussed how Toledo has continued to position itself as a key transportation and logistics hub for its region, while expanding into new areas such as advanced and alternative energy and advanced manufacturing.

One primary goal of the *Downtown Toledo Master Plan* is to create an active industry-based waterfront that connects existing industrial activity with Lake Erie, while also allowing for daily access and activity by the recreational boating community and new potential users along a revived downtown waterfront. The plan highlights the need for long-term planning which can appropriately integrate industry, commerce, residential and recreational demands (22nd Century Committee, 2017).

One city official identified Toledo's collaborative approach to business development as key to the success of the industrial economy. He discussed how the Regional Growth Partnership, a public-private partnership, focuses on site preparation and marketing, as well as keeping partners aware of national economic development best practices. The Partnership is also a critical marketing arm, expanding business interest in Northwest Ohio in partnership with its statewide counterpart, Jobs Ohio. In turn, the City of Toledo's Office of Economic and Business Development specializes in workforce development, training and helping to advertise and screen for job applicants. In turn, The Toledo Lucas County Port Authority, as part of its broader role supporting economic development, provides financing opportunities including building ownership and long-term lease options.

Strategic Investment in Industrial Assets

Many of Toledo's transportation assets are similar to Duluth's. In addition to being a Great Lakes port, Toledo serves as a hub for two Class 1 railroads (Norfolk & Southern and CSX), a local international airport (Toledo Express Airport), and has strong access to the interstate system (I-75). The City of Toledo, and in particular the port authority, has focused on investing in industrial land to better leverage the competitive advantage of these transportation assets.

The port authority has continued to invest in its existing property, as well as in expanding its real estate holdings. The success of this dual investment strategy was illustrated by the decision by the mining company Cleveland-Cliff to invest \$700 million in a hot-briquetted iron production plant on formerly vacant land that the port authority had purchased in 2008, and on which it had developed warehousing capacity and rail infrastructure (Suttell, 2018).

The port authority plays a leading role in the redevelopment of contaminated sites in Toledo, purchasing and redeveloping 450 acres since 2004. In the past few years, the City of Toledo has

looked to the port authority to take leadership over the remediation, redevelopment and marketing of the Gulf Oil refinery and Toledo coke works in East Toledo, as well as the former Jeep factory in central Toledo. As one city official shared, in each instance, the sites were successfully redeveloped with industrial use maintained.

Targeted Economic Development

While there is very limited speculative industrial development, the Port Authority has increasingly made the development of new industrial space a priority. At the same time, leaders from the public and private sector identified and implemented strategies to increase industrial land use, including the conversion of underutilized residential land that abuts growing industrial areas (City of Toledo, 2015). As part of this approach, the Port Authority, along with public partners and the Toledo Community Foundation, have made local hiring a priority, specifically targeting hiring in the abutting lower-income communities.

Both the public and private sectors in Toledo and the surrounding region have prioritized the diversification of its manufacturing sector. For example, given the city's roots in glass manufacturing, there has been a sustained focus on developing a photovoltaic sector in Toledo. A recent \$400 million investment in a new manufacturing facility by First Solar, one of the nation's largest manufacturers of solar panels, is indicative of the success of this strategy ("First Solar announces plans to build new manufacturing plant in Northwest Ohio," 2018). The photovoltaic sector has also benefited from a close partnership with local higher educational institutions. The University of Toledo plays an important role in supporting the city and region's photovoltaic business sector. The University has established the Clean and Alternative Energy Incubator, as well as the Nitschke Technology Commercialization Complex, which opened in 2010 and is focused on scaling clean energy manufacturers.

In 2017, the Regional Growth Partnership launched a digital marketing strategy for five sites with a focus on attracting food processing and beverage businesses. This type of strategy, where sites are marketed as part of a sector-specific approach, increased the number of leads generated. The tool is housed online on a dedicated website. When a development site is purchased, a case study video is developed that reinforces the focus on the targeted sector (e.g., food processing and beverage businesses) (Regional Growth Partnership, 2017).

Supportive Business Environment Policies

To support its redevelopment efforts, the port authority utilizes a number of financing tools. This includes a public property tax levy that is collected across Lucas County. The levy was last renewed in 2013 and will be up for reauthorization by the public in November 2018. In the past, revenue generated from the levy provided matching support for public grants for industrial site remediation and redevelopment, and also supported partnerships between the port authority and community partners, particularly in communities of concentrated need in Toledo (Patch, 2018).

The ongoing reinvestment in downtown Toledo has allowed the City to focus on revitalizing industrial areas. While there was only approximately 300 housing units in the downtown area ten years ago, there were close to 3,000 units as of 2018 (Chavez, 2018). As one city official stated, "Ten years ago we had to incentivize companies to stay downtown. Now that we don't need to incentivize downtown, we would love to spend more incentivizing jobs that have a higher multiplier – like the Cliffs Iron Ore." As an example of this shift in incentives, the city's Downtown Employment Incentive Program (DEIP) was superseded by the Toledo Expansion Incentive Program (TEIP). TEIP has a broader geographic catchment area, and includes a specific focus on industrial businesses.

One business owner spoke of the importance of Northwest Ohio's low industrial electric rates in incentivizing industrial companies to locate in Toledo and the surrounding region. The region offers some of the lowest rates in the Midwest due to an abundance of natural gas, which gives Toledo a competitive advantage for companies that are large electricity users. Relatedly, under Ohio law, public utilities can make "reasonable arrangements" for large industrial customers as part of "economic development and job retention" programs (Public Utilities Commission General Powers, 2008). Utilities can make up for the loss in revenue from the rest of the rate base.

6. Catalyzing Industrial Growth in Duluth: Four Priorities

Duluth's industrial sector already drives significant economic growth in the city and region and reflects the region's natural competitive advantages. Our analysis, interviews with 51 representatives from the public and private sectors in Duluth, and review of peer cities, provide insights into the four priorities required for industrial sector growth and highlight issues and opportunities that need to be addressed to catalyze industrial sector growth in the city and region.

