

REGIONAL MANUFACTURING RESILIENCE PLAN



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ABOUT THIS PROJECT

The purpose of this plan is to offer suggestions for the region's manufacturing clusters as they continue to support prosperity as the backbone of the regional economy. The recommendations provided are based on a flexible framework intended to accommodate regional manufacturing diversity and scales of operations. Strategic action proposals are intended to work both during times of expansion and downturn, necessary to accelerate the former and dampen the latter. It is a general framework for a robust and enduring regional economy with manufacturing as a driver of economic resilience. The plan is in response to recent unprecedented events and is intended to augment existing strategies for sustaining economic growth, weathering business cycles, and supporting shared prosperity across the region, as identified in the Comprehensive Economic Development Strategies (CEDS: 2022-2026) and other plans and initiatives.

Given the regional nature of our economy, its labor pool, housing, labor sheds, and commute flows, viable solutions to economic shocks must reflect a regional perspective. Region Nine Development Commission (RNDC) has prepared for the normal pace of growth over the last several decades in partnerships with public and private entities. The shortcomings of traditional planning have become apparent, however, during the COVID-19 pandemic. If not meaningfully addressed, persistent issues around housing, transportation, and the workforce will be amplified by COVID-19 and impede a successful recovery. No individual plan will facilitate the recovery, but this opportunity provided to RNDC and the region by the federal Economic Development Administration (EDA) represents a critical step in engaging stakeholders in discussions of recovery and future strategies.

Region Nine's economic strength lies in the diversity and adaptability of its innovative people and its ability to attract the best and the brightest, and this plan would not have been possible without collaborative partners. The engagement process included in-depth interviews with regional manufacturing leaders and other stakeholders to identify opportunities for securing the region's competitiveness, broad-based opportunities, and economic vitality based on sustainable redevelopment of the regional manufacturing clusters. Given the various regional planning and strategy efforts currently underway in response to the COVID-19 pandemic, this project provides perspectives from the manufacturing community and representatives from other sectors on issues critical to future vitality during times of growth and decline.

Nicole Griensewic
Executive Director

ACKNOWLEDGEMENTS

Background research included more than fifty interviews with industry, community, and academic stakeholders, in addition to peer organizations and out-of-state experts on economic resilience. We appreciate the support we received from these individuals, in addition to commissioners, staff members, peers across the state, and other organizations that are partners of RNDC. We are also especially grateful for insights from the federal EDA.

ABOUT REGION NINE DEVELOPMENT COMMISSION

Region Nine Development Commission (RNDC) takes great pride in working with and on behalf of counties, cities, townships, and schools throughout South Central Minnesota. Since 1972, being a partner for progress has led to the development of programs and identification of solutions in the areas of economic development, business development, healthy communities, transportation, community development, and leveraging regional resources. The core function of RNDC is to aid the private, public and non-profit sectors within our jurisdictional boundaries of Blue Earth, Brown, Faribault, Le Sueur, Martin, Nicollet, Sibley, Waseca, and Watonwan Counties. Region Nine's governing board is comprised of local elected officials, and public interest groups from the nine-county area. The Commission sets the agenda and approves the work plan for the agency. A secondary function is to provide a vehicle for implementation of regional programs that cross over traditional jurisdiction and agency boundaries. The Commission also serves as a vehicle to work in cooperation with state and federal agencies to implant various programs on a regional basis.



SECTION 1: THE NEED FOR MANUFACTURING RESILIENCE IN REGION NINE

1.1. OVERVIEW

As uncertainty and volatility increase in the wake of the global COVID-19 pandemic, how do we grow our economic, environmental, and social resilience? Resilience is the ability to recover from or adjust to misfortune or unexpected change. New opportunities come with change, and they are best leveraged when a community or region is willing to proactively shape the future. The alternative is a reactive mode where one responds to immediate crises instead of preparing strategically for the future.

The Regional Manufacturing Resilience Plan aims to lay the foundation for building the vital feedback loops, resilience, and agility the region requires for securing broad-based prosperity in our cities, towns, and townships post COVID-19. The recommendations presented in this plan reflect thoughtful discussions among business and other leaders in the region over the course of a two-year engagement process. These individuals brought their unique perspectives from their professional points of view. They also brought their added perspectives as neighbors, colleagues, and partners with a vested interest in supporting the growth of shared opportunity in Region Nine.

Region Nine's diverse businesses drive the regional economy in partnerships with non-profits, academic institutions, and the public sector. They also employ the vast majority of the region's workforce, support local universities and schools, and engage in philanthropic efforts in our communities. Many of the region's employers are also deeply integrated into national and global supply chains, giving them valuable insight into the quick pace of change taking place in larger markets.

Bringing together perspectives from Region Nine's business community and the public sector is critical for maintaining Region Nine's economic vitality. Employers are on the front end of recognizing changing skills needs in the workforce. During the COVID-19 pandemic, Region Nine employers experienced a recruitment crisis that is deeply exacerbated by the region's vulnerabilities to the pandemic. Manufacturing represents the highest grossing industry in eight of our nine counties and employment in these clusters are at more than twice the national average.

In the context of a quickly changing economy and an ongoing pandemic, there is much to be done to address the growing employment crisis and to reduce the impact of future disruptions. However, as this report indicates, there are also a multitude of opportunities to stimulate manufacturing success and economic prosperity in Region Nine. The recommendations presented in this document will hopefully lead to further conversations regarding economic recovery and future resilience that aligns with needs and opportunities in related clusters and industries.



1.2. THE QUICKENING PACE OF CHANGE AND INCREASING VOLATILITY OF MARKETS

In the wake of COVID-19 and other recent disruptions, such as regionwide flooding in spring 2019 and several large plant closures, Region Nine must prepare for the quickening pace of change while overcoming challenges associated with an aging and more diverse workforce. Advances in technology are upending industries, spawning entirely new industries, and reshaping our work and home lives. Demographic changes are driving new needs and attitudinal shifts. Our integration into the global economy is also picking up speed. Growth driven by emerging economies is increasing demand for natural resources, and climate change is threatening communities around the world and in Region Nine.

Technological advances are driving changes across the economy, disrupting markets and entire industries, promising new opportunities, while adding to the growing skills gap. Region Nine's economy has experienced relatively modest economic gains since the recessionary recovery began in 2009/2010. Considering that the workforce has grown relatively slowly and at a negative rate in six of our nine counties, the economic growth that has taken place is a testament to regional adaptability and a highly skilled workforce.

Over the last several decades, Region Nine has made the necessary investments to support normal population and job growth, and during periods of economic expansion, housing, transportation, and workforce needs have been adequately met by these investments. COVID-19, however, has uprooted some of these efforts, and if these issues are not addressed in a meaningful way, the pandemic and its aftermath will threaten the region's current growth cycle and its ability to rebound into the next growth cycle.

Most of the regional economic success hinges on companies and individuals located in Region Nine. Their investments and efforts will spur new businesses and jobs, as well as entirely new business models. However, other changes are of a global nature. We are currently witnessing the reinvention of all industries through smart mobility, cloud computing, social networking, big data analytics, and accelerated technology adoption. Communication will take place between infrastructure and cars, between machines and people, and between machines.

A massive revolution is also taking place in how we make things. 3D printing is now used by artisanal makers spawning new businesses as well as by large-scale manufacturers to produce sophisticated components. Robotics and human augmentation are changing the factory floor as well as the operating rooms of hospitals. Breakthroughs in nanomaterials are resulting in tiny batteries for tiny devices and paper-thin armor and solar cells. Biology is now programmable: bacteria and yeast are being altered to produce products they would not normally make, such as fuels or drugs.

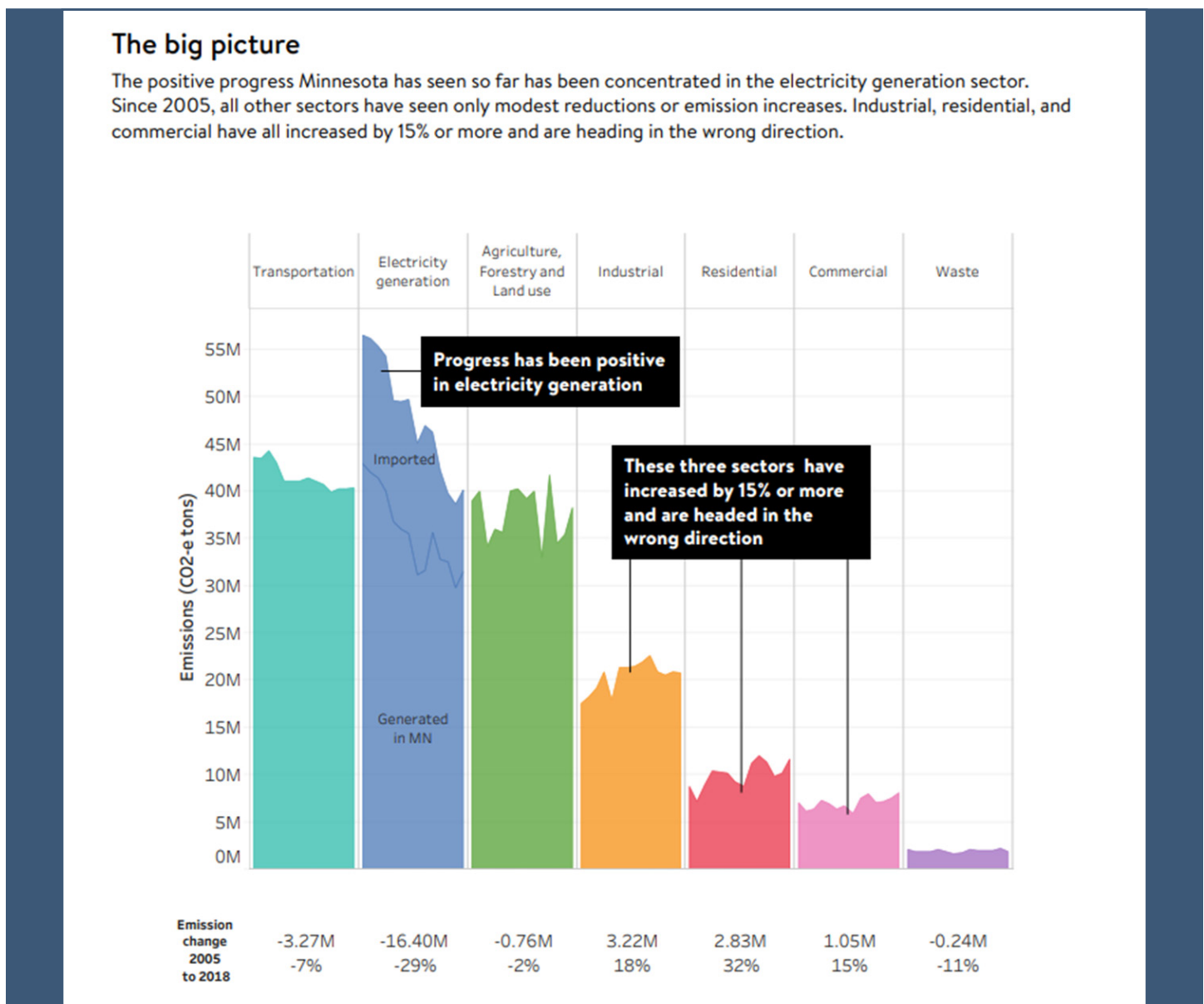
New platforms are emerging in the region that enables new business and work models. Sharing platforms allow individuals to generate new revenue streams from their own assets, such as extra rooms or cars. Maker spaces and mobile payment systems offer new options for artisanal and freelance activity. Local city governments are creating new systems for providing public services such as waste removal and paramedic services more efficiently, thus also spurring new business activity.

1.3 SUSTAINABLE MANUFACTURING

Our manufacturing systems have always faced pressure from economic, political, and social factors, but a new threat is emerging, the limits of our finite planet. These limits manifest tangibly along the supply chain as rising costs for resources disposing of waste into quickly filling landfills. The limits are also traceable in polluted soils and an increasingly acid atmosphere filled with greenhouse gases which impact the livability of our communities. The goal then of sustainable manufacturing is to recognize these limits and see them as opportunities that can be addressed to ensure manufacturing remains a viable and valuable component of our regional economy.

The State of Minnesota has made some concerted efforts to address these issues which have resulted in transportation emissions dropping 7% and emissions from electricity dropping 25% from 2005 levels. However, over that same period emissions from Minnesota's industrial sector increased 18%¹. These lamentable numbers show a clear opportunity to make manufacturing in South Central Minnesota more sustainable. The aim of this section is to understand what the landscape of sustainable manufacturing looks like in south central Minnesota and outline opportunities for further action in this sector.

Figure 1 Minnesota Pollution Control Agency Greenhouse gas emissions data by sectors 2005 – 2020



1 <https://public.tableau.com/app/profile/mpca.data.services/viz/GHGemissioninventory/GHGsummarystory>

First Steps: Minnesota Sustainability Consultants

Manufacturing plants have a wide range of sustainability opportunities based on their location, the design of their plant, the products they produce, and the machinery they use. For example, the possible renewable energy resources available to manufacturers include solar, geothermal, wind, hydrogen, and biogas. But with so many options to choose from, how should a manufacturer decide where to start? Fortunately, there are organizations both public and private that can provide technical assistance to decide what interventions provide the largest reduction in environmental impact and greatest financial benefit.



Minnesota Clean Energy Resource Teams (CERTs)

The Minnesota Clean Energy Resource Teams (CERTs) was founded in 2003 with the goal of helping communities, companies, and households achieve their clean energy goals. The organization which is housed within the University of Minnesota Extension is a statewide collaborative with six regional teams covering the entire state.

CERTs offer a wide variety of resources internally and are well-connected to other resources throughout the state. One example of a program they offer internally is Renewable Energy for Greater Minnesota. This program offers free consultation which includes energy audits, solar assessments, information about grants and loans, and a financial feasibility analysis. These studies are completely free and offer an easy first step for organizations that hope to become more sustainable.

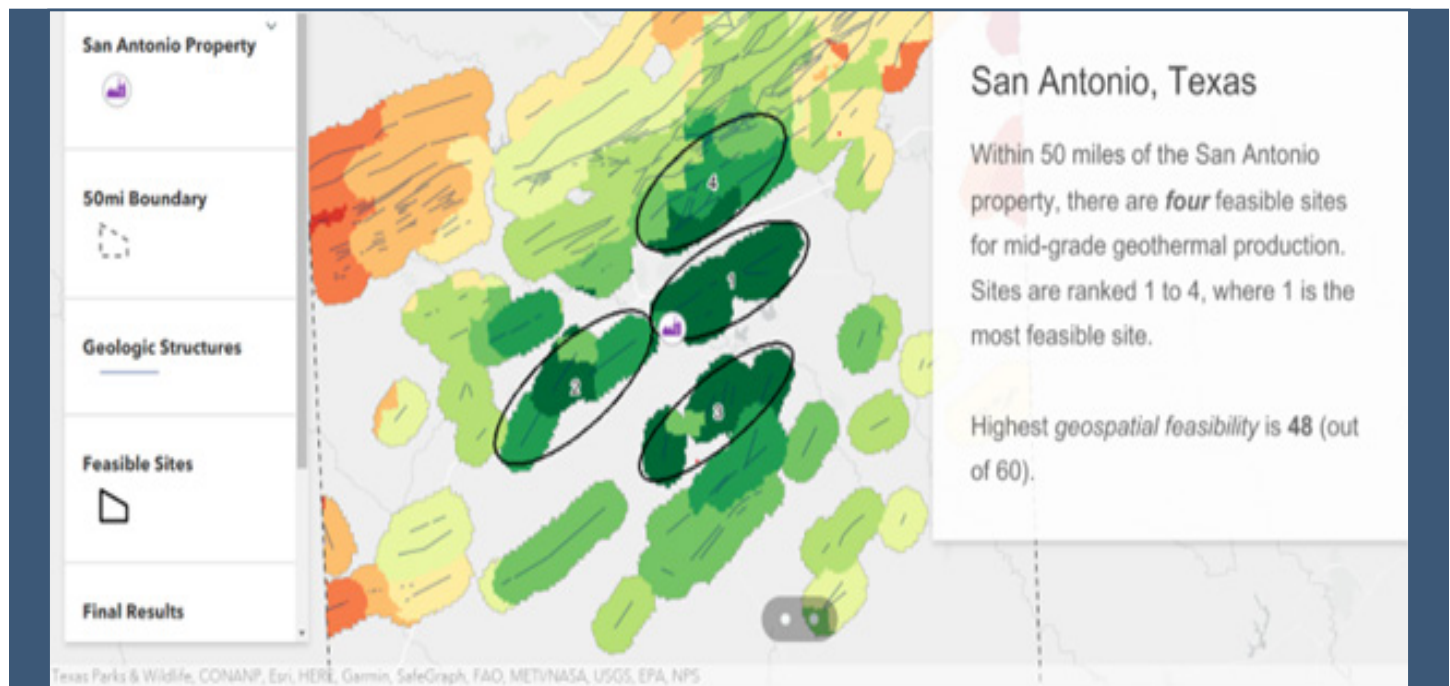
Another program offered through the University of Minnesota is the Minnesota Technical Assistance Program (MnTAP). This program utilizes graduate-level students to help companies plan and implement beneficial projects focused on water conservation, energy efficiency, and waste reduction. Having implementation support is a critical aspect of helping companies become more sustainable as staff time is often limited. In 2021 MnTAP clients included international brands such as General Mills and Coca-Cola, as well as local small and mid-sized companies like JIT Powder Coating Co, and Miller Manufacturing. Projects designed as part of this program offered clear benefits such as the case of JIT Powder Coating where upgrading to a more energy-efficient pretreatment system showed annual savings of \$17,000 and a payback time of only three years.

WSB Renewable Energy Match

Another sustainability consulting option in Minnesota is WSB, a design and consulting firm with offices across the United States. Their Renewable Energy Match (REM) program aims to support clients in reaching their greenhouse gas (GHG) reduction goals by providing sustainable, cost-effective, and flexible renewable energy solutions. REM conducts a four-step feasibility assessment that includes geospatial analysis, climate risk evaluation, energy production calculations, and economic outlook. After each step, the client is presented with the findings to see if they wish to continue and which energy sources they want to investigate further. The program which was developed in partnership with ID8 Energy Group can provide manufacturers with an in-depth analysis of five different renewable energies: solar, wind, geothermal, renewable natural gas, and hydrogen. The project team at WSB believes that this tool is useful for any size of manufacturer, but it can be especially powerful for those with multiple sites across geographies because each site will have unique opportunities.



Figure 2 Example of WSB's Renewable Energy Match analysis for geothermal energy in San Antonio, Texas



Conversations with Manufacturing Plants

Conversations with manufacturers about the sustainability of their operations revealed a few main themes that offer great opportunities for further research and action on this topic. One of the most critical is that manufacturers have a strong appreciation for the role that energy and resource efficiency play in their operations' daily success.