1. A Balanced Economic Development Strategy that Recognizes the Importance of Industry Along With Other Sectors

Misperceptions about the importance of the industrial sector to Duluth's current and future economy pose the greatest challenge to this priority in Duluth. Part of the issue is the perception that industry is a shrinking sector that is part of Duluth's past, rather than its future. Some may be equating industry with "smoke stack" manufacturing, large gritty grain silos, and abandoned industrial sites. Newer industrial business sectors, such as aviation, may not be recognized as "industrial." When the breadth and importance of the aggregate industrial sector is misunderstood, the imperative to include industry in economic development plans is weakened. As one public official framed the issue in Duluth, "It seems like the narrative, more from a community standpoint, is that when large industrial employers shut down, the economy went in a different direction, both nationally and here in Duluth. People think the local economy just relies on tourism. Maybe people know of Cirrus or AAR, but some people might not even know about those companies."

Another challenge in Duluth is the "us versus them" mentality that pits industry against other sectors in economic development planning. As the modeling in this report shows, most economic sectors are in fact interdependent and the growth of industry supports the growth of other sectors including tourism and healthcare. A stronger narrative and communication push around the important role that industrial jobs can play in driving not only economic growth, but equitable growth, is needed to help develop balanced economic development plans for the city that incorporate industrial sector growth.

There have been recent strides to develop public plans that acknowledge the importance of industry in Duluth. *Imagine Duluth 2035* attempts to balance the needs of the industrial sector with other parts of the city's economy. The plan highlights the aviation and manufacturing sectors, as well as the opportunity to strengthen the city's role as a transportation connector, while simultaneously calling for further investment in the medical and education sectors. The plan also prioritizes natural amenities as an economic development strategy, with a goal of capitalizing on Duluth's natural amenities to attract more tourists seeking outdoor adventures as well as new permanent residents (millennials and retirees) (City of Duluth, 2018). Moving

forward, the implementation of the comprehensive plan should continue to recognize the importance of industry, alongside other sectors, in growing a strong economy.

2. Invest in "High-Return" Industrial Assets

Duluth is fortunate to have many industrial assets. Targeted investment in some of the assets could yield high returns for the aggregate industrial sector and spur additional growth.

Duluth Intermodal Terminal

The Duluth Intermodal Terminal (DIT) may be a leading candidate. The Terminal is a core asset that makes Duluth more competitive as a transportation and logistics hub for the broader region, providing an opportunity for many industrial businesses in Duluth to reach a broader market. The DIT opened in March 2017, providing an immediate increase in connectivity and mobility for local and regional manufacturers and shippers. One current user of the DIT shared in an interview that by utilizing the terminal they had seen a reduction in transportation costs of nearly one-third. In order to meet the expected capacity demand, DSPA was awarded state funding in early 2018 to expand the capacity of the facility (Duluth Seaway Port Authority, 2017).

This investment is aligned with recent planning in the city. The 2016 Duluth-Superior Port Land Use Plan recommends enhancing intermodal transportation assets through various methods, including extending rail service in Rice's Point and upper harbor areas and improving access to Interstate 35 connectors to accommodate more efficient freight transport. In 2017, the Minnesota Freight Advisory Committee released a white paper that called attention to the lack of investment in transportation and logistics in the state. The white paper finds "new or improved intermodal terminals" as a key component for making Minnesota an attractive freight market. With limited intermodal options, many businesses face the so-called "Chicago Problem," having to send freight to Chicago before it can head west to California (Minnesota Freight Advisory Committee, 2017, p. 8). The DIT resolves the "Chicago Problem" for the Minnesota freight market, and offers an attractive alternative to Twin Cities intermodal terminals, which struggle with congestion, wait/idle times and a lack of value-added services.

The DIT can help a diverse set of businesses in Duluth expand their global market. As one business leader explained, "[the DIT can support] the entrepreneurial side of the industrial economy. Companies from the northern part of Minnesota, and even in some cases in the Twin Cities, will find an economic advantage if they can run their supply chains through Duluth." As one small business expert shared, "Lots of businesses want to expand, but few have thought about exporting. With the Port and DIT, it is just a no brainer. It is amazing how many businesses haven't even thought about it, even just expanding down the St. Lawrence Seaway. It hasn't crossed people's minds, they just see the ore going out and think it's still a commodities

market." New industrial business sectors could grow in Duluth as the mix of commodities moving through the DIT continue to expand (for example agriculture products).

Our research suggests that the DIT is not currently capturing all potential business, as some industrial businesses in Duluth, even some located on Rice's Point, do not fully understand or have not fully embraced the potential benefits of DIT to their business. Several business owners we interviewed noted that while they were somewhat aware of the opportunities presented by the DIT, they have not fully explored what increased intermodal capacity could mean for their businesses in terms of cargo handling and expanding markets. Continued investment in both the DIT and increased communication and education about its benefits provides a significant growth opportunity for Duluth's industrial businesses.

Public Infrastructure

Continued investment in public infrastructure can also help catalyze growth in the industrial economy. For example, the City received a grant from the Minnesota Department of Employment and Economic Development's Transportation Economic Development Infrastructure Program to extend a road that will connect the Waseca/Irving industrial area to Grand Avenue/State Highway 23. The goal of this investment is to separate residential land use from industrial land use, improve safety and air quality for the nearby residential neighborhood and to attract new businesses to the area ("Duluth receives state funding for road projects," 2018). A state official noted that "we have some companies in Waseca who are looking to make investments of their own down the road, so this made the public investment more compelling."

Planned improvements to the Interstate 35 and Highway 53 Twin Ports Interchange (a.k.a., the "Can of Worms") interchange will also benefit industrial businesses, improving accessibility to and from Rice's Point. These improvements are particularly important as the investment in the DIT leads to growth and diversification of the freight traffic entering and exiting Rice's Point. Construction on the interchange project is scheduled to commence in 2019 and cost between \$250 million and \$275 million ("I-35, I-535, Hwy 53 Twin Ports Interchange," n.d.). Funding has already been secured from the Minnesota Highway Freight Program, which is run by the Minnesota Department of Transportation ("Minnesota Highway Freight Program," n.d.). The Twin Ports Interchange project will also benefit the broader Duluth community, including the removal of a series of blind intersections that impact both industrial and non-industrial traffic through the interchange. As one community development leader put it: "The Twin Ports Interchange project is a great example of where we are all working toward a common goal, whether we are directly part of industry or not."

3. Target Economic Development to Address Industrial Cluster Gaps

Our research for this report identified several industrial clusters that represent a competitive advantage for Duluth. While clusters occur organically and reflect the unique assets and competitive advantages of a region, their growth can be accelerated and their impact maximized through strategic interventions to address cluster weaknesses (ICIC, 2017). Focusing on clusters also provides a framework for organizing disparate local and regional public policies and investments directed at economic development (Figure 6). Cluster initiatives can help coordinate the work of the various economic development organizations at work in Duluth.



Figure 6: ICIC Strategic Cluster Growth Framework

Complete a Cluster Diagnostic

The business composition of clusters can vary depending on the cluster and the region. Effective cluster interventions need to be developed in response to gaps within clusters, which can be identified through a comprehensive cluster diagnostic. The diagnostic should include analyzing components such as the following:

- Business types within the cluster;
- Firm composition (size and age) within the cluster;
- Workforce requirements within the cluster;
- Existing workforce within the city;
- Sources and incentives for innovation within the cluster and the city;
- Source of capital within the city;
- Land use patterns in the city; and
- Local, state and federal policies and regulations that impact the cluster.

While a comprehensive cluster diagnostic was beyond the scope of our study, our research surfaced two cluster gaps that need to be addressed: readily developable land to support the retention and expansion of existing industrial businesses and the attraction of new industrial businesses; and a mismatched workforce (in size and skills).

Developable Land

As our research shows, Duluth may not have sufficient, readily developable industrial zoned land to support significant industrial sector growth. According to those we interviewed, there is also limited inventory of industrial buildings in Duluth that meet the needs of modern industrial uses (e.g., sufficient ceiling height). As one state official put it, "Any size building in Duluth is difficult to find. There might be only one 20,000 square foot, turnkey building available at any time where a tenant could move in and grow but where the company doesn't have to put in a lot of work to make it fit for their business."

The inclusion of non-developable land (due to low elevation) leads to overestimates of developable industrial land in the city. The City of Duluth could explore rezoning non-developable industrial zoned land for conservation use. As an initial step, the City of Duluth, in collaboration with relevant public sector partners, could conduct an assessment to understand the implications of climate change on its low-lying land, and ensure that any rezoning process is forward looking. The "loss" of converted non-developable industrial zoned land could be offset by zoning underutilized parcels adjacent to industrial zoned land for industrial use.

In addition, the City should also address combining smaller, piecemeal industrial sites not currently attractive for industrial development into sites that can attract larger industrial businesses. Faster review and authentication of land titles, identifying additional funding sources for site remediation and continuing to make investment in infrastructure improvements will also help increase the amount of developable sites.

For contaminated sites, resources for remediation are available at the state and federal levels, but funding is limited and competitive. In addition, many sites need infrastructure improvement to make them market ready. Public- and private-sector representatives are aware of this need and are working to identify funding to support the necessary infrastructure improvements. As one business owner shared, "We are on a Superfund site—we have had a lot of support from the City to help find funding for remediation so that we can purchase the site. The City has also worked hard for us, and other public partners, to change transportation lanes—getting funding and grant money to improve access to our site." This kind of public sector support is critical for industrial business attraction and retention.

The judicious use of Tax Increment Financing (TIF) to accelerate industrial development is an additional tool that could be explored by the City. As one city official shared, "TIFs can be

"powerful tools for reclaiming land for industrial development, and we don't want to see that overlooked as an option."

Without more investment and stronger public-private partnerships, Duluth will not be able to compete with other cities in attracting new industrial businesses and retaining high-growth businesses. This is particularly important for the attraction of larger enterprises and reinforces the value of preparing and marketing larger industrial sites in Duluth for redevelopment, such as the U.S. Steel site and the Atlas Industrial Park. Without the creation of additional developable sites of sufficient size, Duluth may also lose existing industrial businesses. For example, on Rice's Point, one business was looking to expand but found it difficult to find suitable land and buildings. As a result, DSPA recently moved offices to allow the business to expand. As a smaller, northern city, it may be more cost effective for Duluth to focus on growing existing industrial businesses than attracting new businesses that are relocating from other cities.

Workforce Issues

As the economy improved after the Great Recession, Duluth's labor market has tightened, with an unemployment rate of 3.7 percent in 2017.⁵² As those we interviewed shared, the Duluth workforce has a well-deserved reputation for having the right skills for industry. However, industrial employers are struggling to find sufficient applicants for both skilled and unskilled positions. For many businesses, finding sufficient employees is often the most significant barrier to expansion. As one business owner stated, "The biggest challenge is finding talent in the workforce. We are planning to hire 100 people in the next year, but other industrial businesses are also hiring, the economy is getting better, so we are all going to be competing for the same resources and talent."

The need to grow the workforce in Duluth has been part of an ongoing public policy and community dialogue for years. Duluth has experienced growth of its college-age population in the past 30 years, but a decline in age groups older than 25, suggesting that many young adults are leaving after graduation (Schaefer, Mattingly, and Gagnon, 2017). The 2008 *Knight Creative Community Initiative* report identified the need to grow the local workforce and included strategies to retain Duluth's college students after graduation through increased community connections (Duluth Superior Area Community Foundation, 2008). Without some type of intervention, the limited workforce will constrain the growth of industrial businesses, making it difficult for existing businesses to expand and challenging to attract new businesses to the area.