Reducing Waste

One concept that was common for many larger manufacturers was the idea of Zero Waste to Landfill. This means that all waste produced at the plant is either reused, recycled, composted, or sent to an incinerator. Several manufacturers have been able to achieve this goal thanks to key pieces of infrastructure in our region, most notably the Wilmarth Incinerator. This incineration plant located in Mankato collects refuse from across the region and burns it to create electricity. The plant can produce 25MW of electricity, enough to power 20,000 homes. The manufacturers we spoke to, and state laws consider this to be a renewable energy source, while other sectors of society consider it to be an environmental disaster. Another key piece of infrastructure that supports companies in claiming the title of Zero Waste to Landfill is the Hometown Energy Biodigester in Le Sueur County. This biodigester accepts organic waste from several food and beverage manufacturers. This waste is converted into electricity and renewable natural gas (RNG). With a capacity of 8 MW, it can power 6,500 homes.

Plastic waste presents a massive issue for the sustainability of manufacturing due to the sheer volume produced and the pervasive nature of this material which never biodegrades. Our region is home to many manufacturers who produce plastics for food, beauty, and healthcare products. One method that was utilized at multiple plastic manufacturers in our region is "regrind". This process allows them to capture excess plastic from their process and feed it back into the manufacturing process. However, this can only be used for certain products since every time plastics are heated and molded their quality degrades. This would lead medical grade plastic waste to possibly only be "reground" into say a shampoo bottle or a pair of sunglasses. For waste plastic that couldn't be reused internally because of quality issues, some manufacturers were able to redistribute that to their regional colleagues with less stringent quality standards who could use the waste in their own processes. Supply chain connections like these represent a great opportunity to increase the resource efficiency of manufacturers in our region.

Metal is a highly valuable and easily recycled material that is central to many manufacturing processes. Because of its high value, there is a clear monetary incentive that encourages companies to capture scrap metal and send it to a recycler. This was visible through a conversation with a local manufacturer in our region which has created an innovative way to encourage the recycling of scraps. They were able to encourage this by providing employees with bonuses based on the volume of metal recycled. The bonuses are offered on a quarterly basis and amount to roughly \$500. Examples like this highlight how being green can provide financial benefits.



Conversations with Electric Utilities

The renewable energy portfolios of Minnesota utilities are a model within the United States and offer many opportunities for manufacturers to meet their energy goals. This is highlighted by a quote from one of our interviewees who, when asked about companies wanting to cover their electricity uses with renewable energy stated, “If they want 100% renewable, we can offer that”. The simplest method for a company to reach such a goal is through renewable subscription services for wind and solar energy.

Renewable Energy Subscriptions

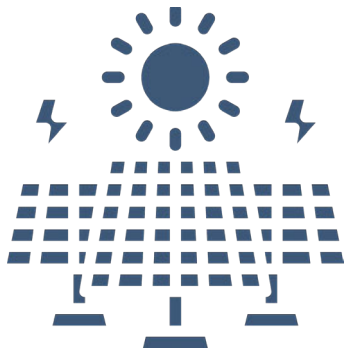
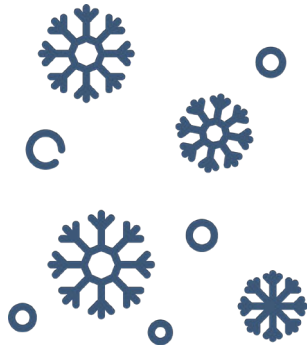
As touted on their websites, these subscription-based opportunities allow utility members to support renewables without installing their own. From conversations with municipal and co-op utilities these programs are not highly utilized, and although they didn’t state why, one can surmise it is because they provide limited cost savings to the subscriber. For example, one local utility charges users \$2 more per month to utilize green energy. The story for subscription services differ in Xcel Energy’s territory.

Xcel Energy covers many of the most densely populated areas of Minnesota, meaning they also serve some of the state’s largest manufacturers. And it is these same large manufacturers whose corporate offices have set ambitious sustainability goals. One Xcel representative shared that subscriptions to renewable energy projects offer an easy on ramp for manufacturers to “use” sustainable energy and meet their goals. In Xcel territory these subscriptions offer a cost-saving opportunity because the solar farms are run by third-party companies whose business model is based on passing on the savings of renewable generation to their subscribers. These savings often run between 10–15% on an annual basis. Thus, making a subscription to renewables more lucrative and beneficial in Xcel territory. Another added benefit of subscribing to renewable projects in the Xcel system is that it gives subscribers ownership of their Renewable Energy Credits, which they can use to meet environmental reporting standards.

Renewable Energy Credits are an accredited way for companies and reporting systems to track and meet their sustainability goals. One REC counts for 1 MWh of renewable energy generation and each REC “created” can only be counted once. RECs are important for companies because they can report those numbers to the government and consumers. A representative from Xcel shared that these are most often used by larger multinational manufacturers to meet European Union standards.

The availability of subscription-based renewable energy is not a limiting factor for local companies wanting to meet certain sustainability goals. However, it is not always lucrative for manufacturers to pursue this due to actions by utilities that remove any economic incentive. Thus, the current action by utilities on renewable energy subscriptions do not meet the needs of the climate crisis, they do however, meet the superficial needs of trend-setting manufacturing facilities.





Onsite Solar Opportunities

The advances in solar technology and financing mechanisms have lead to onsite solar providing an undeniable opportunity to increase the resilience of our regional manufacturers. However, there is still a lack of knowledge about solar from how it physically integrates with manufacturing infrastructure to the economic benefits of the investment. We sought to address some of these concerns by talking with experienced solar installers across the state. When asked about the most common concerns installers shared a simple list of hail, impact on the roof, panel end-of-life process, and managing snow. This installer had very clear and concise answers to these concerns and why they shouldn't be a deterrent for companies looking to go green and save green.

Common Addressed Concerns

Hail – All UL-certified solar panels go through a rigorous testing process with an industry-standard guarantee of protection against a direct hit from a 1-inch hailstone at 75mph.

Snow – Snow in the winter is not a big issue for rooftop installations because wintertime production is already limited due to the latitudinal position and the related reduction in daylight hours. With such a big drop in daytime production, snow reduces production but the impact is minimal. In short, most of the electricity generation savings will come in spring, summer, and fall.

Panel End of Life – Many manufacturers are also concerned about the eventual disposal of the panels after their lifetime. Solar panels have an industry-standard 25-year warranty but have a useful life of 30–40 years. Solar panel recycling technologies have also advanced tremendously in recent years, although there is not a strong market for this yet. The technology is highly recyclable as they are made of inert compounds like glass, aluminum, silver, and silicon.

Roof Safety – Before solar panels are installed a thorough inspection is done to ensure the roof is in good shape. The weight of panels per square foot is roughly 2-4 lbs./sq ft, far less than the 20 lbs./sq ft required by building codes. Secondly, on typical manufacturing facilities with flat roofs, there is no need to penetrate the roof as a ballasted mounting system is used which utilizes concrete blocks to hold down the panels. These ballasted systems can withstand winds of up to 120 mph.

Solar Financial Benefits

Solar is now one of the cheapest sources of energy available at any scale. This makes it a great option for manufacturers of any size from mom-and-pop shops to multinational facilities. The economic benefits are vastly increased by federal tax incentives and asset depreciation. Below we offer two cash flows from Cedar Creek Energy, a solar company that has done installations for manufacturers across Minnesota.

| Project | Megawatt A/C |
|------------------------------|--------------|
| AC kW | 1,000 |
| DC kW | 1,450 |
| Y1 kWh | 1,740,000 |
| Degradation | 0.60% |
| Build Cost | \$2,500,000 |
| Build Cost \$/w DC | \$1.72 |
| Federal Tax Rate | 37.00% |
| State Tax Rate | 9.85% |
| Discount Rate | 5.00% |
| Current Customer Power Rate | \$0.099 |
| Xcel Power Inflation | 3.00% |
| Xcel Energy PV Demand Credit | \$50,000 |

| Net Present Value | |
|-------------------|-------------|
| NPV (10 Yr) | \$1,365,443 |
| NPV (15 Yr) | \$1,915,727 |
| NPV (20 Yr) | \$2,544,136 |
| NPV (25 Yr) | \$3,086,624 |
| NPV (30 Yr) | \$4,609,611 |

| Internal Rate of Return | |
|-------------------------|--|
| IRR (10 Yr) | |
| IRR (15 Yr) | |
| IRR (20 Yr) | |
| IRR (25 Yr) | |
| IRR (30 Yr) | |



Xcel Energy Photovoltaic Demand Credit Rider

Performance Based PV Incentive, priced at \$0.069648 per kWh generated between the hours of 1:00 PM and 7:00 PM. CREDIT KWH LIMIT The maximum kWh applied to the Rider credit per kWh each billing period is the Peak Period maximum 15-minute Solar Photovoltaic kW output for the billing period times 100 hours for billing periods ending in the months of June, July, August or September and 75 hours for billing periods ending in other months.

Sample Cashflow For A One Megawatt A/C Project With Xcel Energy PV Demand Credit

| Year | PACE Financing 10 YR @4.25% | PV Array kWh Generated | \$/kWh Generated | Xcel Energy Power Savings | Xcel Energy PV Demand Credit | Federal Tax Credit (26%) | Federal Depreciation | State Depreciation | Annual Cash Flow | Cumulative Savings | Year |
|---------|--------------------------------|---------------------------|---------------------|------------------------------|------------------------------------|-----------------------------|-------------------------|-----------------------|---------------------|-----------------------|---------|
| Year 0 | | | | | | | | | | | Year 0 |
| Year 1 | | 1,740,000 | \$0.099 | \$172,260 | \$50,000 | \$650,000 | \$804,750 | \$49,250 | \$1,726,260 | \$1,726,260 | Year 1 |
| Year 2 | -\$307,320 | 1,729,560 | \$0.102 | \$176,363 | \$49,700 | | | \$78,800 | -\$2,457 | \$1,723,803 | Year 2 |
| Year 3 | -\$307,320 | 1,719,183 | \$0.105 | \$180,564 | \$49,402 | | | \$47,280 | -\$30,074 | \$1,693,729 | Year 3 |
| Year 4 | -\$307,320 | 1,708,868 | \$0.108 | \$184,865 | \$49,105 | | | \$28,368 | -\$44,981 | \$1,648,748 | Year 4 |
| Year 5 | -\$307,320 | 1,698,614 | \$0.111 | \$189,269 | \$48,811 | | | \$28,368 | -\$40,873 | \$1,607,875 | Year 5 |
| Year 6 | -\$307,320 | 1,688,423 | \$0.115 | \$193,777 | \$48,518 | | | \$14,184 | -\$50,841 | \$1,557,034 | Year 6 |
| Year 7 | -\$307,320 | 1,678,292 | \$0.118 | \$198,393 | \$48,227 | | | | -\$60,700 | \$1,496,334 | Year 7 |
| Year 8 | -\$307,320 | 1,668,222 | \$0.122 | \$203,119 | \$47,937 | | | | -\$56,264 | \$1,440,070 | Year 8 |
| Year 9 | -\$307,320 | 1,658,213 | \$0.125 | \$207,957 | \$47,650 | | | | -\$51,713 | \$1,388,357 | Year 9 |
| Year 10 | -\$307,320 | 1,648,264 | \$0.129 | \$212,910 | \$47,364 | | | | -\$47,046 | \$1,341,311 | Year 10 |
| Year 11 | -\$307,320 | 1,638,374 | \$0.133 | \$217,982 | \$47,080 | | | | -\$42,258 | \$1,299,053 | Year 11 |
| Year 12 | | 1,628,544 | \$0.137 | \$223,174 | \$46,797 | | | | \$269,972 | \$1,569,024 | Year 12 |
| Year 13 | | 1,618,773 | \$0.141 | \$228,490 | \$46,516 | | | | \$275,007 | \$1,844,031 | Year 13 |
| Year 14 | | 1,609,060 | \$0.145 | \$233,933 | \$46,237 | | | | \$280,170 | \$2,124,201 | Year 14 |
| Year 15 | | 1,599,406 | \$0.150 | \$239,505 | \$45,960 | | | | \$285,465 | \$2,409,666 | Year 15 |
| Year 16 | | 1,589,809 | \$0.154 | \$245,210 | \$45,684 | | | | \$290,894 | \$2,700,561 | Year 16 |
| Year 17 | | 1,580,270 | \$0.159 | \$251,051 | \$45,410 | | | | \$296,461 | \$2,997,022 | Year 17 |
| Year 18 | | 1,570,789 | \$0.164 | \$257,031 | \$45,138 | | | | \$302,169 | \$3,299,191 | Year 18 |
| Year 19 | | 1,561,364 | \$0.169 | \$263,154 | \$44,867 | | | | \$308,020 | \$3,607,211 | Year 19 |
| Year 20 | | 1,551,996 | \$0.174 | \$269,422 | \$44,598 | | | | \$314,020 | \$3,921,231 | Year 20 |
| Year 21 | | 1,542,684 | \$0.179 | \$275,840 | \$44,330 | | | | \$320,170 | \$4,241,400 | Year 21 |
| Year 22 | | 1,533,428 | \$0.184 | \$282,410 | \$44,064 | | | | \$326,474 | \$4,567,875 | Year 22 |
| Year 23 | | 1,524,227 | \$0.190 | \$289,137 | \$43,800 | | | | \$332,937 | \$4,900,811 | Year 23 |
| Year 24 | | 1,515,082 | \$0.195 | \$296,024 | \$43,537 | | | | \$339,561 | \$5,240,373 | Year 24 |
| Year 25 | | 1,505,991 | \$0.201 | \$303,076 | \$43,276 | | | | \$346,351 | \$5,586,724 | Year 25 |
| Year 26 | | 1,496,955 | \$0.207 | \$310,295 | \$43,016 | | | | \$353,311 | \$5,940,035 | Year 26 |
| Year 27 | | 1,487,974 | \$0.214 | \$317,686 | \$42,758 | | | | \$360,444 | \$6,300,479 | Year 27 |
| Year 28 | | 1,479,046 | \$0.220 | \$325,253 | \$42,501 | | | | \$367,755 | \$6,668,233 | Year 28 |
| Year 29 | | 1,470,172 | \$0.227 | \$333,001 | \$42,246 | | | | \$375,247 | \$7,043,481 | Year 29 |
| Year 30 | | 1,461,351 | \$0.233 | \$340,933 | \$41,993 | | | | \$382,926 | \$7,426,407 | Year 30 |
| | -\$3,073,200 | 47,902,932 | | \$7,422,086 | \$1,376,521 | \$650,000 | \$804,750 | \$246,250 | \$7,426,407 | | |

Utility Hostility: Critical Analysis

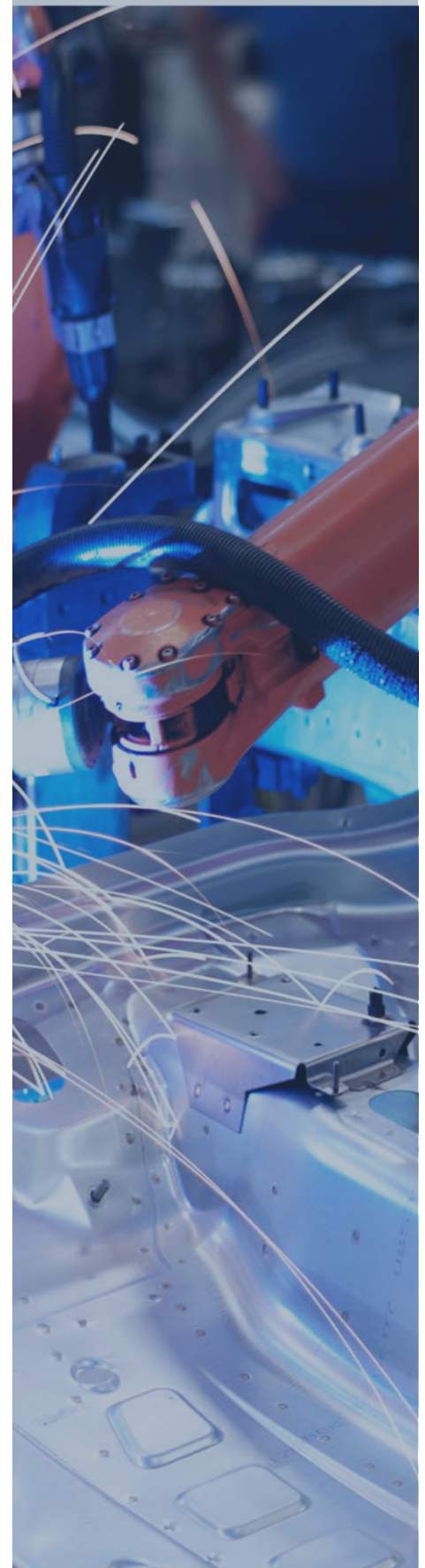
Co-ops and Municipal Utilities:

From a geographic perspective, Region Nine is serviced largely by both co-op and municipal utility providers. One of the first things that was clear is the demand for clean energy is not as high for the manufacturers they serve. One utility official equated this largely to them serving more conservative areas that are less interested in renewable energy, especially for just the “green” reasons. However, this mindset is misleading and indicative of a more prevalent hostility they have towards renewables. This lack of interest can be clearly traced to the way they advertise and speak about onsite solar.

When visiting some utility websites about onsite solar, interested parties are encouraged to instead look at subscription options and warned to be skeptical of solar installers. One solar installer we spoke to, shared that certain utilities have outright lied to people interested in solar, telling them that the electricity produced by solar panels is incompatible with the grid. This statement is not at all true as these systems go through rigorous testing and are designed for integration with the grid. These utilities have also supported limits on solar system sizes and are quick to share that solar projects sometimes don’t “pencil out”. However, the reason solar systems don’t seem to make sense financially is largely based on their own rules and regulations such as grid access fees. For comparison, certain co-ops have a grid access fee of \$17/month while for others it is \$77. These grid access fees are closely correlated with rates of solar adoption.

Conclusion:

Manufacturers in our region have a very strong appreciation for the role that resources and energy efficiency play in the success of their operations. Despite this, we have seen an increase in emissions from Minnesota’s industrial sector. This trend needs to be reversed to keep our manufacturers competitive in a global market and for the sake of our communities. Advances in technology and financing mechanisms have increased the accessibility of implementing sustainable initiatives yet progress remains slow. A critical aspect of speeding up the sustainable manufacturing transition will be increasing local knowledge of technologies and providing technical assistance to support the implementation of these practices.





1.4 THE CURRENT CONTEXT OF THE REGIONAL EFFORTS UNDERWAY

Sustainability is all about the ability to retain resiliency. However, the importance of economic, environmental, and social dimensions varies from time to time and according to different criteria. Various activities such as “product design, manufacturing by-products, by-products produced during product use, etc.” have also been included in the supply chain core activities as was highlighted in MedTech Connect as Region Nine’s manufacturers participate in many of these activities in the medical device manufacturing supply chain without necessarily being exclusively focused in these areas.