In an effort to strengthen workforce pipelines, many industrial businesses are reinforcing their relationships with high schools and two-year colleges in addition to four-year colleges. One example of a successful program has been the Aviation Maintenance Technology program at

⁵² ICIC analysis using 2017 Minnesota Local Area Unemployment Data from the Minnesota Department of Employment and Economic Development. Unemployment rate is not seasonally adjusted.

Lake Superior College, which has provided aviation businesses with a pipeline of mechanics. However, workforce training demands are increasing as industry continues to grow, requiring new skillsets for new businesses. For example, aviation businesses require different workforce training than food-based manufacturing businesses. Building and funding sufficient capacity for workforce readiness and training programs is an ongoing issue for the higher educational institutions in Duluth. According to one expert we interviewed, there are also issues with resource allocation within the University of Minnesota system. Limited funding to the Duluth campus means that it may not be able to expand its training programs to meet the growing demand.

Northforce, a platform for regional career and talent connection overseen by APEX and the Northspan Group, should continue to be leveraged to connect industrial employers to the broader labor force in Duluth. Northforce, and its predecessor organization, TwinPortsConnect, focuses on retaining talent in the region. The success of the platform requires new industrial businesses to register, as well as existing industrial business participants to actively utilize the platform as part of their recruitment strategy.

Businesses and community-based organizations are also exploring opportunities to build partnerships that connect employment opportunities with communities of concentrated need. These formal partnerships have previously existed for other sectors in Duluth, particularly around the healthcare sector, but have had limited application to industrial businesses. As our analysis has shown, industrial jobs are high quality, providing good wages and benefits. They are also accessible. Of the 10 strong and emerging competitive industrial clusters in Duluth, the majority of jobs in each cluster require less than a Bachelor's degree (ranging from 61 and 86 percent). As one community organizer framed the issue, "We are always looking for jobs for people we work with, and recently we started looking at industrial jobs for people who are unemployed. These are good jobs and good jobs for people who didn't graduate college. I see the industrial sector as having great potential for the community we serve."

Effective partnerships that build industrial workforce pipelines in high-unemployment communities could substantially improve economic inequality in the city. Such partnerships are already being explored between specific industrial enterprises and community-based organizations like LISC Duluth and Community Action Duluth. Innovative funding strategies will need to be explored, including industry-supported programs to alleviate the overreliance on public grants. Sustainable funding for training programs and partnerships has been one of the limiting factors in this effort.

4. Develop Policies That Create a More Supportive Business Environment for Industry

While a full review of relevant state and local policies was beyond the scope of this report, our research provides some insights into local policies that are particularly relevant for industrial business growth. Land use policies that preserve existing industrial zoned land may be the most significant. To date, the City has successfully prevented other types of land use from encroaching on industrial zoned land. Continued commitment by the City to preserve industrial zoning is an important incentive to spur industrial investment and development. As one industrial business owner stated, "Everyone says: 'we have no intention of pushing you away,' but historically that has been the concern. Any lack of public support can lead to speculation from non-industrial users that if they push hard enough, they'll get the rezoning they want."

Other local policies, such as wastewater and electricity rates, also significantly affect industrial business growth (and the attraction of new businesses). For example, the Duluth City Council passed an ordinance in September 2016 to raise from one percent to three percent a franchise fee that the city charges Minnesota Power for use of public rights-of-way. Since the utility's consumers pay franchise fees, several of the larger industrial businesses in Duluth raised concerns about the significant increase in their franchise fee surcharges (Passi, 2016). After sustained comment from industrial businesses, the City Council approved an amendment that capped the maximum surcharge that any single customer would have to pay ("Duluth caps franchise fee," 2016). More than half of Minnesota Power's revenue comes from 11 large industrial customers in the mining, paper and energy business sectors. Therefore, the loss of a single large industrial user would significantly affect all remaining customers (industrial and non-industrial), as the fixed costs of the system would need to be supported by a smaller group of consumers.

Previous assessments of Duluth's industrial sector have identified policy and regulations as a challenge for industrial businesses. The 2016 *Duluth-Superior Port Land Use Plan* surveyed businesses located in the Twin Ports. Eighty percent of the surveyed businesses agreed that there are regulatory challenges in the region. Those surveyed cited a cumbersome permitting process and felt that improved partnerships with regulatory agencies, and a better understanding of the nature of port area businesses, would be beneficial to the sector (Duluth Superior Metropolitan Interstate Council, 2016).

Final Thoughts

ICIC was engaged by DPSA to analyze the potential of Duluth's industrial sector to spur greater economic growth and economic opportunity in the city. We hope the numerous quantitative and qualitative findings included in this report will inform future economic development planning

⁵³ Data provided by email by Nancy Norr, Director, Regional Development at Minnesota Power on May 15, 2018. The data was verified by Minnesota Power Strategic Accounts Rate Analysts.

and actions in both the city and region. Our research reinforces the need to develop a comprehensive vision that embraces the strong and growing industrial sector to create a vibrant and equitable Duluth. Realizing this vision will require sustained collaboration and alignment from partners inside and outside of the industrial sector.

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Appendix A: Advisory Committee Members

Name	Title	Organization	
Lisa Bodine	President	Giant Voices	
Karen Diver	Faculty Fellow	St. Scholastica	
David Faynik	General Manager	Altec Industries	
Nancy Norr	Director, Regional Development	Minnesota Power	
Adam Fulton Manager, Community Planning Cit		City of Duluth	
Adam Futton	Division	City of Duluth	
Brian Hanson	President and CEO	APEX	
Phil Jents	Community Relations Officer	City of Duluth	
Lars Kuehnow	Neighborhood Program Officer	LISC Duluth	
Neal Ronquist	Publisher	Duluth News Tribune	
Andrea Schokker	Dean, Swenson College of Science &		
Aliulea Schokkel	Engineering	University of Minnesota Duluth	
Tony Sertich	President	Northland Foundation	

Appendix B: Interview List

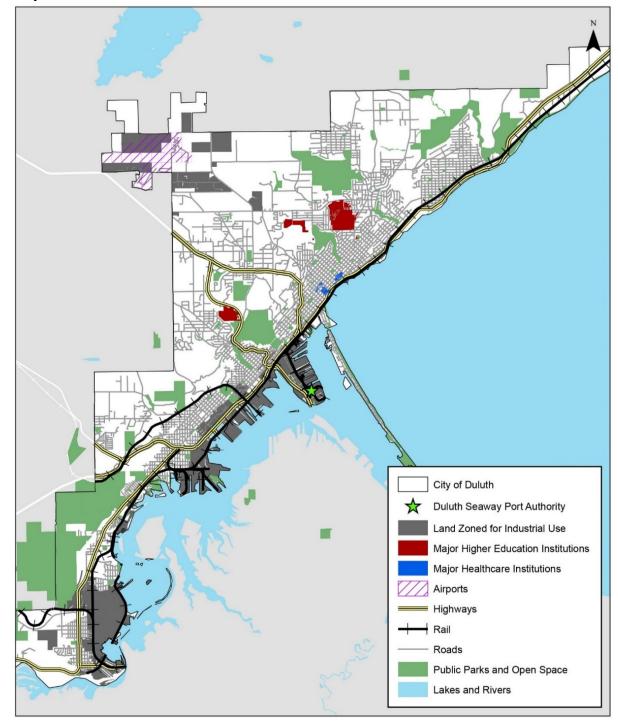
The following list includes the 51 individuals we interviewed for this report. All interviews were conducted between November 2017 and March 2018.

Name	Title	Organization
Lisa Bodine	Giant President	Giant Voices
		Western Lake Superior Sanitary
Marianne Bohren	Executive Director	District
		Minnesota, Department of
	Northeast Business	Employment and Economic
Brad Brzezinski	Development Representative	Development
		City of Toledo, Department of
Bill Burkett	Acting Director	Economic & Business Development
	Faculty Fellow for Inclusive	-
Karen Diver	Excellence	St. Scholastica
Frank Duke	Planning Director	City of Baton Rouge
Ronald Dvorak	Marketing Director	Lake Superior Warehousing Company
		Greater Baton Rouge Industry
Connie Fabre	Executive Director	Alliance
David Faynik	General Manager	Altec Industries
Adam Fulton	Manager	City of Duluth, Community Planning
		University of Minnesota Duluth,
Elaine Hansen	Director	Center for Economic Development
	Operations and Engineering	-
David Hanskala	Manager	ME Elecmetal
Brian Hanson	President & CEO	APEX
		University of Minnesota Duluth,
		Bureau of Business and Economic
Monica Hayes	Director	Research
Sandy Hoff	President	F.I. Salter Co., Inc
Phil Jents	Community Relations Officer	City of Duluth, Mayor's Office
	Neighborhood Program	
Lars Kuehnow	Officer	LISC Duluth
Mark LaLiberte	Plant Manager	Compass Minerals - Duluth
Wayne Larson	Director of Global Logistics	Valley Worldwide Logistics Solutions
Randy Lasky	President & CEO	The Northspan Group
, ,	Director, Community	•
Lorraine Little	Engagement	Enbridge Energy
	Senior Vice President,	
	Business & Intergovernmental	
Lorrie Louder	Affairs (retired)	Saint Paul Port Authority
		City of Duluth, Business and
Josh MacInnes	Business Developer	Economic Development

Mike McCoshen	President	Hallett Dock Company
Wendy Meirhoff	VP of Marketing & Sales	BendTec, Inc.
Angie Miller	Executive Director	Community Action Duluth
Dan Moline	VP, Operations	Moline
David Montgomery	Chief Administrative Officer	City of Duluth
Glenn Nelson	Chief Financial Officer	Valley Express, Inc
	Director,	1
Nancy Norr	Regional Development	Minnesota Power
Jackie O'Connell	President	IPS Cranes
Steve Pedigo	Director	Creative Class Group
J		Iron Range Resources and
Mark Phillips	Commissioner	Rehabilitation Board
-		City of Duluth, Business and
		Economic Development/Duluth
Heather Rand	Director	Economic Development Authority
Russell Richardson	SVP of Business Development	Baton Rouge Area Chamber
Neal Ronquist	Publisher	Duluth News Tribune
David Ross	President & CEO	Duluth Area Chamber of Commerce
Todd Rothe	President	J.R. Jensen Construction Company
		Duluth Superior Area Community
Holly Sampson	President	Foundation
	Dean, Swenson College of	
Andrea Schokker	Science & Engineering	University of Minnesota Duluth
Bob Schoneberger	CEO	United Piping
	Director of Marketing,	
Karl Schuettler	Research & Analysis	The Northspan Group
	Planning, Economic	
	Development and Port	
Jason Serck	Director	City of Superior
Tony Sertich	President	Northland Foundation
Jodi Slick	Founder & CEO	EcoLibrium3
John Strange	President & CEO	St. Luke's Health System
Anna Tanski	President & CEO	Visit Duluth
		City of Duluth, Business and
**		Economic Development/Duluth
Heidi Timm-Bijold	Business Resources Manager	Economic Development Authority
Paul Toth	President & CEO	Toledo-Lucas County Port Authority
)		Greater Fargo-Moorhead Economic
Mark Vaux	EVP, Business Development	Development Corporation
Rolf Weberg	Executive Director	Natural Resources Research Institute