The U.S. Department of Commerce defines sustainable manufacturing (SM) as the “creation of manufactured products that use processes that are nonpolluting, conserve energy and natural resources, and are economically sound and safe for employees, communities, and consumers”, which clearly implies fostering of domestic and international conditions for doing business in addition to fulfilling basic dimensions of sustainability. However, in the long run, growth is subject to constraints associated with economic resiliency. With a growing economy, Region Nine is bound to experience an increase in demand for materials and energy, putting serious constraints on natural resources such as land, water, minerals, and fossil fuels, and the potential increase in energy and commodity prices. Moreover, increasing activity will lead to an increase in levels of waste and pollution, particularly in the form of higher GHG emissions, which can ultimately restrict the region’s ability to grow, rendering its momentum unsustainable. Due to the ongoing trend, it has thus become a need to develop and pursue manufacturing activities, which helps in maximizing economic and social benefits along with minimizing environmental impact.

Sustainable manufacturing uses environmentally friendly practices to reduce their impact on the environment, in fact by using this, world-class manufacturing also can improve profitability. According to the Brundtland report (named after the former Norwegian Prime Minister and Secretary General to the World Health Organization), sustainability is defined as growth that meets the needs of the present without compromising the capability of the upcoming generation to meet their own needs. Adaptive and dynamic manufacturers should be concerned about sustainability issues and the recognition of the relationship between the natural environment and manufacturing operations, which plays an important role in decision-making among industrial regions. From a technical standpoint, sustainable manufacturing represents a system that approaches the creation and distribution of innovative products and services that can minimize the resources of inputs, eliminates toxic substances, and produces zero waste. As these byproducts increase the costs of production, in addition to being harmful to the environment, the use of sustainable manufacturing practices presents opportunities for enhancing economic resiliency in the region.

Venture capital remains a challenge, as it does in Minnesota in general. This is particularly true outside the Twin Cities. Venture capital flowing into Minnesota in 2019 was one third of the amount available in 2000. Although these figures tend to fluctuate from year to year, the competition for capital has increased over the years as a downward trend has continued.

Finally, the region is experiencing growing pressure on the middle class. Over the last 15 years, GDP growth has not translated into growth in middle incomes in the United States, Minnesota, or in Region Nine. Median household income in the region dropped 9% from 2008 to 2011 and has stagnated since. Statewide, median household incomes are 10% below 2008 levels. Across the country, the percentage of households with incomes under \$35,000 has grown since the last recession. The widening income gap is exacerbated by the lack of skills in the workforce necessary for successful employment in the 21st century economy.

In Minnesota, middle-skill jobs, those requiring education beyond high school but not a four-year degree, account for nearly 55% of the state's labor market, but only 40% of the state's workers are qualified. The development of Region Nine's workforce begins in the region's K-12 schools. Region Nine has been successful in preparing youth for success in comparison to statewide averages, with a high school graduation rate for some of the counties above 92%. However, noticeable differences exist with three of the region's counties graduating a significantly lower percentage of their high school age adolescents.

While the region enjoys many economic strengths, issues such as childcare cost and availability, mental health, and substance abuse treatment options, growing economic disparities, and a lack of progress on closing the skills gap resurfaced as particularly problematic during the pandemic as they impact manufacturing clusters as sources of high paying jobs and earning potential in our local communities. These issues point to the need for both a more effective partnership between business and government on economic issues and a stronger sense of shared purpose surrounding the region's growth and community development.

Several COVID-19 specific efforts have taken place in Region Nine over the last year to respond to immediate needs. Small business relief packages, as grants or payments (specifically aimed at the hospitality industry), federal CARES ACT funding – grants, payments, or loans, and Paycheck Protection Programs (PPP) have been made available and utilized throughout the region by state entities such as the Minnesota Department of Employment and Economic Development (DEED), counties, and local governments to salvage and stimulate pandemic recovery. However, great uncertainties remain as we plan for the future.





1.5. GLOBAL AND LOCAL CHANGES AND REGIONAL MANUFACTURING CONDITIONS

In-depth descriptions of market conditions nationally, statewide, and regionally are also provided. To make sense of changes to the external environment this report will address political, economic, socio-cultural, technological, and demographic changes that have occurred and that are expected to occur. Each of these are considered as part of a framework of macro-environmental factors that should be used in the environmental scanning component of strategic planning for any academic organization. This is common practice when conducting a strategic analysis or doing market research as it provides an overview of the different macro-environmental factors that should be taken into consideration when attempting to make sense of industrial changes. It should, however, only be used as an initial step in developing a strategic understanding of market growth or decline, business position, potential, and direction for operations.

1.5.1. Political Changes

An ongoing political challenge impacting Minnesota industries is the changing use of tariffs implemented on both sides of the Pacific and the Atlantic. While some argue tariffs will have a negative long-term impact on Minnesota (and U.S.) manufacturing, others suggest that they could contribute to the reshoring of manufacturing jobs. Regardless, the state's supply chains can expect to be impacted by the changing cost structures, the quality of products and supplies, and the overall way in which products are made. Additionally, these political changes may contribute to the use of new techniques in manufacturing, tools, and the types of materials used. The nature of taxing global trade is getting more complex, with supply chains opening up, geographical borders dissolving, and high-tech engineering. These factors contribute to added value and impact the price of end products.

New government regulations and standards may also impact contract manufacturing.² Typically, the larger players are forced to comply with new standards resulting in the request for new information about products. The smaller manufacturers follow the new compliance requests as well. Yet, when new ideas, concepts, and products are introduced the response time for most companies within the industry is slow. These types of new standards will particularly impact smaller regional manufacturers and their ability to respond to environmental changes. Quickly adapting can provide companies with an edge in negotiations by offering new data before being asked to supply it. For example, standard certifications like ISO 9001, RoHS, REACH, UL, CSA, MSHA, and OSHA begin to trickle through the industry and eventually may become required. Each of these certifications require some added testing or template-style organization for products and companies to comply with standards and regulations.

² A contract manufacturer is a manufacturer that contracts with a firm for components or products. It is a form of outsourcing. A contract manufacturer performing packaging operations is called co-packer or a contract packager

1.5.2. Economic Changes

Funding of operations, particularly in the manufacturing segment of the economy, has changed over the last decade. Capital investments are shifting to more mature companies rather than early start-ups. Investment in early start-ups is seen as risky in the current cautious marketplace resulting in more difficulties for entrepreneurs to access capital.³ This may be of some concern as smaller companies have traditionally been more innovative than their larger competitors. It may also stifle competition within the industry and lead to monopolization over time. These trends should be considered as universities and colleges assess programming geared toward entrepreneurial support and career preparations.

Trends also indicate regional manufacturers' service providers struggle to adjust processes due to the emergence of the "super consumer". A super-consumer is considered a consumer that has access to information previously reserved for experts only. As communication technologies continue to gain more access to information, consumer behaviors demonstrate an increasing preference for recognizable brands. Consumers have traditionally relied on wholesalers and retailers to select products and services on their behalf. As a result of this new knowledge and trend, design elements that promote ease of use have become more important along with a greater concentration within the industry for brand recognition.

1.5.3. Socio-Cultural Changes

Generational changes, perceptions of environmental impact associated with manufacturing, and fair and balanced labor standards are at the forefront of sociocultural changes that impact the reputation and economic sustainability for many regional firms. Increased awareness of energy sources among millennials and the negative impact manufacturing can have on the climate is just one of many factors that firms must consider in today's market. Public relations are as a result a critical component of both production and marketing of products.

Additionally, millennials have to a greater extent continued their education at four-year colleges than at trade and technical colleges. This has contributed to labor shortages that many regional employers struggle to close. Most of the nation's young adults grew up in a de-industrialized or at least de-industrializing economy, and few of these potential workers have a relationship to manufacturing or have an idea of the earning potential in the manufacturing industries. Hence, opportunities to redesign curriculums to position students for success in growing industry clusters appear to be important.





1.5.4. Technological Changes

The rise of mobile devices has shifted the internet to the cloud, giving rise to an interconnected mesh of devices now being called the “Internet of Things.” Although service industries were at the forefront of these changes, manufacturing has also experienced the impact of these developments, with 19 % of manufacturing departments using cloud apps by 2016, a figure expected to triple over the next few years. As an example, medical manufacturers are increasingly producing wireless, wired, and hybrid medical solutions. This is in response to the rising demand for connected devices in hospitals and clinics, imaging and diagnostic centers, and home healthcare consumers. This segment of the market expected to grow to over \$1.3 billion by the end of 2021.

3-D printing is also impacting manufacturing and the production of durable goods. The 3-D printing industry is expected to triple in size between 2016 and 2021 for a total of \$21 billion annually. Robotics is helping medical manufacturing catch up to other areas of manufacturing. Traditionally, strict regulatory requirements have delayed the incorporation of novel manufacturing techniques into the medical device industry. However, improvements in manufacturing robotics are helping to close this gap. Medical robots are assisting with everything from pharmacy automation to surgery and demand for medical robots is expected to almost triple between 2015 and 2020, growing from \$4.2 billion to \$11.4 billion over that time

1.5.5. Demographic Changes

An aging population represents a major demand driver for medical devices, as it is also putting its toll on labor demands and supplies. The U.S. retirement age population (persons 65 and older) totaled 48 million in 2015 (15% of the population). The U.S. Census Bureau estimates that this population will more than double to 98 million by 2060 when retirement-age persons will represent 24% of the total U.S. population. Minnesota is on par with the U.S. average as indicated in the figure below.

According to United Nations projections, the global percentage of retirement-aged individuals will more than double from 8.3% of the world population in 2015 to 18.1% of world population in 2060. Europe’s elderly population is projected to reach 28% by 2060, making it the world’s oldest region - challenging Europe’s stronghold in many manufacturing industries.

SECTION 2: THE CURRENT STATE OF REGIONAL MANUFACTURING

Market analysis in the context of economic development is associated with broad-based changes in many aspects of the economy. An aspect that has gained increasing attention over recent years is the systematic changes in economic geography and sectoral composition over time. As they develop, economies often see activities shift to higher value-add activities within existing industries and to higher value-add industries, to successfully compete in a broader set of industries. Conversely, a growing divergence between locations within an economy, also reflected in different specialization patterns, can undermine overall prosperity growth. Understanding these trends and using evidence on how they play out in specific locations has become a critical piece of intelligence to inform stakeholders.

Clusters, defined as regional concentrations of economic activities in related industries connected through local linkages and spillovers, are an important conceptual tool in these efforts. They provide a way to understand the interplay between location, value chains, and regional specialization patterns. Clusters rest as a conceptual idea on several key dimensions:

First, they are groups of related industries and the economies of scope that such relationships help unlock. Clusters are thus not simply a concentration of economic activity in a narrow industry, driven by economies of scale. They are much more related to the notion of related variety, where dynamism emerges from the combination of capabilities and activities that are complementary, not identical.

Second, clusters are shaped by geographical proximity. They reflect the specific nature and density of local connections, for example in a deep local skill pool, local knowledge spillovers, and the opportunities for deeper collaboration among local partners. They do not ignore or question the relevance of relationships that stretch longer distances such as global value chains and knowledge networks. The cluster framework suggests that local and global connections play different but complementary roles. Local clusters can be the sources of unique competitive advantages, providing access to a specific set of local circumstances and partners. Global linkages add capabilities that are missing locally – no location provides everything – but can be copied by rivals from other locations.

Third, clusters are driven by the interplay of collaboration and competition among related activities within a given location. Clusters provide benefits already as the mere co-location of related activities, for example, knowledge spillovers, and deeper, more specialized input markets. The dynamic power of co-location becomes significantly enhanced if the co-located entities start to engage with each other. This can happen through collaboration, an example being joint research or training efforts. It can also happen in the intense local competition among rival firms, forcing them to adopt more differentiated strategies as well as enhancing productivity and innovation.

Fourth, the dynamics that can emerge in clusters is driven by the critical mass that a specific location achieves in a set of related industries. If the set of activities and entities locally present is small, the number of possible linkages is small as well. As the number of players grows, the possible interactions grow more than proportionally. This drives an S-shaped growth path, where clusters start showing significantly higher performance and growth once they move beyond a certain size. Clusters emerge naturally as the benefits of co-location affect the growth of firms differently across locations and enhance specific locations' attractiveness for firms that are moving. The process of cluster emergence is shaped both by the decisions firms make about their investments and ways of competing and by the decisions governments and other institutions make about relevant qualities of the cluster-specific business environment.

2.1. CLUSTER LINKAGES AND ECONOMIC DIVERSIFICATION IN REGION NINE

Region Nine's composition of industry clusters has changed over the last 20 years, although some of the linkages have stayed the same. Sixty-three percent of Region Nine's clusters are considered local clusters, i.e., clusters consisting of industries that serve the local market. They are prevalent in every region of the country, regardless of the competitive advantages of a particular location. As a result, a region's employment in local clusters is usually proportional to the population of that region. Moreover, most of Region Nine's employment comes from jobs in local clusters. Since local clusters are tied to the regions in which they are located, they are not directly exposed to competition from other regions. Examples include local entertainment, local health care services, and local commercial services.

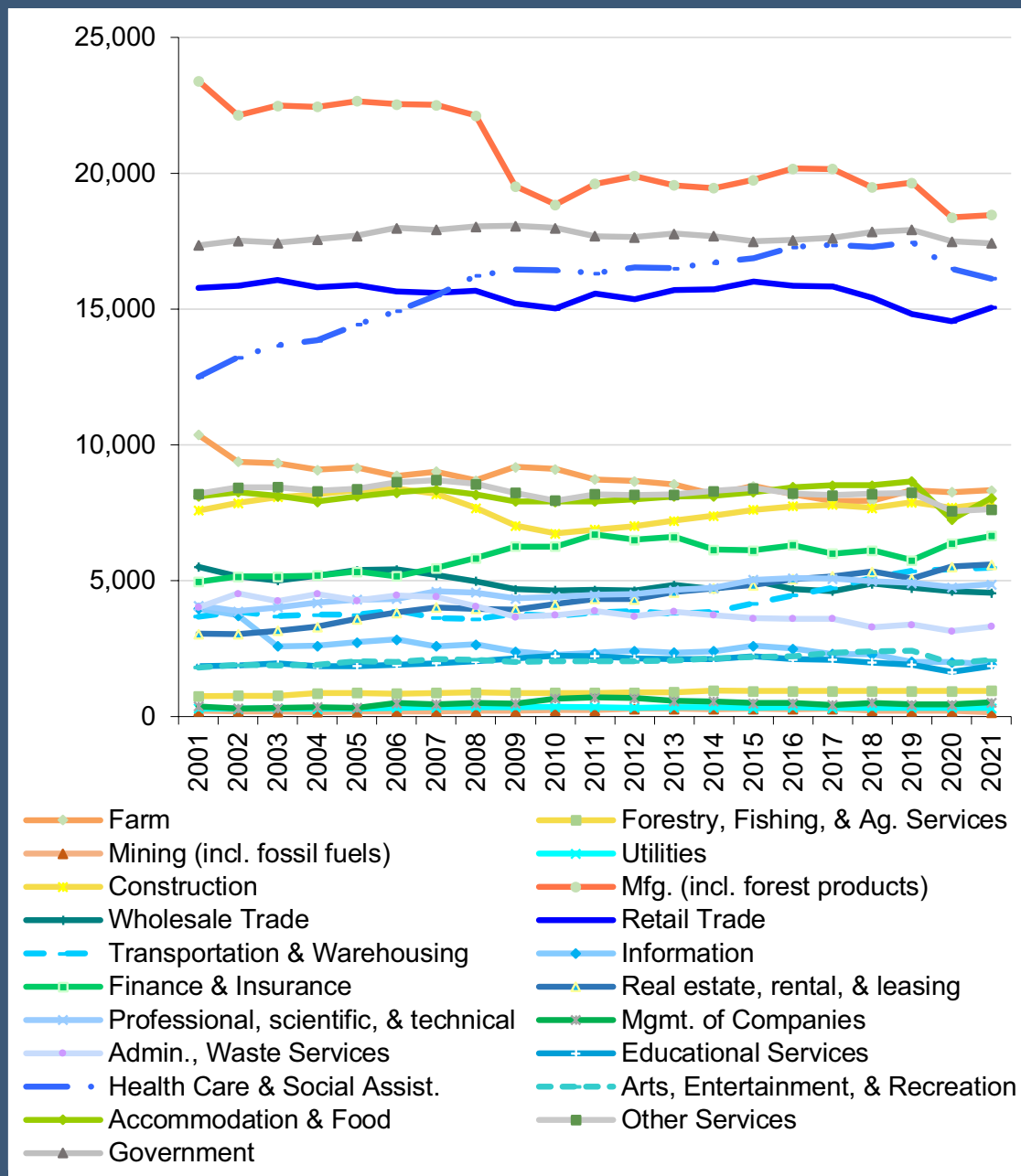
Traded clusters are groups of related industries that serve markets beyond the region in which they are located. They are free to choose their location of operation (unless the location is based on the presence of natural resources) and are highly concentrated in a few regions, tending to only appear in regions that afford specific competitive advantages. Since traded clusters compete in cross-regional markets, they are exposed to competition from other regions.

The two strongest industry clusters in Minnesota over the past couple of decades, marketing and printing, have been significant performance drivers for the state, yet are industries that have undergone major structural changes during the same time period. Printing, despite recent closures of regional facilities, most notably Quad Graphics (formerly Brown Printing) in Waseca, has remained a key industry for the region, although employment is trending downward as digital media increasingly replaces printed media.

The downward trends in one of the state's strongest clusters also necessitate a shift in related industries. More industry clusters have experienced net job losses over the last 20 years, which is also true for manufacturing segments of the regional economy. This is of course offset by strong gains in a few select industries, but it warrants a closer examination of the state's strengths and potential for economic resilience.