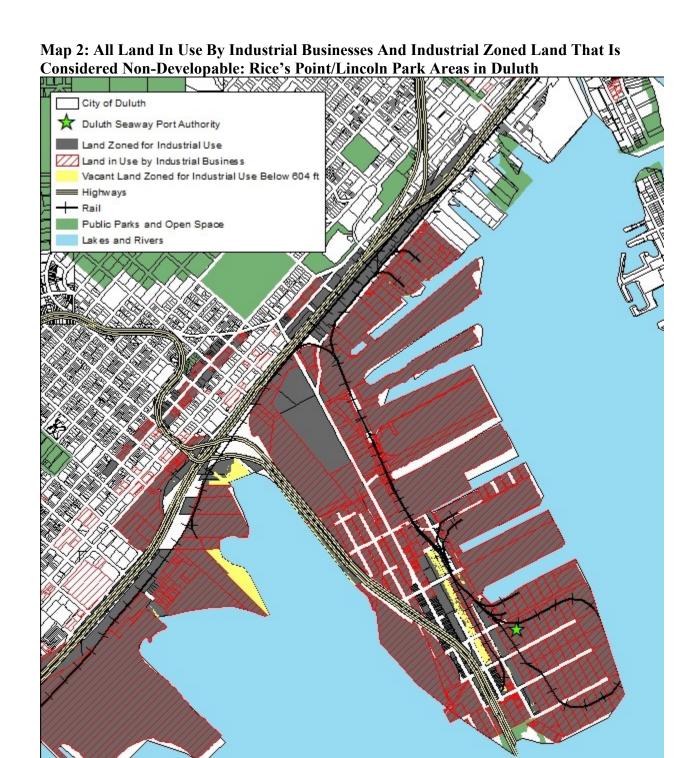
Appendix C: ICIC Land Use Maps

- Map 1: Industrial Zoned Land: Duluth
- Map 2: All Land In Use By Industrial Businesses And Industrial Zoned Land That Is Considered Non-Developable: Rice's Point/Lincoln Park Areas in Duluth
- Map 3: All Land In Use By Industrial Businesses And Industrial Zoned Land That Is Considered Non-Developable: Oneota Area in Duluth
- Map 4: All Land In Use By Industrial Businesses And Industrial Zoned Land That Is Considered Non-Developable: Waseca/Irving Areas in Duluth
- Map 5: All Land In Use By Industrial Businesses And Industrial Zoned Land That Is Considered Non-Developable: Atlas/U.S. Steel Areas in Duluth
- Map 6: All Land In Use By Industrial Businesses And Industrial Zoned Land That Is Considered Non-Developable: Airpark Area in Duluth
- Map 7: Industrial Zoned Land Currently In Use By Any Business: Duluth
- Map 8: Industrial Zoned Land Currently In Use By Industrial Businesses: Duluth
- Map 9: Industrial Zoned Land That Is Considered Non-Developable: Duluth
- Map 10: All Land In Use By Industrial Businesses: Duluth



Map 1: Industrial Zoned Land: Duluth

Note: Land zoned for industrial use includes all parcels of land in the city of Duluth that are wholly or partially located in the City of Duluth's Industrial-General (I-G), Industrial-Waterfront (I-W), and Mixed Use-Business Park (MU-B) zones. These zones represent all zones where industrial land uses are permitted under the City of Duluth Zoning Regulations. Zone boundaries were obtained from the City of Duluth. Parcel data was obtained from Saint Louis County. **Sources**: City of Duluth Zoning (2016), Saint Louis County Assessor parcels (2017). U.S. Census Bureau Gazetteer Files (2017).

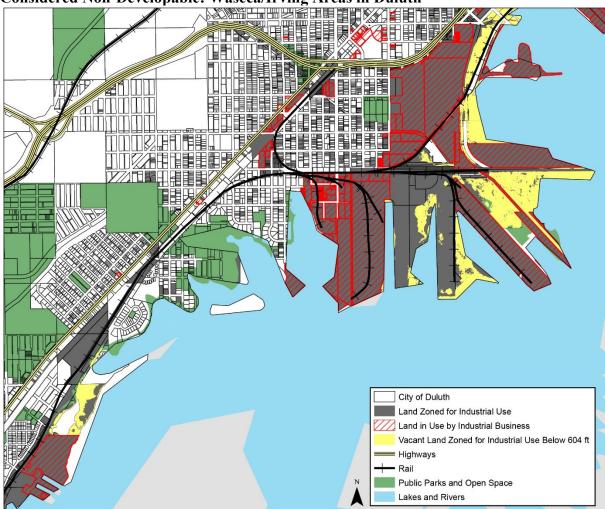


Note: All land in use by industrial businesses includes all parcels of land in the city of Duluth being used by *industrial* businesses (regardless of City of Duluth Zoning Regulations. **Sources**: City of Duluth Zoning (2016), Dun & Bradstreet's Hoovers Database (2017), Saint Louis County Assessor parcels (2017). Minnesota Department of Natural Resources MnTOPO LiDAR digital elevation (2012).



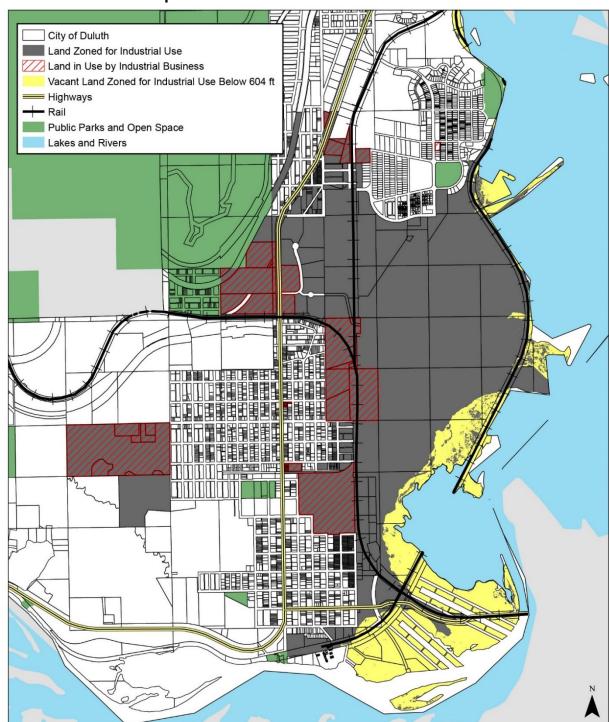
Map 3: All Land In Use By Industrial Businesses And Industrial Zoned Land That Is Considered Non-Developable: Oneota Area in Duluth