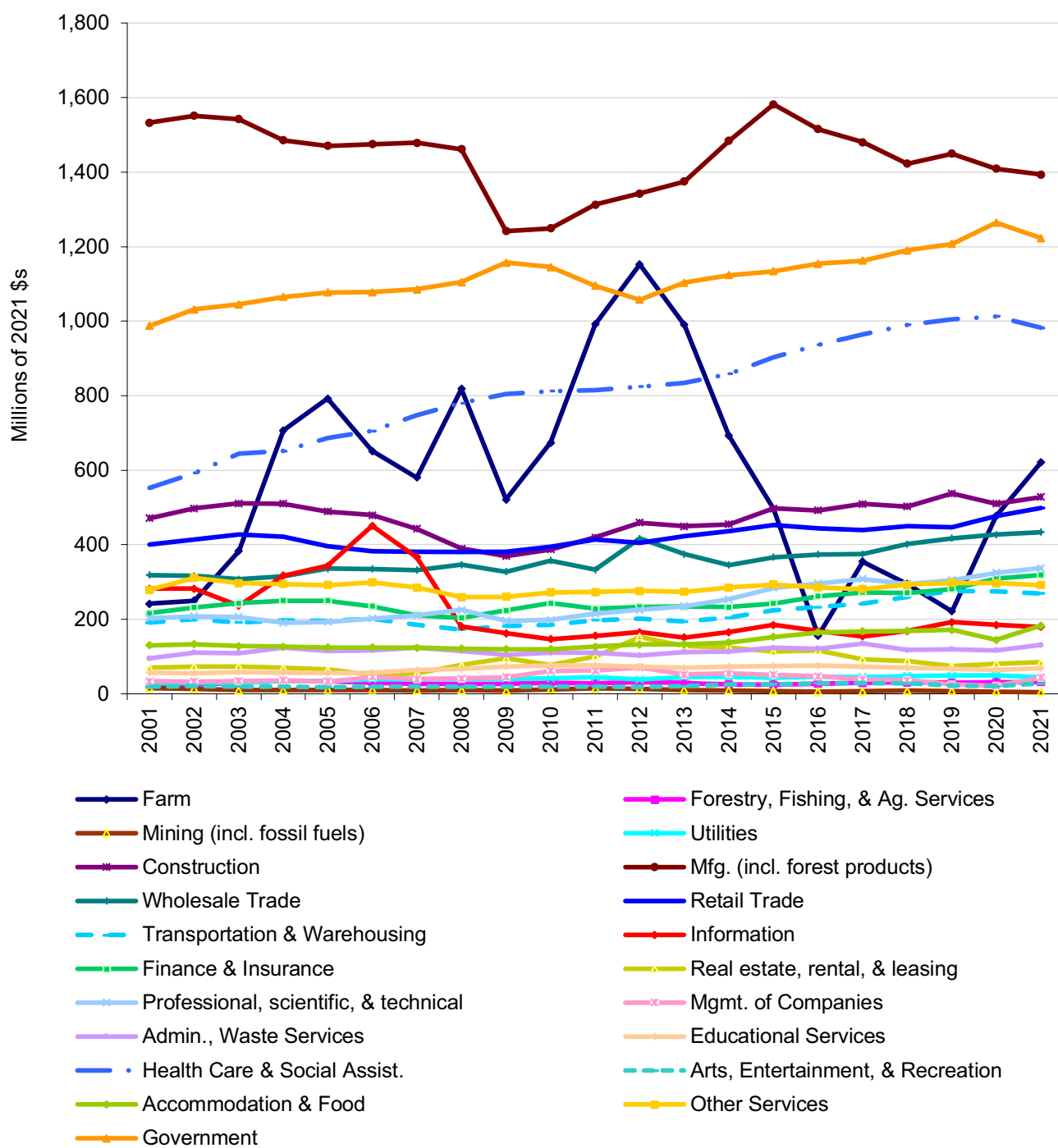


Figure 4 Employment in Region Nine by Industry (since 2000)⁶



As the above table illustrates, Region Nine's economy is fairly diversified as assessed by total employment. Yet, the region is also heavily dependent on the resilience of four broad industries: manufacturing, government, health care and social assistance, and retail trade. No significant growth exists in other sectors and as a result, any future prosperity hinges on the success of these sectors. The relatively large employment in the public sector can partially be attributed to the presence of the largest university in the Minnesota State system, a comprehensive two-year college in the same system, and a large state hospital, all in the Mankato/North Mankato MSA.

Figure 5 Earnings by Industry in Region Nine (since 2000)⁷



Given the diversification that exists, with four dominant sectors accounting for much of the regional employment, it is noteworthy that only three of these are main drivers of regional earnings, and are experiencing growth over the past two decades: manufacturing, government, and healthcare and social assistance, of which only manufacturing is a traded cluster. The more volatile agricultural sector (farms) account for the fourth highest earnings through portions of this timeline yet are also more susceptible to extreme variations. Accordingly, the regional industry is not as diversified as employment numbers would indicate, nor do these figures suggest that any other sectors are growing at a significant rate within Region Nine.

⁷ Data Sources: U.S. Department of Commerce. 2022. Bureau of Economic Analysis, Regional Economic Accounts, Washington, D.C., reported by Headwaters Economics' Economic Profile System, headwaterseconomics.org/eps.

2.2. REGIONAL MANUFACTURING CLUSTERS AND PERFORMANCE

Economic growth hinges on attracting or cultivating jobs that characterize the “innovation economy”. These are firms and occupations relying on talented workers whose skills are based on significant knowledge, insight, and creativity. Innovation-based economic growth in rural America, however, has long lagged behind the nation’s metropolitan areas. To address this gap, the U.S. Economic Development Administration sponsored a project, Innovation in American Regions, to develop new tools to support strategic economic development planning in rural regions. The goal of this work is to help rural planners assess their region’s comparative strengths and weaknesses with respect to fostering innovation-based growth.

A common method to identify regional or local clustering is to utilize Location Quotients (LQ). A location quotient is an analytical statistic that measures a region’s industrial specialization relative to a larger geographic unit (usually the nation). An LQ is computed as an industry’s share of a regional total for some economic statistics (earnings, GDP by metropolitan area, employment, etc.). For this study, RNDC chose to utilize Proximity Adjusted Location Quotients (PA-LQ) as this method mitigates several frequently cited issues with the traditional location quotient. These include:

- One:** Extremely high LQs are often found in less populated and remote counties that typically have simple and highly specialized industry structures. Such counties often emerge with high LQs but very low employment counts. This can occur because an LQ for one county doesn’t take into account the industry shares of neighboring counties, even though counties in close proximity to each other are often highly integrated.
- Two:** The LQ’s bias toward specialization without regard to size leads to statistical issues, as the distribution of LQs across counties will be highly skewed and contain many outliers that have to be dealt with in the context of regression and hypothesis testing.
- Three:** The LQ based on national industry statistics does not usually include key information on related industries. Each industry-county pair has its own LQ, which fails to account for industries that may be closely integrated through input-output linkages. This information is essential if one wishes to capture not only the concepts of specialization and spatial concentration, but also the broader concept of agglomeration.



The proximity-adjusted location quotient is a new measure of industry agglomeration that enhances the standard location quotient by considering two important aspects of industry clustering:

1. input-output (IO) linkages among related industries
2. spatial spillovers of industry concentration across geographic units, such as individual counties.

The three-digit North American Industry Classification System (NAICS)⁸ was utilized. This report assesses the regional and intra-regional manufacturing performance as it pertains to PA-LQ while integrating this with the Quarterly Census of Employment and Wages to classify industries in terms of regional growth, where a PA-LQ above 1.0 indicates a higher concentration than the national average.

The Quarterly Census of Employment and Wages (QCEW) program publishes a quarterly count of employment and wages reported by employers covering more than 95% of U.S. jobs, available at the county, metropolitan statistical area (MSA), state, and national levels by industry. The QCEW publication data set is vastly larger in scale than most Bureau of Labor Statistics (BLS) products. For example, the National Current Employment Statistics (CES) program publishes data for most of the 1,083 NAICS detailed industries for the nation. QCEW publishes every NAICS industry for the more than 3,000 counties in the United States, Puerto Rico, and the U.S. Virgin Islands, as well as every MSA, every state, and the nation.

Data was collected from Stats America's Data Browser and forecasts were generated utilizing data from 1994 through 2021. Although newer data is available from the BLS at the individual county level, forecasts generated at the aggregate level (i.e., economic development regions such as Region Nine) is more accurate than individual forecasts per county. The aggregate numbers also include more than 25 years' worth of quarterly historical data, which is considered robust for forecasting purposes.

GROWTH CLUSTERS

(High PA-QL & Employment Growth)

Only one manufacturing sector, beverage manufacturing, has a high location quotient and experiencing employment growth in the region. Tobacco is also included in this sub-sector but is not produced in Region Nine. Beverage manufacturing is therefore considered a growth cluster. Accordingly, it is an industry segment that should be considered critical to support as the region's economy moves forward. It is important to note that despite employment growth, the sector applies less than half a percent (0.48%) of the region's manufacturing workforce as of 2022, up from 0.24% in 2012.

SLOWING CLUSTERS

(High PA-QL & Declining or Stagnant Employment)

Six manufacturing sectors exhibit location quotients above the national average but are experiencing declining or stagnant employment growth. These sectors are therefore considered slowing clusters. These are industries that should be considered critical to watch as they historically represent competitive advantages for the region.

Most notably, food manufacturing, the region's largest manufacturing sector, falls into this category. Other sectors include electrical/appliance manufacturing, machinery manufacturing, wood product manufacturing, primary metal manufacturing, and transportation equipment manufacturing.

Food manufacturing employs 6.26% of regional manufacturing workers, which is on par with 2012 figures (6.23%), yet down approximately 200 workers as overall manufacturing employment has declined. It is, however, by far the largest employment sector in the region.

8. NAICS is the standard used by Federal statistical agencies in classifying business establishments for the purpose of collecting, analyzing, and publishing statistical data related to the U.S. business economy. NAICS was developed under the auspices of the Office of Management and Budget (OMB) and adopted in 1997 to replace the Standard Industrial Classification (SIC) system.

IMPROVING CLUSTERS

(Low PA-QL & Employment Growth)

Three industry clusters with location quotients (LQs) below the national average are expected to experience employment growth over the next ten years. These clusters are therefore considered improving clusters. These are also expected to experience increasing wages and are industries that should be considered critical to support as the regional economy moves forward.

These include chemical manufacturing, non-metallic minerals manufacturing, and fabricated metal manufacturing.

DECLINING CLUSTERS

(Low PA-QL & Declining or Stagnant Employment)

Three industry clusters with location quotients (LQs) below the national average are experiencing, or are expected to experience, negative employment growth over the next ten years. These clusters are therefore considered declining clusters. Each of these clusters are also expected to experience decreasing wages. These are industries that will contribute less to the regional economy than in the past.

These include apparel manufacturing, textile mills, paper manufacturing, printing, computer and electronic product manufacturing, furniture manufacturing, and plastics and rubber manufacturing. Also, petroleum products manufacturing has a particularly low presence as part of the regional portfolio and could be added to this category.

These analyses should not be considered independent of other data as some of these industries (e.g., performance arts) are small industries and do not employ large workforces. However, these are industries with predicted significant changes. Also, these analyses do not include local clusters such as healthcare services.



Figure 8. Region Nine’s Industry Clusters Identified by Projected Employment and PA-QL



The above table illustrates the four categories with the size of the image indicating size differentials between the industries. As with overall diversification, it is increasingly important to monitor these developments over the next five years as the manufacturing clusters appear to increasingly hinge on narrower segments of subsectors in comparison to the past.

2.3. SUMMARY AND IMPLICATIONS

There is strong growth potential in Region Nine and specifically within manufacturing, construction, and healthcare-related clusters. Yet, progress within the three stated clusters has been gradual and at times halted due to the inability to fill vacancies, promote workers, and retain talent. Additionally, firms are indicating that there is little synergy in some industry clusters with corresponding high operations costs, which puts them at a competitive disadvantage despite the proximity to major manufacturing hubs in the Twin Cities and other regional centers.

Developments in Region Nine are typical of economic development challenges outside the Twin Cities. Whereas the largest industry sectors are all relatively robust industry clusters, regional average earnings per job have stagnated somewhat over the past five years, with the 2018 regional figure at \$45,083. This was a 13% increase from 2010. The relatively slow increase corresponds with a slowdown in manufacturing jobs and an increase in service jobs, particularly in retail trade. Total employment increased by 7,348 jobs regionally between 2010 and 2018. The largest gains were in services with 5,268 jobs, manufacturing with 1,378 jobs, and construction with 1,221. During the same period, 800 farm jobs and 306 government jobs were lost.

IN 2018, THE THREE INDUSTRIES WITH THE LARGEST EARNINGS WERE:

Manufacturing (\$1,371.1 million)

Health Care and Social Assistance (\$983.3 million)

Retail Trade (\$408.6 million)

Manufacturing continues to represent the highest wages by industry at an average annual wage (in 2018 dollars) of \$52,904 per year, closely followed by construction at \$52,777. Service-related jobs averaged \$36,837 per year, which is 12.9% below the regional average. This remains a concern with respect to regional economic resiliency as these industries represent the fastest-growing segments of the economy. Investments to boost the manufacturing sector is therefore warranted as it presents opportunities for further job creation and higher paying jobs.

Previous studies (e.g., Investing in Manufacturing Partnerships, RNDC 2016-2018) indicated that there is great potential to increase productivity and export potential in manufacturing industries across the region, however, it is critical for organizations to invest in system capabilities to facilitate economies of scale. It appears as if this can best be done through sharing of existing resources or the development of shared knowledge sharing (such as managerial or staff training). This may be too costly for the individual firm, so it is critical for regional companies to utilize and maximize existing resources. Given the nature of these industries and the specific needs that exist, no other regional institutions other than the local institutions of higher education can deliver the type of technical expertise and develop the specific skills needed. However, such efforts would necessitate a multi-disciplinary approach to academic/business partnerships.

SECTION 3: THE ECONOMIC IMPACT OF DISRUPTIONS TO REGIONAL MANUFACTURING

Economic resilience in a regional context requires intergovernmental agility when anticipating risks, evaluating impacts on economic assets, and increasing responsive capacity. The Federal EDA recognizes that regional economic prosperity is linked to an area's ability to recover quickly from a shock, the ability to withstand a shock, and the ability to avoid the shock altogether. When considering economic resilience, it is important for local economic practitioners and organizations to consider their role in both preparations for potential economic disruptions and recovery from those disruptions. Local economic practitioners and organizations can assist with post-incident coordination, providing information, responding to external inquiries, and acting as the lead grant administrator for federally funded recovery initiatives.

The regional CEDS document and subsequent annual performance reports are critical mechanisms that identify regional vulnerabilities and mitigates or helps respond to economic disruptions. Woven throughout the 2022-2026 CEDS and the 2022 Annual Performance Report, are components of economic resilience. The goals and strategies construct a foundation for increased regional resilience and support any economic mitigation efforts for future natural or economic disasters. In addition, throughout the CEDS and annual performance report planning processes, RNDC established and continues to strengthen a network of cross-sector stakeholders that collaborate and communicate about existing and potential future challenges.



3.1 REGIONAL ECONOMIC DISTRESS

Region Nine's aggregate poverty rate was 11.4% at the end of 2022, for those whose poverty status is determined, which was higher than the statewide rate of 9.2% but less than the baseline year of 12%. Individuals between the ages of 18 to 34 years were more likely to be below the poverty level than all other age groups. Black/African Americans continue to have the highest percentage of poverty status for race and Hispanic or Latino origin, and individuals with less than high school graduate status, are twice as likely than those with a high school diploma to be in poverty.

The Bureau of Economic Analysis (BEA) per capita personal income for the region increased by nearly \$6,000 from \$49,808 to \$55,728. Similarly, the 2021 5-year American Community Survey (ACS) per capita money income regional figure is up \$2,000 from \$31,022. While still above the 80% threshold for measuring distress, the regional figures continue to be behind that of the United States by 9.7% and 13.7% respectively. Region Nine's unemployment rate is doing better than the national percentages when looking at the EDA economic distress criteria.

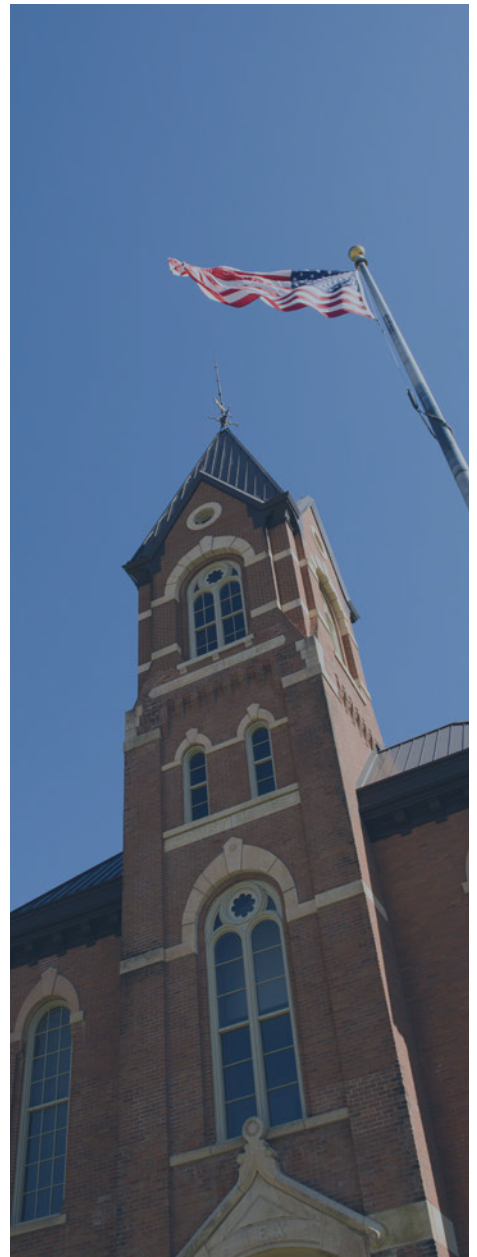
Examining the distress criteria at the county level, all have a threshold calculation below 100 for both per capita personal income (PCPI) and per capita money income (PCMI), with the exception of Nicollet County's PCMI figures. Waseca County is the only county that qualifies as economically distressed, based on PCPI being 21.4% below the national average, closely followed by Blue Earth County.

Interestingly, no distinct patterns exist between unemployment and PCPI or PCMI. Unemployment has continued to remain at least one or more percentage points below the national average when looking at the 24-month period for August 2022. The threshold to qualify as distressed is an unemployment rate that is at least 1% greater for the most recent 24-month period for which data is available. Per capita, money income fluctuates from census tract to census tract to a greater extent than between counties. The region has 15 census tracts with a PMCI above the national average of \$37,638 (Threshold = 100); 12 of these are in the counties of Blue Earth, Nicollet, or Le Sueur. An additional 18 census tracts are above the regional average of \$33,973 (Threshold = 90.3), but below the national average as indicated in Table 4.

Five tracts are below the regional average, yet above the federally designated cut-off that indicates economic distress and there remains 13 census tracts under the 80% threshold. Most of these are urban census tracts and relatively densely populated. Five of them are in Mankato, two in New Ulm, and one in each of the cities of Blue Earth, Fairmont, St. James, St. Peter, and Waseca. These are tracts that RNDC will continue to monitor closely as CEDS objectives are evaluated. Each of these are eligible for economic adjustment assistance from the EDA (at various rates) and may need particular emphasis as programming is developed by the organization or partners.

The distress metrics use average income earned per person in a geographic area whereas median household income is the income of the “middle” household; meaning the income where half of all homes in a particular area earn more than the other half. Household income is the combined adjusted gross income of everyone over 15 who lives together in a household.

The median household income for the region is \$62,450, again lower than the state figure. Le Sueur County has the highest median household income at \$80,425; whereas Faribault County had the lowest at \$53,156. Waseca County saw the greatest change over the time periods, gaining \$9,700 or 17%.



3.2 ECONOMIC OUTPUT DISRUPTIONS AND REGIONAL GDP

Economic regions are not closed economies and as a result, any examination of production, sales, employment, exports, and capital investments tend to underestimate the economic impact of economic disruptions, whether they are of a temporary or prolonged nature.

In the language of economic impact studies, the above-mentioned variables are considered direct impacts. However, economic impacts do not end with direct effects. Because the products of capital and labor from Region Nine are purchased primarily by consumers outside the region, the industry impact is significantly larger than the direct impact.

Dollars in a local or regional economy recirculate among vendors, employees, and households beyond its limits and these spinoffs and their impact on the regional economy must be examined if one were to understand the impact of disruptions to the status quo, growth cycles, or both. If done correctly, one may generate an aggregate estimate of the total economic impact of a regional economy's losses during times of economic shocks or disruptions.

One way to understand the impact of economic disruptions is to utilize custom input-output models to examine linkages between a region's industry and its proportional annual impact on the economy and then base impact scenarios on expected reductions in economic output. The Regional Input-Output Modeling System (RIMS-II) from the Bureau of Economic Analysis (BEA) is a tool used by investors, planners, and public servants to assess the potential economic impacts of projects, the benefits of investments, and the potential costs of economic disruptions. Data are based on a series of national input-output (I-O) accounts, which show the goods and services produced by each industry and the use of these goods and services by both industry and final users. Like most regional I-O models, RIMS-II adjusts these national relationships to account for regional supply conditions.

The idea behind the results of RIMS-II is that an initial change in one economic sector results in other rounds of spending. For example, building a new road will lead to increased production of asphalt and concrete. The increased production of these commodities will lead to more mining. Workers benefiting from these increases will presumably spend more on other goods, services, and housing. Examples include eating at regional restaurants, spending more on entertainment, engaging in home improvements, etc.

Conversely, one may use these models to examine how reduced spending in one or more economic sectors impact spending in other sectors and throughout the economy. For example, a disruption in the manufacturing sector in Region Nine will lead to layoffs and lower industry earnings. Workers being laid off will presumably spend less on other goods, services, and housing as their disposable income has been reduced.

RIMS-II multipliers are frequently applied to include government/infrastructure, economic development/business investment, and private industry/for-profit growth. Some common examples include local impacts of government investment in specific industries and assessment of transportation and infrastructural projects. RNDC has previously used RIMS-II to assess the economic impact upon flooded highways in and out of Henderson (Sibley County) on behalf of the



Minnesota Department of Transportation, and the assessment of other infrastructure and human capital investments throughout the state.

For the purposes of this study, RIMS-II multipliers for Region Nine are deployed through the lens of economic development as it applies to the regional economy. Three assumptions are made to make sense of the data:

- **manufacturing as a driver of the regional economy is representative of future developments**
- **the economic impact is not geographically limited to Region Nine**
- **economic disruptions impact sectors unequally yet are assumed to impact any clusters over time**

Finally, the study utilizes what is referred to as Type II indicators, which include household spending, and is limited to manufacturing industries and their impacts on the overall economy.

Economic modeling is never perfect, yet the assumptions made for this study are not “one-sided”. The region has experienced severe economic shocks on an almost annual basis since the 2009 economic recovery began yet has managed to grow its output. The second assumption does not place boundaries upon the study, which allows us to analyze the impact upon not only residents and businesses within the regional limits, but also our neighboring economies and trading partners. The third and final assumption is a qualitative assessment that recognizes uneven geographic and sectoral developments upon industrial output and its impacts upon the region's economy (and its trading partners). This allows for simple reproduction of results if different assumptions of output reduction were to be made.



3.3 ECONOMIC OUTPUT

The Bureau of Economic Analysis considers regional value-added outputs to be a surrogate for increased gross domestic product (GDP) in the geographic area for which they are provided. Larger value-added multipliers correlate with greater increases in regional GDP. Because increases in GDP are widely viewed as favorable indicators for robust economic health and stable growth, we, therefore, performed our first analysis on the highest-ranking value-added industries related to all industries in Region Nine.

The final-demand output represents the total dollar change in output that occurs in all industries for each additional dollar of output delivered to final demand by the corresponding industry. As an example, a dollar input in the cheese manufacturing industry is expected to yield approximately \$2.90 in final-demand output. Among the top ten manufacturing industries ranked by final-demand output, all offer a 100 percent or greater increase in regional GDP. In other words, for every dollar invested in these top twenty industries, total GDP in Region Nine increases by \$2.00 or more. It is noteworthy that all of these are in the food and beverage manufacturing category.

Table 1: *Final Output Multipliers, top 10 regional industries by output, ranked by greatest earnings impact to lowest.*

| Industry | Final-demand Output /1/ (dollars) |
|---|-----------------------------------|
| Cheese manufacturing | 2.8979 |
| Poultry processing | 2.832 |
| Animal (except poultry) slaughtering, rendering, and processing | 2.779 |
| Soybean and other oilseed processing | 2.4337 |
| Fluid milk and butter manufacturing | 2.415 |
| Other animal food manufacturing | 2.3752 |
| Dry, condensed, and evaporated dairy product manufacturing | 2.2768 |
| Flour milling and malt manufacturing | 2.2134 |
| Frozen food manufacturing | 2.2028 |
| Breakfast cereal manufacturing | 2.0737 |

Forecasts for changes in GDP include downstream impacts on other industries and calculate an overall impact based on dollar-value input. Scenarios in which these final-demand multipliers are applied offer an estimate of the total impact across all industries in the region. The multipliers are unable to forecast the degree to which investments in one industry will affect microeconomic changes in other related industries; rather, the multiplier offers a macro perspective for the entire region. Output is the sum of intermediate and downstream change, in addition to taxes on production and imports of gross operating surplus.

Table 2. Final Earnings Multipliers, industry aggregations, and the top 10 regional manufacturing industries ranked by greatest earnings impact to lowest.

| Industry | Final- demand Earnings /2/ (dollars) |
|---|--|
| Industrial process variable instruments manufacturing | 0.6375 |
| Apparel manufacturing | 0.5672 |
| Other communications equipment manufacturing | 0.5555 |
| Special tool, die, jig, and fixture manufacturing | 0.5492 |
| Other electronic component manufacturing | 0.528 |
| Dental laboratories | 0.5246 |
| Cheese manufacturing | 0.5213 |
| Optical instrument and lens manufacturing | 0.512 |
| Animal (except poultry) slaughtering, rendering, and processing | 0.5102 |
| Poultry processing | 0.5052 |

As Table 2 shows, there is more diversity across industries when it comes to final earnings multipliers. Of the top ten industries ranked by earnings, only three of the food and beverage manufacturing industries remain in the top ten. High output, yet low earnings multipliers is typically an indication that industries produce with labor-intensive production systems with downward pressure on wages that suppresses growth in earnings over time. Labor-intensive production generates more jobs per one million dollars invested, which catches up with earnings as break-even points are reached, i.e., systems operate with a high degree of operating leverage. This can be confirmed by an analysis of job creation per million dollars invested as performed below.

The below figures represent the total change in the number of jobs that occurs in all industries for each additional 1 million dollars of output delivered to final demand by the industry corresponding to the entry.



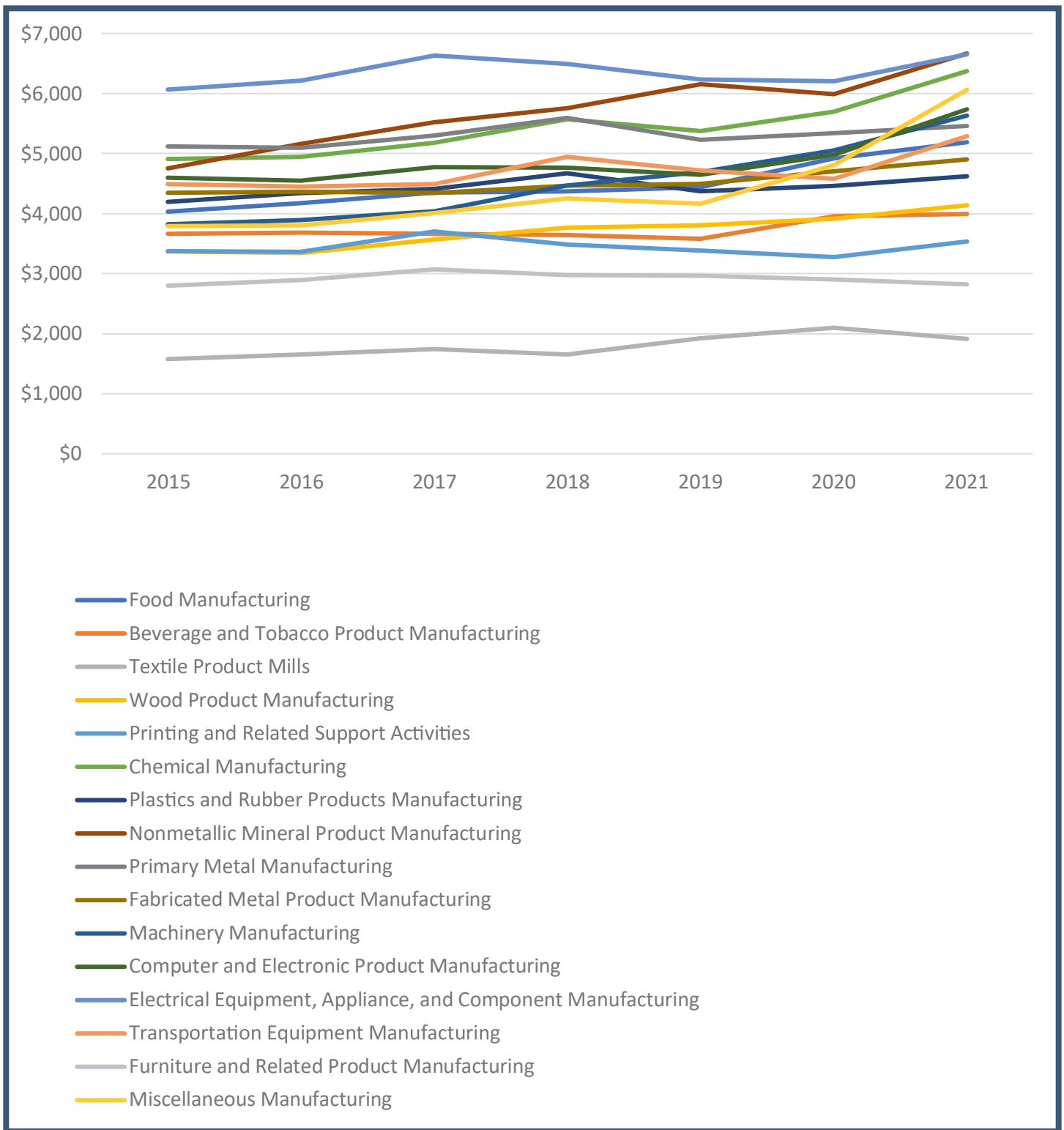
Table 3. Final Employment Multipliers, top 10 regional manufacturing industries by greatest employment impact to lowest.

| Industry | Final- demand Employment /3/ (number of jobs) |
|---|---|
| Apparel manufacturing | 24.677 |
| Animal (except poultry) slaughtering, rendering, and processing | 15.135 |
| Dental laboratories | 14.1217 |
| Poultry processing | 13.3096 |
| Cheese manufacturing | 13.0251 |
| Soybean and other oilseed processing | 11.9801 |
| Wood kitchen cabinet and countertop manufacturing | 11.0269 |
| Fluid milk and butter manufacturing | 10.9852 |
| Flour milling and malt manufacturing | 10.9802 |
| Other animal food manufacturing | 10.5522 |

As the Table 3 figures indicate, these industries create more than ten jobs per million dollars invested, i.e., they have a significant impact on job creation. This could also mean that a) these are labor-intensive industries and/or b) wages are generally low in these industries relative to other clusters. Figure 1 below illustrates the discrepancies between the various industry sectors in the region when it comes to monthly average wages – a common indicator of the labor-intensive nature of the work. High wages are typically associated with higher capital investments, although inter and intra-industry differences exist.



Figure 9. Average Monthly Wages by NAICS 3-digit Subsectors. Region Nine 2015-2021.



A 10% decline in output across the manufacturing clusters in Region Nine would vary based on the size of the industry and local market conditions. However, a useful assessment would be to assess the relative impact on the regional economy from a ten percent decline in overall industry output per \$1 million. Not surprisingly, the top ten industries are all food manufacturing subsectors as illustrated in Table 4 on the next page.

Table 4. Regional Economic Impact from 10% decline in Industry Output per \$1m by industry sector.

| Industry Sector | Regional Impact from 10% Decline in Industry Output per \$1m |
|---|--|
| Cheese manufacturing | -\$2,897,900 |
| Poultry processing | -\$2,832,000 |
| Animal (except poultry) slaughtering, rendering, and processing | -\$2,779,000 |
| Soybean and other oilseed processing | -\$2,433,700 |
| Fluid milk and butter manufacturing | -\$2,415,000 |
| Other animal food manufacturing | -\$2,375,200 |
| Dry, condensed, and evaporated dairy product manufacturing | -\$2,276,800 |
| Flour milling and malt manufacturing | -\$2,213,400 |
| Frozen food manufacturing | -\$2,202,800 |
| Breakfast cereal manufacturing | -\$2,073,700 |

As an example, these figures suggest that a 10% decline in cheese manufacturing leads to an aggregate decline in industrial output of nearly \$2.9 million per million dollars produced.

Table 5 shows the regional impact from a 10% decline in industrial output per one million dollars of output. As the table indicates, only three of the food manufacturing segments from Table 4 remain when it comes to earnings, suggesting that other subsectors of manufacturing have higher earnings potential than food clusters. Each of these would represent regional losses of more than half a million dollars per million dollars in output with a ten percent decline in production.



Table 5. Regional Economic Impact from 10% decline in Industry Output per \$1m by industry sector.

| Industry Sector | Regional Impact from 10% decline in Industry Output per \$1m |
|---|--|
| Industrial process variable instruments manufacturing | -\$637,500 |
| Apparel manufacturing | -\$567,200 |
| Other communications equipment manufacturing | -\$555,500 |
| Special tool, die, jig, and fixture manufacturing | -\$549,200 |
| Other electronic component manufacturing | -\$528,000 |
| Dental laboratories | -\$524,600 |
| Cheese manufacturing | -\$521,300 |
| Optical instrument and lens manufacturing | -\$512,000 |
| Animal (except poultry) slaughtering, rendering, and processing | -\$510,200 |
| Poultry processing | -\$505,200 |

Employment is more aligned with the figures represented in Figure 9.

Table 6. Regional Economic Impact from 10% decline in Industry Output per \$1m by industry sector.

| Industry Sector | Regional Impact from 10% decline in Industry Output per \$1m |
|---|--|
| Apparel manufacturing | -25 |
| Animal (except poultry) slaughtering, rendering, and processing | -15 |
| Dental laboratories | -14 |
| Poultry processing | -13 |
| Cheese manufacturing | -13 |
| Soybean and other oilseed processing | -12 |
| Wood kitchen cabinet and countertop manufacturing | -11 |
| Fluid milk and butter manufacturing | -11 |
| Flour milling and malt manufacturing | -11 |
| Other animal food manufacturing | -11 |

Not surprisingly, apparel manufacturing would lose more jobs per million dollars from a ten percent decline in industrial output, followed by animal slaughtering, rendering, and processing as these are labor-intensive industries.

3.4 REGIONAL ECONOMIC IMPACT

There are multiple ways to perform an aggregate impact analysis, but for the sake of this report, the top 10 industry sectors by output were utilized. The impact may be overestimated due to the relatively high multipliers from an output standpoint, yet as the figures in section 1.3. revealed, high-output sectors do not necessarily have high earnings, so the latter may be underestimated choosing output as the criteria for inclusion in the sample. The critical element is to provide ballpark estimates of what a ten percent decline in output would mean for the regional economy and not to be prescriptive on any one industry's importance over another.

One method to measure economic impact for a finite population, such as Region Nine, is to utilize GDP per capita x population as a starting point. Accordingly, this report utilizes data from StatsAmerica's Regionalizer data tool (<http://www.statsamerica.org/reg/default.aspx>), which is the preferred data source for economic development work for projects funded by the Federal EDA.

Industrial Output Value

Region Nine's aggregate GDP = GDP/Capita x Total Population = \$55,728 x 233,477 = \$13,011,206,256

With estimates for the region's GDP, it is now possible to derive estimates for lost economic value as measured by lost economic output, revenues, and employment.

This would be estimated by the product of the average multipliers and the region's estimated GDP times 10%.

Estimated GDP x Average multipliers x 10% = \$13,011,206,256 x 2.45 x .1 = \$3,187,745,532

Hence, with a 10% reduced industrial output in the top ten sectors of the manufacturing clusters, the region loses over \$3.1 billion annually.

Industry Earnings

Reduction in total industry earnings as a result of a 10% reduction in economic output due to a disruption would be estimated by the product of the average multipliers and the region's estimated GDP. Accordingly;

Estimated GDP x Average multipliers x 10% = \$13,011,206,256 x 0.54 x .10 = \$702,605,137

Hence, a ten percent reduction in output leads to an expected decline in the region's earnings by \$702.6 million annually.

Industry Employment

Reductions in employment would be estimated by the product of the average multipliers per \$1 million and the region's estimated GDP. Accordingly;

(Estimated GDP/1,000,000) x Average multipliers = (\$13,011,206,256 /1,000,000) x 13.58 = 176,692 jobs

Hence, an industrial reduction in output of 10% in the top 20 industries reduces investments throughout the region which reduces labor demand by 176,692 positions, regionally and elsewhere (i.e., neighboring economies and trading partners).