Note: All land in use by industrial businesses includes all parcels of land in the city of Duluth being used by *industrial* businesses (regardless of City of Duluth Zoning Regulations. **Sources**: City of Duluth Zoning (2016), Dun & Bradstreet's Hoovers Database (2017), Saint Louis County Assessor parcels (2017). Minnesota Department of Natural Resources MnTOPO LiDAR digital elevation (2012).



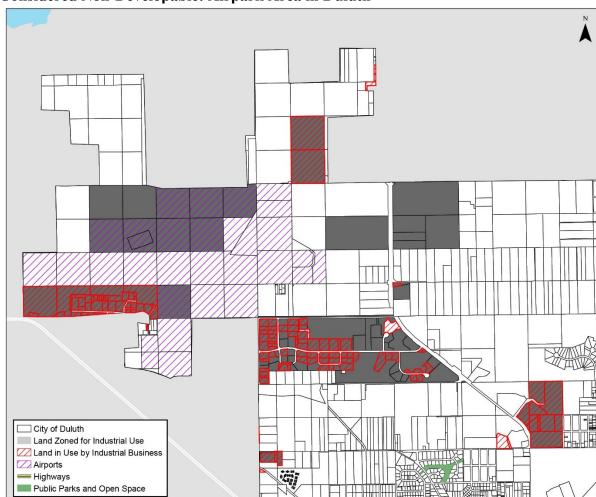
Map 4: All Land In Use By Industrial Businesses And Industrial Zoned Land That Is. Considered Non-Developable: Waseca/Irving Areas in Duluth

Note: All land in use by industrial businesses includes all parcels of land in the city of Duluth being used by *industrial* businesses (regardless of City of Duluth Zoning Regulations. **Sources**: City of Duluth Zoning (2016), Dun & Bradstreet's Hoovers Database (2017), Saint Louis County Assessor parcels (2017). Minnesota Department of Natural Resources MnTOPO LiDAR digital elevation (2012).



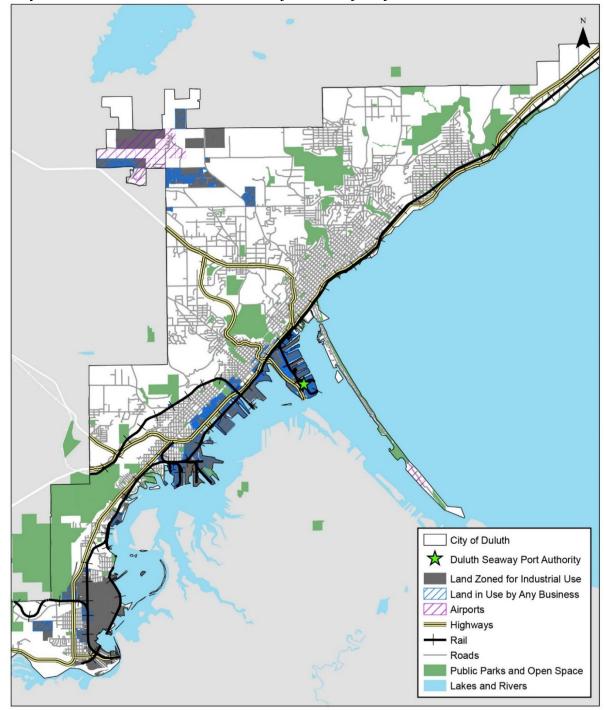
Map 5: All Land In Use By Industrial Businesses And Industrial Zoned Land That Is Considered Non-Developable: Atlas/U.S. Steel Areas in Duluth

Note: All land in use by industrial businesses includes all parcels of land in the city of Duluth being used by *industrial* businesses (regardless of City of Duluth Zoning Regulations. **Sources**: City of Duluth Zoning (2016), Dun & Bradstreet's Hoovers Database (2017), Saint Louis County Assessor parcels (2017). Minnesota Department of Natural Resources MnTOPO LiDAR digital elevation (2012).



Map 6: All Land In Use By Industrial Businesses And Industrial Zoned Land That Is Considered Non-Developable: Airpark Area in Duluth

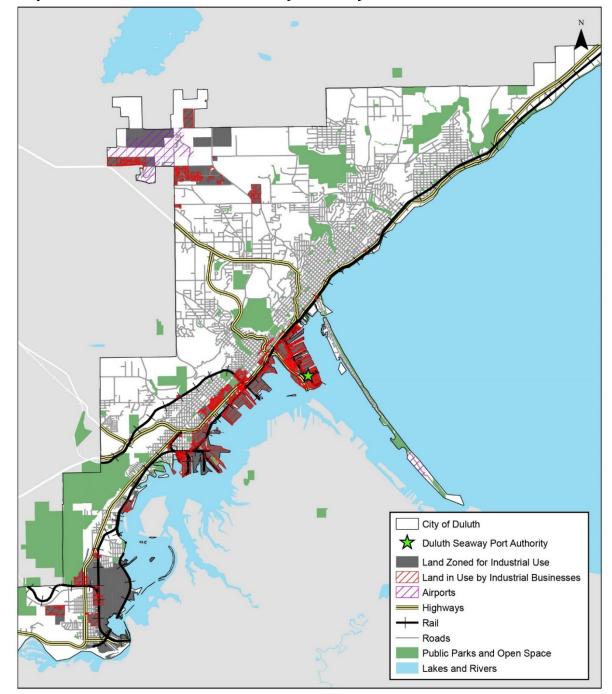
Note: All land in use by industrial businesses includes all parcels of land in the city of Duluth being used by *industrial* businesses (regardless of City of Duluth Zoning Regulations. **Sources**: City of Duluth Zoning (2016), Dun & Bradstreet's Hoovers Database (2017), Saint Louis County Assessor parcels (2017). Minnesota Department of Natural Resources MnTOPO LiDAR digital elevation (2012)