RIMS-II Multipliers Utilized

| | | Final-demand Output /1/ (dollars) | Final- demand Earnings /2/ (dollars) | Final- demand Employment /3/ (number of jobs) | Final- demand Value- added /4/ (dollars) | Direct- effect Earnings /5/ (dollars) | Direct- effect Employment /6/ (number of jobs) |
|--------|--|---|--|---|--|---|--|
| 311513 | Cheese manufacturing | 2.8979 | 0.5213 | 13.0251 | 0.7095 | 3.6417 | 5.5789 |
| 311615 | Poultry processing | 2.832 | 0.5052 | 13.3096 | 0.7479 | 3.5291 | 4.1411 |
| 31161A | Animal (except poultry) slaughtering, rendering, and processing | 2.779 | 0.5102 | 15.135 | 0.8321 | 3.5637 | 5.1961 |
| 311224 | Soybean and other oilseed processing | 2.4337 | 0.4625 | 11.9801 | 0.6779 | 3.2309 | 6.5343 |
| 31151A | Fluid milk and butter manufacturing | 2.415 | 0.4384 | 10.9852 | 0.6836 | 3.0625 | 4.9916 |
| 311119 | Other animal food manufacturing | 2.3752 | 0.438 | 10.5522 | 0.6261 | 3.0594 | 4.6056 |
| 311514 | Dry, condensed, and evaporated dairy product manufacturing | 2.2768 | 0.4075 | 9.8826 | 0.6553 | 2.8464 | 3.9478 |
| 311210 | Flour milling and malt manufacturing | 2.2134 | 0.4243 | 10.9802 | 0.6997 | 2.9642 | 6.185 |
| 311410 | Frozen food manufacturing | 2.2028 | 0.3994 | 9.8643 | 0.6992 | 2.7903 | 3.5568 |
| 311230 | Breakfast cereal manufacturing | 2.0737 | 0.3692 | 7.3032 | 0.6723 | 2.579 | 3.9401 |
| 311111 | Dog and cat food manufacturing | 2.0276 | 0.3582 | 7.9684 | 0.651 | 2.5022 | 3.4608 |
| 311990 | All other food manufacturing | 1.8334 | 0.3357 | 8.0148 | 0.5713 | 2.3449 | 2.7498 |
| 311810 | Bread and bakery product manufacturing | 1.7802 | 0.4185 | 10.4456 | 0.6877 | 1.7804 | 1.7507 |
| 311420 | Fruit and vegetable canning, pickling, and drying | 1.7604 | 0.308 | 6.3649 | 0.5578 | 2.1513 | 2.3672 |
| 311300 | Sugar and confectionery product manufacturing | 1.7474 | 0.3101 | 6.4058 | 0.5418 | 2.1662 | 2.3313 |
| 311940 | Seasoning and dressing manufacturing | 1.7131 | 0.3069 | 6.4439 | 0.5403 | 2.1438 | 2.7114 |
| 312120 | Breweries | 1.6419 | 0.287 | 7.939 | 0.6865 | 2.0048 | 1.8165 |
| 336500 | Railroad rolling stock manufacturing | 1.628 | 0.2835 | 4.7335 | 0.5284 | 2.0306 | 2.3975 |
| 325120 | Industrial gas manufacturing | 1.5813 | 0.418 | 5.9077 | 0.7532 | 1.4992 | 1.9034 |
| 325190 | Other basic organic chemical manufacturing | 1.5786 | 0.2805 | 5.2362 | 0.474 | 1.9593 | 3.2404 |
| 327320 | Ready-mix concrete manufacturing | 1.5641 | 0.3325 | 7.0076 | 0.6291 | 1.7338 | 1.7342 |
| 3363A0 | Motor vehicle steering, suspension component (except spring), and | 1.5453 | 0.2825 | 5.369 | 0.5147 | 1.9763 | 2.0828 |
| 326290 | Other rubber product manufacturing | 1.5208 | 0.2667 | 4.9148 | 0.5532 | 1.8631 | 2.0166 |
| 331314 | Secondary smelting and alloying of aluminum | 1.5168 | 0.2739 | 4.9227 | 0.3962 | 1.9623 | 2.1018 |
| 327999 | Miscellaneous nonmetallic mineral products | 1.5053 | 0.2694 | 6.1551 | 0.7548 | 1.8139 | 1.7015 |
| 332710 | Machine shops | 1.5003 | 0.4811 | 9.1612 | 0.7676 | 1.4184 | 1.5213 |
| 327390 | Other concrete product manufacturing | 1.4991 | 0.3558 | 8.2005 | 0.6878 | 1.5923 | 1.5294 |
| 337110 | Wood kitchen cabinet and countertop manufacturing | 1.4944 | 0.4607 | 11.0269 | 0.6932 | 1.4133 | 1.3876 |
| 333314 | Optical instrument and lens manufacturing | 1.4921 | 0.512 | 10.1912 | 0.7571 | 1.3882 | 1.4484 |
| 335314 | Relay and industrial control manufacturing | 1.4852 | 0.4271 | 6.9883 | 0.7101 | 1.4599 | 1.7029 |
| 336211 | Motor vehicle body manufacturing | 1.4848 | 0.3312 | 6.3893 | 0.5099 | 1.6081 | 1.6792 |
| 334513 | Industrial process variable instruments manufacturing | 1.482 | 0.6375 | 10.2142 | 0.9149 | 1.2982 | 1.4822 |
| 336214 | Travel trailer and camper manufacturing | 1.4809 | 0.2528 | 5.2192 | 0.4479 | 1.8109 | 1.7836 |
| 33329A | Other industrial machinery manufacturing | 1.4795 | 0.3024 | 5.0499 | 0.6486 | 1.7341 | 2.021 |
| 335999 | All other miscellaneous electrical equipment and component manufacturing | 1.4791 | 0.3253 | 5.6417 | 0.6398 | 1.7419 | 1.976 |
| 333514 | Special tool, die, jig, and fixture manufacturing | 1.4764 | 0.5492 | 9.963 | 0.8244 | 1.3465 | 1.459 |
| 33441A | Other electronic component manufacturing | 1.4757 | 0.528 | 9.4333 | 0.8035 | 1.3706 | 1.4891 |
| 336390 | Other motor vehicle parts manufacturing | 1.4726 | 0.2623 | 4.816 | 0.4649 | 1.8789 | 2.0683 |
| 327100 | Clay product and refractory manufacturing | 1.4713 | 0.3492 | 8.835 | 0.7195 | 1.5578 | 1.4212 |
| 312130 | Wineries | 1.4713 | 0.2651 | 10.0584 | 0.584 | 1.8515 | 1.337 |
| 334290 | Other communications equipment manufacturing | 1.4693 | 0.5555 | 8.0183 | 0.8741 | 1.3417 | 1.6227 |
| 339950 | Sign manufacturing | 1.4681 | 0.394 | 8.4207 | 0.6415 | 1.456 | 1.4578 |
| 311920 | Coffee and tea manufacturing | 1.4652 | 0.262 | 5.0639 | 0.4353 | 1.8305 | 2.0325 |
| 333993 | Packaging machinery manufacturing | 1.4648 | 0.3411 | 5.5947 | 0.6821 | 1.6035 | 1.8531 |
| 323110 | Printing | 1.4648 | 0.3714 | 8.0598 | 0.6953 | 1.5113 | 1.5653 |
| 333912 | Air and gas compressor manufacturing | 1.4552 | 0.2529 | 4.2916 | 0.6113 | 1.8118 | 2.0984 |
| 339920 | Sporting and athletic goods manufacturing | 1.4495 | 0.2847 | 6.0501 | 0.6153 | 1.6911 | 1.6716 |
| 327200 | Glass and glass product manufacturing | 1.448 | 0.3031 | 7.0433 | 0.6689 | 1.6199 | 1.5091 |
| 321200 | Veneer, plywood, and engineered wood product manufacturing | 1.4455 | 0.2767 | 5.5205 | 0.5422 | 1.6988 | 1.7756 |
| 331520 | Nonferrous metal foundries | 1.4455 | 0.3242 | 6.3972 | 0.6219 | 1.5832 | 1.6531 |
| 327330 | Concrete pipe, brick, and block manufacturing | 1.4427 | 0.2926 | 6.5243 | 0.6635 | 1.6702 | 1.6334 |
| 326190 | Other plastics product manufacturing | 1.4391 | 0.2587 | 4.9748 | 0.553 | 1.7234 | 1.8101 |
| 326150 | Urethane and other foam product (except polystyrene) manufacturing | 1.4343 | 0.2471 | 4.5548 | 0.4868 | 1.726 | 1.8414 |
| 331510 | Ferrous metal foundries | 1.4333 | 0.3195 | 6.0094 | 0.6871 | 1.5648 | 1.659 |
| 321910 | Millwork | 1.4309 | 0.3002 | 6.1659 | 0.5629 | 1.6028 | 1.6436 |
| 334418 | Printed circuit assembly (electronic assembly) manufacturing | 1.4297 | 0.3322 | 6.4977 | 0.6929 | 1.6327 | 1.6413 |
| 333517 | Machine tool manufacturing | 1.4278 | 0.3332 | 5.7438 | 0.5959 | 1.5481 | 1.7441 |
| 332320 | Ornamental and architectural metal products manufacturing | 1.4247 | 0.3579 | 6.9147 | 0.6194 | 1.5003 | 1.5885 |

| | | Final-demand Output /1/ (dollars) | Final- demand Earnings /2/ (dollars) | Final- demand Employment /3/ (number of jobs) | Final- demand Value- added /4/ (dollars) | Direct- effect Earnings /5/ (dollars) | Direct- effect Employment /6/ (number of jobs) |
|--------|---|---|--|---|--|---|--|
| 339940 | Office supplies (except paper) manufacturing | 1.4218 | 0.2601 | 7.4192 | 0.5803 | 1.693 | 1.4224 |
| 326110 | Plastics packaging materials and unlaminated film and sheet ma | 1.4211 | 0.2428 | 4.3822 | 0.4786 | 1.6958 | 1.8525 |
| 339990 | All other miscellaneous manufacturing | 1.4194 | 0.3179 | 7.3323 | 0.668 | 1.5785 | 1.5272 |
| 315000 | Apparel manufacturing | 1.417 | 0.5672 | 24.677 | 0.8199 | 1.2818 | 1.1348 |
| 339116 | Dental laboratories | 1.4118 | 0.5246 | 14.1217 | 0.8027 | 1.3055 | 1.2524 |
| 3219A0 | All other wood product manufacturing | 1.4117 | 0.2875 | 6.2793 | 0.5616 | 1.6172 | 1.5888 |
| 314900 | Other textile product mills | 1.4113 | 0.3551 | 9.567 | 0.6017 | 1.4729 | 1.4563 |
| 323120 | Support activities for printing | 1.4098 | 0.4583 | 9.2676 | 0.8402 | 1.3543 | 1.4281 |
| 321100 | Sawmills and wood preservation | 1.4091 | 0.2566 | 5.3566 | 0.5015 | 1.7744 | 1.8522 |
| 333111 | Farm machinery and equipment manufacturing | 1.408 | 0.246 | 4.7185 | 0.4956 | 1.762 | 1.8565 |
| 333318 | Other commercial and service industry machinery manufacturin | 1.4019 | 0.292 | 4.8234 | 0.6299 | 1.5862 | 1.8457 |
| 332430 | Metal can, box, and other metal container (light gauge) manufac | 1.399 | 0.2322 | 4.2753 | 0.4455 | 1.6633 | 1.7791 |
| 312110 | Soft drink and ice manufacturing | 1.3987 | 0.2423 | 4.5332 | 0.4333 | 1.6927 | 1.8639 |
| 325620 | Toilet preparation manufacturing | 1.3954 | 0.2454 | 4.1247 | 0.7092 | 1.7144 | 2.0951 |
| 332310 | Plate work and fabricated structural product manufacturing | 1.3935 | 0.3098 | 5.823 | 0.5498 | 1.5324 | 1.6589 |
| 33399A | Other general purpose machinery manufacturing | 1.39 | 0.2627 | 4.44 | 0.5823 | 1.6305 | 1.8657 |
| 336612 | Boat building | 1.3873 | 0.2986 | 6.8435 | 0.5215 | 1.5672 | 1.5023 |
| 3259A0 | All other chemical product and preparation manufacturing | 1.3863 | 0.2404 | 3.8002 | 0.515 | 1.6795 | 2.0303 |
| 333415 | Air conditioning, refrigeration, and warm air heating equipment | 1.3778 | 0.2366 | 4.0975 | 0.5805 | 1.6799 | 1.8383 |
| 333120 | Construction machinery manufacturing | 1.3758 | 0.24 | 4.1504 | 0.5696 | 1.7189 | 1.9726 |
| 335312 | Motor and generator manufacturing | 1.3758 | 0.2843 | 4.6018 | 0.6099 | 1.5273 | 1.7842 |
| 332200 | Cutlery and handtool manufacturing | 1.3693 | 0.36 | 6.5919 | 0.7014 | 1.4008 | 1.523 |
| 332999 | Other fabricated metal manufacturing | 1.362 | 0.3181 | 6.3914 | 0.5958 | 1.4554 | 1.5045 |
| 325411 | Medicinal and botanical manufacturing | 1.3614 | 0.2655 | 4.1664 | 0.7087 | 1.5548 | 1.8669 |
| 333920 | Material handling equipment manufacturing | 1.3552 | 0.2344 | 4.1819 | 0.5337 | 1.6793 | 1.847 |
| 332119 | Metal crown, closure, and other metal stamping (except automot | 1.3545 | 0.2939 | 5.7241 | 0.5524 | 1.4852 | 1.558 |
| 333612 | Speed changer, industrial high-speed drive, and gear manufactur | 1.3538 | 0.2648 | 5.118 | 0.624 | 1.5808 | 1.6491 |
| 332800 | Coating, engraving, heat treating and allied activities | 1.3517 | 0.3117 | 6.7655 | 0.6362 | 1.4512 | 1.4501 |
| 335930 | Wiring device manufacturing | 1.3517 | 0.2761 | 5.0303 | 0.6866 | 1.5186 | 1.6491 |
| 326120 | Plastics pipe, pipe fitting, and unlaminated profile shape manufa | 1.3406 | 0.2525 | 4.3229 | 0.5236 | 1.5102 | 1.6885 |
| 313200 | Fabric mills | 1.3394 | 0.2503 | 6.8149 | 0.5094 | 1.5518 | 1.4272 |
| 333112 | Lawn and garden equipment manufacturing | 1.3378 | 0.2273 | 4.4754 | 0.4019 | 1.6284 | 1.6588 |
| 332720 | Turned product and screw, nut, and bolt manufacturing | 1.3375 | 0.2313 | 4.2456 | 0.5896 | 1.6566 | 1.8068 |
| 335311 | Power, distribution, and specialty transformer manufacturing | 1.3363 | 0.3103 | 6.6868 | 0.6045 | 1.4196 | 1.4217 |
| 335920 | Communication and energy wire and cable manufacturing | 1.3343 | 0.2237 | 3.8733 | 0.4721 | 1.6022 | 1.7917 |
| 325412 | Pharmaceutical preparation manufacturing | 1.3288 | 0.2583 | 3.3654 | 0.763 | 1.5053 | 2.1273 |
| 322210 | Paperboard container manufacturing | 1.3264 | 0.2468 | 4.314 | 0.4238 | 1.5687 | 1.7858 |
| 334220 | Broadcast and wireless communications equipment | 1.3241 | 0.3053 | 4.783 | 0.823 | 1.4359 | 1.6567 |
| 332420 | Metal tank (heavy gauge) manufacturing | 1.3192 | 0.263 | 4.5565 | 0.5309 | 1.5027 | 1.6967 |
| 331200 | Steel product manufacturing from purchased steel | 1.2946 | 0.2194 | 4.2301 | 0.4401 | 1.5718 | 1.6439 |
| 325413 | In-vitro diagnostic substance manufacturing | 1.2918 | 0.2541 | 3.4349 | 0.7093 | 1.4746 | 1.966 |

SECTION 4: IDENTIFIED REGIONAL CHALLENGES

Stakeholder outreach consisted of 35 interviews with small (less than 15 employees), medium (15-50 employees), and large (more than 50 employees) manufacturers from the nine counties. Approximately 100 of the manufacturers contacted participated in these interviews which ranged from 15 to 90 minutes. Interviews took place in the spring and summer of 2021, with follow-up surveys in 2022. Additionally, a number of site visits took place with additional manufacturers through February 2023. Most of these visits were done to gain additional perspectives from sectors not covered by the initial interviews, or to gain information from areas of the region that had not been covered.

RNDC also participated in several community, chamber, and local EDA discussions throughout the grant period to gain further perspectives on challenges and opportunities faced by the manufacturing industry, and to better understand the community and economic development efforts that are underway to attract and retain a resilient workforce. These events also provided an opportunity to present initial findings, connect with local and regional stakeholders that support manufacturing firms, and to solicit feedback on the planning work.

This section of the plan summarizes the key findings from the qualitative input provided by the respondents and other stakeholders that engaged with RNDC throughout the process. The analysis of this data has been focused on identifying key themes throughout the process. Once these overarching themes were narrowed down, the findings were summarized through a Strengths (internal), Weaknesses (internal), Opportunities (external), and Threats (external) framework (SWOT) to identify key dimensions of where the industry sees itself as it positions itself for future success. It is important to recognize that this is an aggregate assessment and not unique or specific to individual manufacturers or communities. What may be true for one firm may not hold true for another, yet the plan seeks to capture shared experiences amongst the majority of manufacturers in the region.



4.1 REGIONAL CHALLENGES AND POSSIBILITIES IDENTIFIED THROUGH INTERVIEWS

GENERAL THEMES

Respondents overwhelmingly emphasized the need for small and mid-sized regional manufacturers to become more globally competitive, adopt lean and agile processes, strategically grow their companies, and invest more effectively in their existing human capital. General themes that emerged have been identified below. Many of these themes overlap with one another with respect to some dimensions.

Upskilling the existing workforce:

There is an apparent need for intentional and targeted educational programming opportunities for youth, underemployed, and marginalized workers. Respondents indicated that integrated skill development opportunities and project-based learning opportunities could narrow current and emerging skills gaps. These could include academic/industry co-facilitated educational training programs, externships, internships, and joint reskilling opportunities. It also entails broader partnerships with Minnesota State system units, K-12 programs, and state-funded Centers of Excellence (e.g., engineering, agriculture, etc.).

Diversity & Equity Programming:

Respondents emphasized the need for programming that engages traditionally underserved populations in manufacturing, e.g., women, veterans, and people of color. This includes interfacing with diverse community stakeholders, leading efforts to explore opportunities for reskilling, and coordinating opportunities for diversity training with community partners.

Co-manufacturing and Shared Learning:

Develop localized opportunities for collaborations and (re)use of existing facilities and redevelopment of underutilized assets for the purpose of advancing technological solutions and cost saving as pathways to manufacturing success, particularly for small and medium-sized manufacturers. This includes opportunities for shared learning/training (e.g., LEAN, robotics, and automation) at underutilized facilities in local communities, and the support of reinvestments in community assets in partnerships with municipalities and counties.

Closer Collaborations with Academia:

Establish technology diffusion pathways for academic/industry partnerships through applied teaching and research projects, including the implementation of training opportunities for educational and industry staff and management, and college students. In addition, respondents emphasized the need to develop industry/academic work groups to foster human capital and training collaboration among industry partners. This includes providing on-site research expertise, providing training modules in partnership with industry, and engaging academia in applied projects with industry partners.

Expanding Mankato (MSA) Resources to Smaller Communities:

Expand the regional footprints of creative business development opportunities that could help support operation capabilities and growth. This theme emerged from respondents in rural areas expressing concerns that resources in the MSA (Mankato/North Mankato) are not as readily available to regional partners. This would include connecting industry partners and especially manufacturing entrepreneurs with appropriate academic and technical assistance providers/partners, such as the Small Business Development Center (MSUM), Center for Strategic Partnership, MSUM, South Central College, and organizations that can provide financial assistance.

4.2 PERCEIVED STRENGTHS AND OPPORTUNITIES

Human capital and knowledge creation have historically been a strength for the region, although manufacturers express increasing concerns regarding the supply of labor. Region Nine scores well on measures of collective cognitive capacity and know-how to engage in innovative activities, including educational attainment, patent/technology diffusion, university-based knowledge spillovers, incubator knowledge spillovers, STEM education, and other measures tied to knowledge creation. Yet, with stagnant population growth, the region is at risk of experiencing major challenges as it pertains to labor shortages.

Regional firms often produce a variety of products and services. Many firms consider themselves commodities producers, which happen to sell some of their products to specialized companies in a certain segment of a particular industry. Others are co-manufacturers that produce across related industries such as agriculture, consumer products, and electronics. Although some regional specialization exists, particularly with respect to medical devices and more specialized service providers, most derive significant revenue from other industries and segments of the economy. This form of firm-level **diversification** diminishes their sensitivity to demand fluctuations within a particular industry and a few clusters in Region Nine are therefore vulnerable to boom and bust fluctuations.

Many regional manufacturers have been in existence for several decades and have acquired technology over time, which allows them to adapt to purchase orders without incurring significant capital investments. Some of the plants have developed or acquired technology to easily accommodate **flexible production schedules**, which allows the region's manufacturing industry to remain relevant and competitive during volatile economic times.

Interviews for this plan indicate that supporting industries operating in the key **traded clusters** in the state, such as the globally competitive Medical Device Manufacturing industry (e.g., plastics, electronics, design, engineering, packaging, and laboratory services) remains a competitive opportunity for many regional manufacturers. There are multiple opportunities for manufacturers to **consolidate operations** and take advantage of cost savings as they align with these clusters. As industries grow and technology evolves, the demand for consolidation, or at least **cooperation**, appears to become more pressing, yet presents opportunities to scale operations regionally.

There are localized (and regional) opportunities for the **sharing of production costs** and possibly managing labor issues if firms collaborate to a greater extent than they do today. As many of the regional firms produce products of a similar nature, there are opportunities to purchase collectively to reduce costs. This would not only reduce production costs, but possibly also inbound logistics costs. Similarly, pooled outbound logistics to the Twin Cities would contribute to the **lean** trend that is becoming the norm within the industry. Many regional producers have unique opportunities to provide just-in-time inventory to larger statewide hubs (e.g., Twin Cities, Rochester) due to their geographic proximity to major producers and their plants.

Respondents also recognized opportunities to develop adaptive and dynamic production systems between the natural environment and manufacturing operations. From a technical standpoint, this includes the development of systems that approach the creation and distribution of inputs, eliminates toxic substances, and produces zero waste. As these byproducts increase the costs of production and are harmful to the environment, the use of **sustainable manufacturing practices** presents opportunities for enhancing economic resiliency in the region.



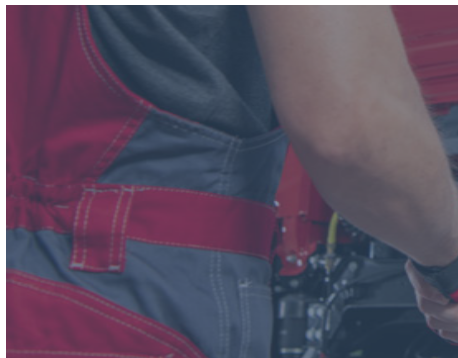
PERCEIVED WEAKNESSES AND THREATS

Few regional manufacturing plants are producing at a scale that compares to global competitors. Their business strengths in product diversity simultaneously diminish their attractiveness to larger companies seeking co-manufacturers as niche partners due to **low-scale production**. In other words, most regional firms cannot achieve the economies of scale necessary to meet preferred supplier status among larger players in their industry. While some of the producers can produce at a higher rate, and thereby reduce the average unit price, many firms **lack the required capital** to significantly increase production and reduce the time from design to production. Others face geographic limitations when it comes to expansion. For example, some plants are in **older industrial parks** and are unable to expand.

There are few indications that producers of similar products in Region Nine utilize pooled logistics channels, which is common in other geographic industry clusters. This significantly increases **procurement costs**, which again puts them at a disadvantage in their respective industries. Similarly, there is no indication that producers outside the Twin Cities pool together to create leveraged purchasing power. Whereas competitors often collaborate to keep **logistics and materials costs** down, there is little indication that this is the norm in Region Nine.

Unlike global trends that indicate that producers increasingly collaborate to meet the demand of buyers, few instances of such arrangements appear to be common in the region and Minnesota outside of the Twin Cities. This lack of interconnectedness generates **low industry synergy**, which is viewed as critical in industries where collaboration and lean manufacturing has become the norm.

Regional businesses and manufacturers also report having **limited access to capital**. Local, regional, and national banks meet the basic funding needs of most locally-owned businesses. However, this project was unable to identify any **venture capital funding** or **collaborative funding sources** specifically for innovative regional manufacturing products and services. In the Twin Cities metro area, dozens of venture capital firms exist primarily to fund product innovation across manufacturing clusters.



Global competition has increased dramatically over the last decade. Off-shoring of production has contributed to lower margins in some sectors, and regional sourcing is increasingly globalized which has contributed to longer lead times and less predictability. On the flip side, increased shipping speeds have made it possible to supply parts or finished products internationally within a short amount of time but has also increased competition in several sectors. Whereas firm-specific diversification is a strength, the regional economy is not as diversified. Much of Region Nine's manufacturing industry is based on **commodity production**. Potential substitutes generate intense price competition, which can lower revenue. Additionally, bringing new products to market is costly for independent regional manufacturers, particularly from a marketing perspective, so small producers are often **forced to sell their patents**, generate a niche market, or become **contract manufacturers**.

Other threats include concerns regarding **population decline** and an **aging population**. Only three counties are experiencing significant population growth. The population (Census 2020) of the nine counties is 237,196 — a jump of 5,894 from the 2010 census. But Mankato alone accounted for 5,183 of those additional residents, rising 13.2% to 44,488. Growth in the immediate Mankato area was offset by falling numbers in every other town in Blue Earth County allowing the county to grow by just under 8% overall. Nicollet County's population rose by nearly 5.3%. Le Sueur County increased by 3.5%, while populations fell in Faribault, Sibley, Martin, and Waseca counties. Watonwan and Brown Counties' populations were virtually unchanged over the past decade.

Region Nine is also slightly **older than the state**. The oldest population is in Faribault County with a median age of 46.8 years, while the youngest is in Blue Earth County where the median is 30.6 years. The largest increase has taken place in the 65 and over demographic while all other age groups declined, with the largest decrease taking place in the 35-44 age group followed by the under 18 age groups. The **regional population shrinkage** will therefore remain a threat to employers seeking workers over the coming years.

Finally, **broadband** remains a challenge for the manufacturing industries. Region Nine ranks among the worst in the State of Minnesota. While some incorporated city centers have access to broadband speeds of at least 100 Mbps download by 10 Mbps upload, coverage throughout many cities is varied and inconsistent. Future developments in manufacturing and other industries would require significant investment in this basic infrastructural component if the state were to succeed with its economic development efforts.



SECTION 5: POSITIONING MANUFACTURING FOR FUTURE SUCCESS

5.1. BUILDING AN ADAPTIVE AND RESILIENT INDUSTRY SYSTEM

A healthy economy is one in which things flow easily: people, goods, money, and ideas. It is a dynamic system with diverse elements and actors, each contributing in different ways to grow the benefits to the community and evolving the output and processes of all activities. Essentially, a healthy economy is one that is undergoing a constant state of adaptation to an ever-changing environment. It is evolutionary. In a context that is always changing, constrained information flows represent a major vulnerability. As the pandemic has reinforced, from any given vantage point in a diverse system, information is limited. To better weather volatility, anticipate change, and prepare for it, Region Nine needs to develop critical feedback loops across different segments of the economy and communities.

These diverse information flows provide early warning of change as well as a platform for collaborative action among different stakeholders. As Professor Ove Jakobsen (Nord University, Norway) eloquently explains in *Transformational Ecological Economics* (2017):

“When we look at the state of the world today, what is most evident is the fact that the major problems of our time – energy, environment, economy, climate change, and social justice – cannot be understood in isolation. They are interconnected problems, which means that they require corresponding systemic solutions.”

What Jakobsen alludes to is that the results we can expect from our efforts to sustain our livelihoods depend on the adaptability of the systems we put in place to not only prevent, but to improve from each shock and disturbance. Developing robust feedback loops in a system provides the information for directing the adaptation, which builds resilience and drives evolutionary development.

Faced with multiple pressures that jeopardize the region’s quality of life and potential for expanding prosperity, Region Nine must harness its existing resources and take on a sustained adaptive approach to supporting the region’s economic success. Some economic systems allow for more ease of movement and exchange than others, and some are more adaptive to change and disruption.

Sudden shocks impact any system. A natural disaster such as tornadoes or floods can strike abrupt blows to economic activity, damaging or even destroying critical infrastructure and other public and private property. In such situations, resources and economic activity are redirected to rescue, safety, and construction while much other economic activity goes on hold. An economic downturn caused by market fluctuations, speculations, or booms (such as the housing boom in 2007/2008) can hit abruptly, as was the case in the last two downturns in Region Nine.

Similarly, periods of sustained market changes, such as those experienced during the COVID-19 pandemic, can reveal longer-term investment shortfalls in a region, through which some jobs rapidly become obsolete while others experience increased demand. Downturns tend to speed up structural changes lingering under the surface. In the case of an economic downturn, jobs are lost unevenly across industries and occupations; some will return, and others will not.



Stresses to the system can build over time, such as population growth and shrinkage, rising housing and childcare costs, aging, inadequate roads, and public transit systems in need of repair and expansion, climate change resulting in rising energy costs, more frequent droughts, and disruption of agriculture, and/or zero-sum thinking among stakeholders that inhibits systemic approaches to addressing the needs of the region. These are all gradual changes taking place. Other changes are sudden and are more difficult to address. Paradoxically, these are, as the pandemic has shown us, even more difficult to address.



Research suggests that multiple factors contribute to growing the resilience of a regional economy. Open communication and collaboration among diverse stakeholder groups, an understanding of national and global trends that are reshaping the competitive landscape, and a positive view of opportunities on the horizon are all examples of prerequisites for resilience. With that goes a willingness to make strategic investments, the ability of decision-makers to act in a deliberative manner and look beyond immediate self-interests, and decision-making based on reliable evidence and metrics for tracking progress.



Building an adaptive and resilient regional economy would require a system of vital feedback loops across diverse stakeholder groups, such as the private sector, the public sector, K-12 education, higher education, occupational/vocational training, environmental management, non-profits, research centers/labs, labor organizations, and others.



Feedback loops require stakeholders from different sectors to engage, convene, and connect on an ongoing basis. This can be done through sharing observations of changing skills needs and technology trends, collaborations on training curricula, and developing a shared system for skill certification to ease the movement of workers across industries. This also includes leveraging technology for added automation to the feedback system by creating a shared platform for tracking economic trends and progress toward goals and maintaining a shared information platform for summarizing and reporting on findings from stakeholder feedback, economic trends, and progress toward meeting stated goals.

Dynamic resilience requires regional support for the qualitative growth of the economy through improved economic mobility. This would include raising educational levels and thereby reducing the collective vulnerability to demand changes by improving resilience for the individual and the community. This means investing in Region Nine youth and residents at all levels of education, including the retraining and upskilling of adults.



Characteristics of resilient economies can be summarized as follows:

Information Sharing:

Supporting the exchange of insights on changing skills needs between employers and the education/training community.

Effective and Efficient Logistics:

Investments in the seamless movement of goods to and from the region as well as around the region.

Efficient “People Movement”:

Investments in the seamless movement of people on public transit systems and roads to ease commutes and widen the scope of opportunity in the region for all groups.

Natural Systems Management:

Supporting life as well as quality of life. When properly managed, natural systems can also mitigate impacts of natural disasters and economic loss (e.g., agriculture and flooding).

Natural Resources Management:

They are limited, though some are renewable. When mismanaged, resource constraints cause stress and conflict.

Economic Wellbeing:

The capacity of individuals to provide for their families varies widely, tends to vary over time, and has a broad vulnerability to shocks. In an increasingly volatile environment, vulnerable populations (children, poor, elderly, mentally ill, and otherwise disabled) must be protected.

Economic resilience depends on building anticipatory systems, so community stakeholders adapt in a manner that benefits the greater community/economy/geography.



5.2. IMPROVING INTERNAL OPERATIONS AND EFFICIENCIES

5.2.1. Investments in LEAN Coaching and Workplace Organization

Lean Manufacturing Operations are dependent upon a set of principles necessary to transform traditional enterprise systems into lean enterprise systems. Historically, many smaller manufacturers in Region Nine have used these principles to focus exclusively on isolated, point-solution improvements, such as creating flow and pull to customer demand, and to pursue perfection in a narrow niche area of production. Yet, many have ignored the importance of defining value and identifying the value stream.

There appears to be a need regionally for manufacturers to re-examine these missing principles in the context of a) *their own work* and b) *through partnerships with other organizations*. As an example, there is an opportunity to utilize *Value Stream Mapping* (VSM) across companies and contexts, i.e., map the flow of products and services to “pull” appropriate waste-elimination tools into problem-solving and continuous improvement, which would generate a higher level of competitiveness.

A broader implementation of lean systems would allow Region Nine manufacturers (and related businesses) to realize the benefits of mitigating the effects of workplace disorganization and performing workplace scans. A problem-solving culture requires processes that behave in predictable ways. Through collaborations with institutions of higher education, companies can relatively easily develop workplace organization systems that set requirements for process outputs, as well as process inputs of skill, method, material, machine, measurement, and environment. Just as speed bumps in a road can slow vehicle travel, a disorganized workspace can create excessive motion that slows down enterprise processes.

Workplace Organization Systems would also address employee ergonomics and safety issues. This methodology seeks to create a safe, clean workplace arrangement and to create a visual method for maintaining workplace organization.

Standard work is the centerpiece of a *Lean Enterprise* as it creates process requirements and its expectations for those processes. Standard work establishes a single method to use enterprise processes and minimizes process variation caused by people, machines, materials, and the environment, enabling predictable results. Standard Work includes four key activities: *Defining Standards, Creating Job Instructions, Training Job Instructions, and Observing Work*.



Respondents suggested that there are workforce opportunities to enhance abilities to analyze sources of variation that exist within the current state to understand the impact on processes and to identify the standards that stabilize safety, quality, delivery and cost so organizations can develop more dynamic job instructions and to develop plans to observe the work being performed.

Set-up was also identified as a key challenge. Large and small manufacturers lose tremendous amounts of productivity to poorly coordinated process setups that add waste to value streams. Setup is the time required to change the production process from the last good product produced to the first good new product produced. Long setup times often go unnoticed, affecting *Overall Equipment Effectiveness* (OEE), as they are not typically viewed as part of a primary process to build products. Respondents emphasized the need to enhance Setup Reduction to increase company scheduling flexibility, enhance employee skillsets, and identify quality opportunities.

5.2.2. Investments in LEAN Implementation

Regional manufacturers use various types of equipment to add value to material and information in the creation of their products. When equipment performance is unpredictable, the ability for that process to achieve stability is diminished, and when a process is unstable, it becomes difficult to implement improvements and proactively solve problems.

Total Productive Maintenance (TPM) is a way to apply Lean thinking to a plant's equipment in a way that strengthens the connections between people and processes. Specific needs that could enhance the resilience of the regional manufacturing clusters include establishing standards and implementing improvements that eliminate the causes of equipment instability, maximizing the effectiveness of equipment resources for their respective life cycles through preventive, predictive, and self-directed maintenance programs, creating an environment that encourages all team members to drive improvement efforts in safety, quality, and performance, and tracking the health of the entire process by optimizing OEE.

Many companies embarking on Lean journeys become frustrated with Kaizen events and isolated improvement projects that yield great short-term results but lack the ability to deliver sustainable improvement. Identified needs include: managing personnel from recruitment through retirement, i.e. identifying and improving the "people" value stream by standardizing the way team members are recruited, on-boarded, trained, and managed throughout their careers; creating a problem-solving culture, which entails a focus on what a company is trying to accomplish; establishing cascading *Key Performance Indicators* (KPIs) that tell organizations if they have reached their goals and populate through the organization so everyone knows what is important.

A Lean implementation process would also help organizations "bring to life" the values and guiding principles found in most mission statements. Instructors would do this by explaining the steps/actions to consider while using problem-solving processes in daily activities (e.g. communication, buy-in, engagement, purpose, customer satisfaction, and more).

5.2.3. Partnerships to facilitate Detailed Supply Chain Analysis Assistance

Interviewees almost universally indicated that their organizations could increase alignment, visibility, and collaboration with respect to *supply chain analyses and coordination*. Respondents suggested that improved skills, knowledge sharing, or outside assistance with supply chain analyses would reduce costs, increase quality and delivery, and possibly contribute to a more skilled workforce leading to supply chain optimization – something most indicated they were far from achieving at the time of the interviews taking place.

5.2.4. Investments in Improved Market Intelligence

Most small and medium-sized manufacturers in Region Nine lack the resources—human, financial, and otherwise—to aggressively pursue new contract leads that would allow them to scale operations and utilize existing capacities. Many realize the need for a *Lead Generation* effort, but without a dedicated structure, too many opportunities are likely to pass them by. *Lead Generation* would represent a proven way to create just such a structure; it would be an effective way to do more with less – i.e., generate Lean systems while scaling organically.

Lead Generation engagements could be designed to bring clarity to customers and clients through opportunity-scouting efforts for preferred end-use profiles and project healthy growth in the coming years. The desired result would be quality, qualified, real-time market opportunities.

5.2.5. Investments in Market Analytics

Respondents in this study addressed competition repeatedly during interviews. Concerns included downward pressures on pricing, the pace of innovation, and the services and benefits manufacturers are expected to offer – something most recognized that they were/are unable to offer. They did, however, recognize that healthy competition could be aligned with healthy collaboration and knowledge sharing, and that such efforts could help their businesses reach new levels of capability.

Most interviewees also addressed the need to uncover gaps in the marketplace that their organizations could fill. Yet, few companies in Region Nine indicated that they take the time to perform comprehensive evaluations of their competitors.

Competitor analysis should be a critical part of any marketing strategy. Like forecasting profitability, examining distribution, and marshalling other resources, having an up-to-date understanding of the headwinds that exist in the marketplace is a vital part of that planning.

These elements would help answer an all-important question: why a customer might select one company over another. Is it a matter of quality? Are there core competencies that place one rival beyond the rest? At the end of the analysis process, students would deliver solid intelligence, or real-world data that can be used to inform strategic business planning.

Technology-Driven Market Intelligence (TDMI) provides a systematic, comprehensive approach to technology-focused market intelligence research. Specifically, TDMI identifies the benefits and market impacts related to a company's technology-based asset - whether it's an idea, product, process, or capability. Unlike traditional market research, TDMI considers the technical and market viability of an asset and characterizes the associated opportunities and barriers.

5.2.6. Engineering Scouting Partnerships

Engineering Scouting (ES) connects businesses with proven technologies to solve technical issues, create new products, and improve processes. With a growing business need to shrink innovation cycles, retaining a competitive edge is an ever-increasing challenge that often means identifying and acquiring external technologies. The next high-impact technology breakthrough could be at a university, national research lab, or another business domestically or abroad. Engineering Scouting is a combination of commercialization expertise, research excellence, and proven processes for road-mapping, technology scouting, and partnership development - applied and refined for a client's benefit.