Map 7: Industrial Zoned Land Currently In Use By Any Business: Duluth

Note: Land zoned for industrial use currently in use by any business includes all parcels of land in the city of Duluth that are wholly or partially located in the City of Duluth's Industrial-General (I-G), Industrial-Waterfront (I-W), and Mixed Use-Business Park (MU-B) zones and have a business using the land.

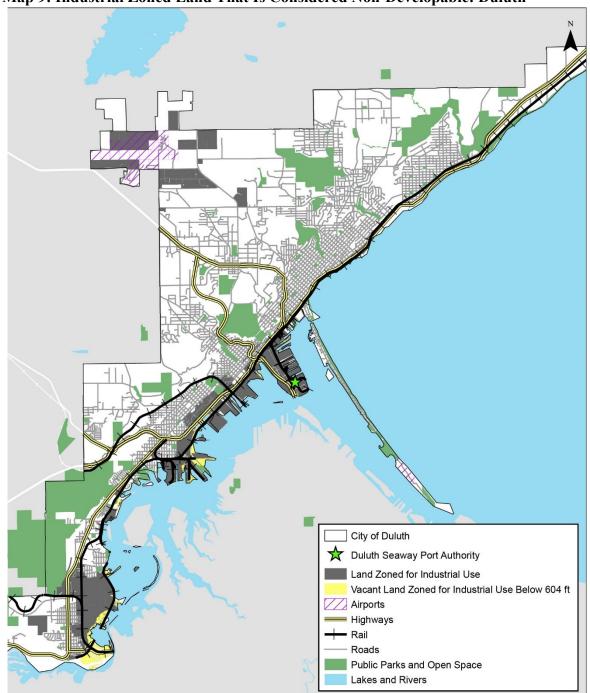
Sources: City of Duluth Zoning (2016), Dun & Bradstreet's Hoovers Database (2017), Saint Louis County Assessor parcels (2017).



Map 8: Industrial Zoned Land Currently In Use By Industrial Businesses: Duluth

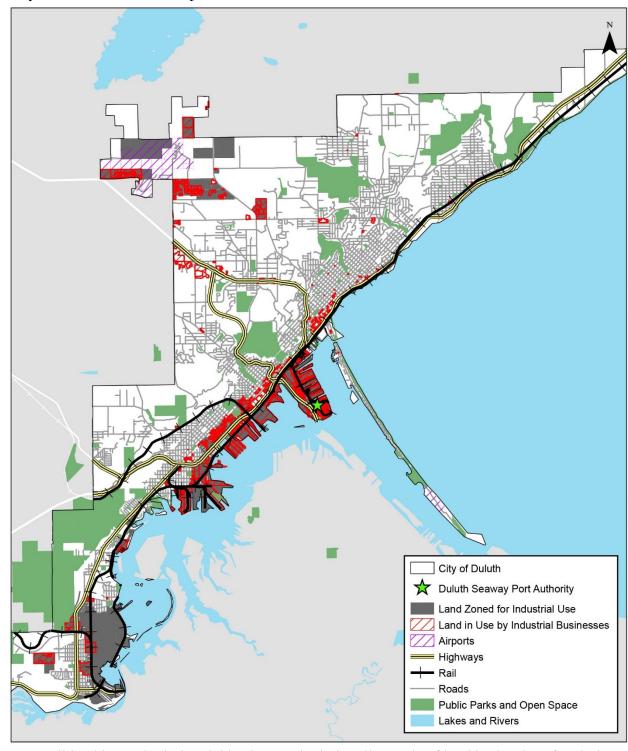
Note: Land zoned for industrial use currently in use by industrial business includes all parcels of land in the city of Duluth that are wholly or partially located in the City of Duluth's Industrial-General (I-G), Industrial-Waterfront (I-W), and Mixed Use-Business Park (MU-B) zones and have an *industrial* business using the land. Industrial businesses were identified using Dun & Bradstreet's Hoovers Database and includes all businesses in the industrial sector (defined by ICIC using NAICS codes).

Sources: City of Duluth Zoning (2016), Dun & Bradstreet's Hoovers Database (2017), Saint Louis County Assessor parcels (2017).



Map 9: Industrial Zoned Land That Is Considered Non-Developable: Duluth

Note: Land zoned for industrial use currently in use by any business includes all parcels of land in the city of Duluth that are wholly or partially located in the City of Duluth's Industrial-General (I-G), Industrial-Waterfront (I-W), and Mixed Use-Business Park (MU-B) zones and have a business using the land. Vacant land zoned for industrial use below 604 feet includes all land zoned for industrial use not currently in use by any business that is below 604 feet. **Sources**: City of Duluth Zoning (2016), Dun & Bradstreet's Hoovers Database (2017), Saint Louis County Assessor parcels (2017), Minnesota Department of Natural Resources MnTOPO LiDAR digital elevation (2012).



Map 10: All Land In Use By Industrial Businesses: Duluth

Note: All land in use by industrial businesses includes all parcels of land in the city of Duluth being used by *industrial* businesses (regardless of City of Duluth Zoning Regulations). **Sources**: City of Duluth Zoning (2016), Dun & Bradstreet's Hoovers Database (2017), Saint Louis County Assessor parcels (2017).