5.2.7. Supplier Scouting Partnerships

Manufacturers often struggle to find suppliers that meet specific criteria. *Supplier Scouting* is a combination of commercialization expertise, research excellence, and proven processes for road-mapping, technology scouting, and partnership development that have been applied and refined using Project Management principles and can support *vendor search*, *technical partner search*, *new material search*, and *substitute for obsolete material search*.

5.3. SUPPORTING A RESILIENT WORKFORCE

Minnesota is at a crossroads when it comes to workforce needs (i.e., labor shortages in dominant clusters) and how we think about our workforce. We are facing challenges, yet numerous opportunities exist if we broaden the scope of identifying potential workforce contributors amongst those not traditionally included in individual sectors of the economy. Historically, women did not participate in manufacturing at the same rate as men, and although gains have been made with respect to gender equality, this arbitrary dimension in the workforce has contributed to major shortages in some sectors of the economy.

No person can be described according to only one dimension, as all of us have many characteristics and identities. You may be a woman or a man, immigrant or born in Minnesota, young or old, employed, or unemployed, religious or atheist, homosexual or heterosexual, or have a disability. Categories and labels attached to individuals or groups may have a stigmatizing effect and contribute to exclusion from the community. It may put individuals into a category which may create and reinforce differences which lead us to think in terms of "us" and "them". Language must be inclusive. There must be acceptance for the fact that there are many ways of being a Minnesotan. Differences within the group "immigrants" will usually be greater than differences between immigrants and the rest of the population.



5.3.1. Diversification of Workforce

Minnesota's and Region Nine's greatest resource are its people. This is the point of departure for inclusion initiatives – that all people should be able to use their resources to the best of their abilities. Employment is the key to community participation, financial independence, and equality. It should therefore be a regional priority to ensure that more immigrants, both women and men, can find employment. We need to make better use of every newcomer's skill and competence. Discrimination prevents domestic and international immigrants from participating in social life and prevents society from utilizing the resources and talents of the population.

Participation in working life is also the key to achieving *equality between women and men*. Many more women need to enter the labor market if we are to be successful and resilient as a region. Workforce participation strengthens the sense of belonging in dynamic and ever-changing communities and strengthen the individual's financial independence. More-over, society will have access to needed labor.

The region also needs *equal opportunities for all children*. All children and young people need good early-development conditions and equal opportunities, including those that are new to the region. Residents of diverse backgrounds have knowledge of cultures and languages that are resources for the region in an ever-globalizing economy. Children and young people with immigrant backgrounds should not face more barriers than other children and young people, whether in society or in their own family. Today's schools and kindergartens must be adapted to the diversity of the child population. Good education policy is good economic resilience policy.

5.3.2. Supporting Working Families

Adding to the problem of locating qualified labor is the prominent problem of *childcare shortages* and childcare deserts within the region. A childcare desert is any census tract with more than 50 children under the age of 5 that contains either no providers or so few options that there are more than three times as many children as licensed childcare slots. Six of the nine counties in Region Nine have at least one census tract that meet the criteria for a childcare desert, including one tract with zero providers.

Housing is another issue identified as a weakness within the region. Nearly 48.6% of households in Blue Earth County spend more than 30% of their household income on housing costs. Residents in Martin and Nicollet counties also have more than 40 percent of households spending more than 30 percent of household income on housing. The seven other counties fluctuate between 31 and 39 percent. Le Sueur County has the highest median monthly mortgage cost of \$1,422, which is nearly as high as the national average, (\$1,491). Housing costs must also be considered up against poverty levels in the region. Whereas 16.4% (U.S. average: 12.4%) of white people fall below the poverty line in Blue Earth County, 51.3% of African Americans in the county live in poverty. The differences are even more pronounced in Le Sueur and Watonwan counties, where 8.0% and 11.0% of white people live below the poverty level respectively, compared to 86.9% and 91.4% of African Americans.

Other critical elements for successful workforce development efforts are recognized by RNDC through the commission's Legislative Priorities and include *Substance Abuse Prevention* and *Regional Crisis Centers*. Substance abuse and mental health services are repeatedly mentioned through our economic and community development conversations as areas in which the region needs substantial improvements. Region Nine's counties, except for Mankato/North Mankato, are largely rural and mental health and substance abuse resources are scarce. Vast geographic distances and few treatment and assessment options therefore present unique challenges not seen in urban areas. Accordingly, efforts aimed at diversifying and strengthening the regional workforce should support mental health and substance abuse programming.



5.4. DEVELOPING STRONG(ER) CLUSTERS

5.4.1. Production Diversification

The regional manufacturing industry, although driven by innovation and new technology, is very much commodity based. Many producers contribute materials or components for the use in final products. Hence, barriers to entry are relatively low and competition tends to be based on cost reduction. The threat of new entrants, both domestically and globally, contribute to a concentration of patents in the largest firms, while most of the producers compete as contractors.

The Medical Device Manufacturing (MDM) industry is a prime example. RND's MedTech Connect study revealed that the larger firms dominate the revenue side of the industry. Whereas 83% of U.S. MDM companies had less than \$1 million in assets and 95% had less than \$10 million in assets, the top 1% of firms in the MDM industry accounted for 82% of total assets, with the top 0.2% of firms accounting for 56% of assets. Globally, the ten largest MDM companies (eight of them being U.S. based) combined for \$160.3 billion of the industry's revenue in 2015. In other words, the concentration of capital is very high, which yields significant market power over other producers and contract manufacturers. This increased market concentration does not appear to be slowing down and may indicate a significant threat to small producers.

It is therefore critical to *diversify the industrial portfolio*, including the number of products produced across industries. This would also include greater downward and upward supply chain integration, where producers are more involved in product design and value-added components as they get closer to the final consumer. Region Nine ships vast amounts of commodities and natural resources harvested within the region to nearby areas where additional value is added and thereby miss out on opportunities to retain some of the surplus value regionally.

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5.4.2. Life Cycle Assessments

As previously stated, sustainable manufacturing strives for non-polluting processes, the conservation of energy and natural resources, safety for employees and communities, and economically sound operations. With such a broad range of entry points into the field, steps can realistically be taken by many regional manufacturers.

Carbon reporting and auditing is the first step towards reducing carbon emissions in the manufacturing process. Before any measures can be taken, a life cycle assessment should be conducted to gain a clear understanding of where emissions hotspots are. *Life cycle assessments* are a valuable method for assessing the environmental impact of a manufactured product, service, or process as they aggregate information on the entire life of a product from production to landfill. They are conducted based on secondary databases such as the Global LCA Data Access and the U.S. EPA Supply Chain Emission Factors. Those values are then given further context through primary data collection from the manufacturer about their specific material sources and processes. The collection and analysis of data give manufacturers a clear understanding of their largest emission's hot spots and thus a clear road map for action. Common emission hotspots in manufacturing include heating and cooling processes, transport, and warehouse storage.

5.4.3. Updating Industrial Parks

One perceived weakness of our region's manufacturing sector is the age and quality of industrial parks. This offers another opportunity for sustainable development by implementing industrial parks that are designed to increase synergy while reducing energy consumption and waste creation. One framework for these parks is the United Nation's Industrial Development Organizations Eco-Industrial Parks (EIP). Eco-industrial parks are a community of businesses located on a common property in which businesses seek to achieve enhanced environmental, economic, and social performance through collaboration in managing environmental and resource issues. This is known as industrial symbiosis which allows companies to gain a competitive advantage through the physical exchange of materials, energy, water, and by-products, thereby fostering inclusive and sustainable development (UN). The idea for eco-industrial parks was first presented at the UN in 1992 and has since led to the development of EIPs that provide benefits to manufacturers, laborers, the economy, and the environment.

5.4.4. Supply Chain Collaboration

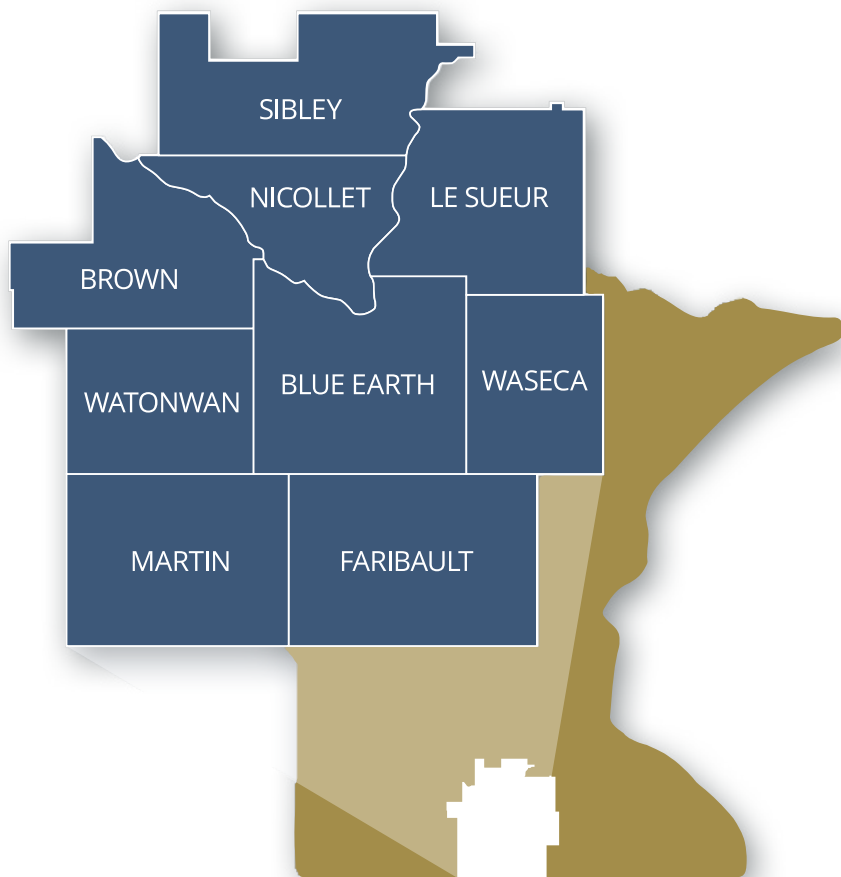
Through interviews and research conducted for this report, one perceived weakness of regional manufacturing is the lack of pooled logistics channels. This practice which is common among other geographic manufacturing clusters helps companies reduce procurement costs, reduce transportation costs, and as it turns out, reduce their environmental impact. Due to the recent awareness of environmental issues and governmental regulations, some companies have begun to collaborate with other supply chain partners specifically for reducing CO2 emissions, either in production and logistics, or other operations. The goals of such supply chain collaboration are to make the companies resilient against changing environmental regulations and changing markets.

5.4.5. Facilitate Foreign Direct Investment Readiness Initiatives

Local, regional, and national banks meet the basic funding needs of many small regional businesses. However, few capital or collaborative funding sources exist that can help nurture innovative products and services in the regional manufacturing clusters. In the Twin Cities metro area, dozens of venture capital firms both publicly traded and private exist primarily to fund product innovation. However, they reported being unaware of companies or activities in Region Nine that could benefit entrepreneurs and innovators. Foreign Direct Investments (FDI) therefore present the most likely expansion potentials for regional manufacturers. The regional clusters, in partnership with the public sector, should therefore carefully assess local readiness for FDI, whether that pertains to local and regional infrastructure, workforce support, or abilities to scale production in existing industrial parks.

5.4.6. Economies of Scale through Consolidation and/or Cooperation

Findings demonstrate that supporting industries to the key traded clusters in Region Nine are numerous yet dispersed. As most regional enterprises produce commodities and services for several industries, methods of optimizing integration and output are complex. There are multiple opportunities for manufacturers to consolidate operations and take advantage of cost savings. As industries grow and technology evolves, the demand for consolidation, or at least cooperation, appear to become more pressing.



SECTION 6: RECOMMENDATIONS

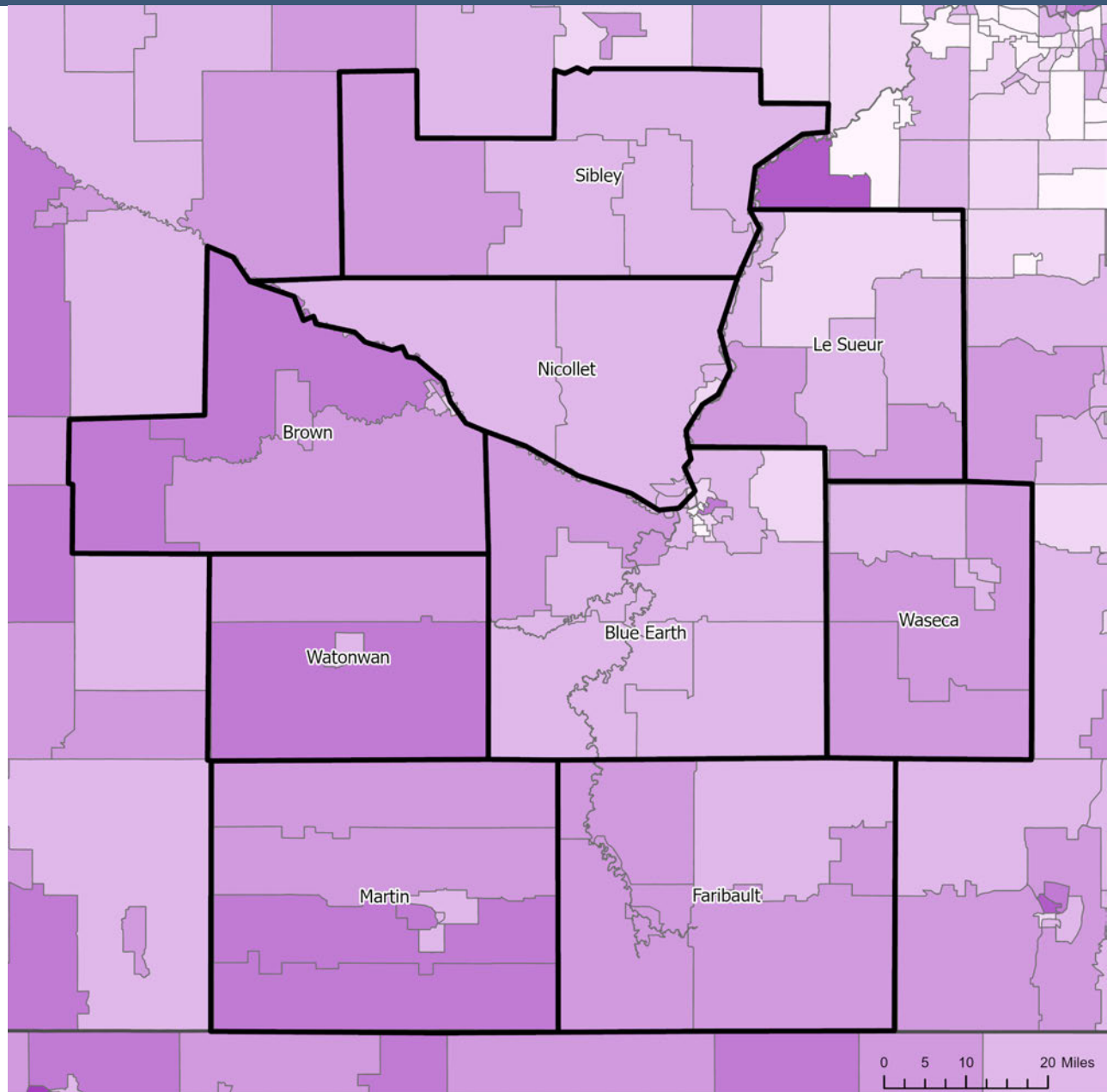
This plan has narrowed down recommendations to eight over-arching areas that would address regional manufacturing resilience and economic prosperity. The plan itself has addressed underlying opportunities and concerns, and these recommendations are meant to categorize higher-level initiatives as starting points based on these findings, rather than being prescriptive suggestions for success.

Each area can be used to develop more granular recommendations over time and be adapted to changing conditions and new challenges.

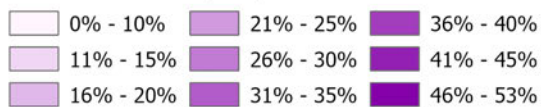
| What to Initiate | Strategy to Initiate | Why? | Frequency? | Who to Initiate? |
|--|---|--|------------------------------------|---|
| Regional task force on manufacturing competitiveness | Nine-county public, private, and academic collaborative group to explore opportunities to increase competitiveness | Foster opportunities for intra-regional collaborations across sectors | Ongoing yearly | Academia (e.g., MSU-Mankato, South Central College) |
| Secure state and federal allocations to support K-12 educational opportunities for applied learning through the Center for Excellence in Engineering | Develop opportunities for primary and secondary education students to learn about regional manufacturing clusters | Generate opportunities for stronger talent retention and pathways to high-paying jobs locally and regionally | Ongoing quarterly or semi-annually | Center for Excellence in Engineering |
| Incorporate diverse community members into community development efforts | Targeted recruitment of community members as discussions about community and economic vitality emerge or develop at the local level | Regional competitiveness hinges on including all community members and identifying needs and opportunities from different perspectives | Ongoing | City Administrator or designated appointee (e.g., local EDA, chamber of commerce, etc.) |

| What to Initiate | Strategy to Initiate | Why? | Frequency? | Who to Initiate? |
|--|--|---|--|---|
| Formalize county specific priorities as they pertain to industrial development opportunities | Form an 11–15 member committee with private and public sector representatives required under §469.1082 Subd. 2 | Industrial development needs are emerging with technological and global changes and existing capacities are often under-utilized and/or at capacity | One-time | County Administrator with County Commissioners |
| Formulate manufacturing-specific needs and opportunities for annual reporting to the Federal EDA | Draft narrative or request support to fund planning and initiatives | Although manufacturing is covered in CEDS and APR, manufacturing remains the highest-yielding industry sector in the region and warrants close monitoring | Annually | Region Nine Development Commission |
| Further engage manufacturers and local communities in conversations about transportation hubs | Identify possible hub locations to reduce transportation costs and the environmental impact of logistics | Transition from rails to roads has increased costs for regional producers while also contributing to greater environmental costs | One-time; reevaluated every 3-5 years | Minnesota Department of Transportation (MnDOT) |
| Establish baseline metrics for manufacturing resilience and competitiveness and a system to track them | Identify important measurements to evaluate impact over time | There are great within-industry (sector) differences and no formal mechanism in place to track progress | One-time with annual reporting and revision if necessary | Region Nine Development Commission |
| Closer alignment with institutions of higher education on internships, externships, and curricular and research collaborations | Examine opportunities for joint programming | Collaborations could yield access to the talent pool, knowledge sharing, and technology diffusion pathways | Ongoing | Academia (e.g., MSU-Mankato, South Central College) |

APPENDIX



Percent of population that is 65 years and over

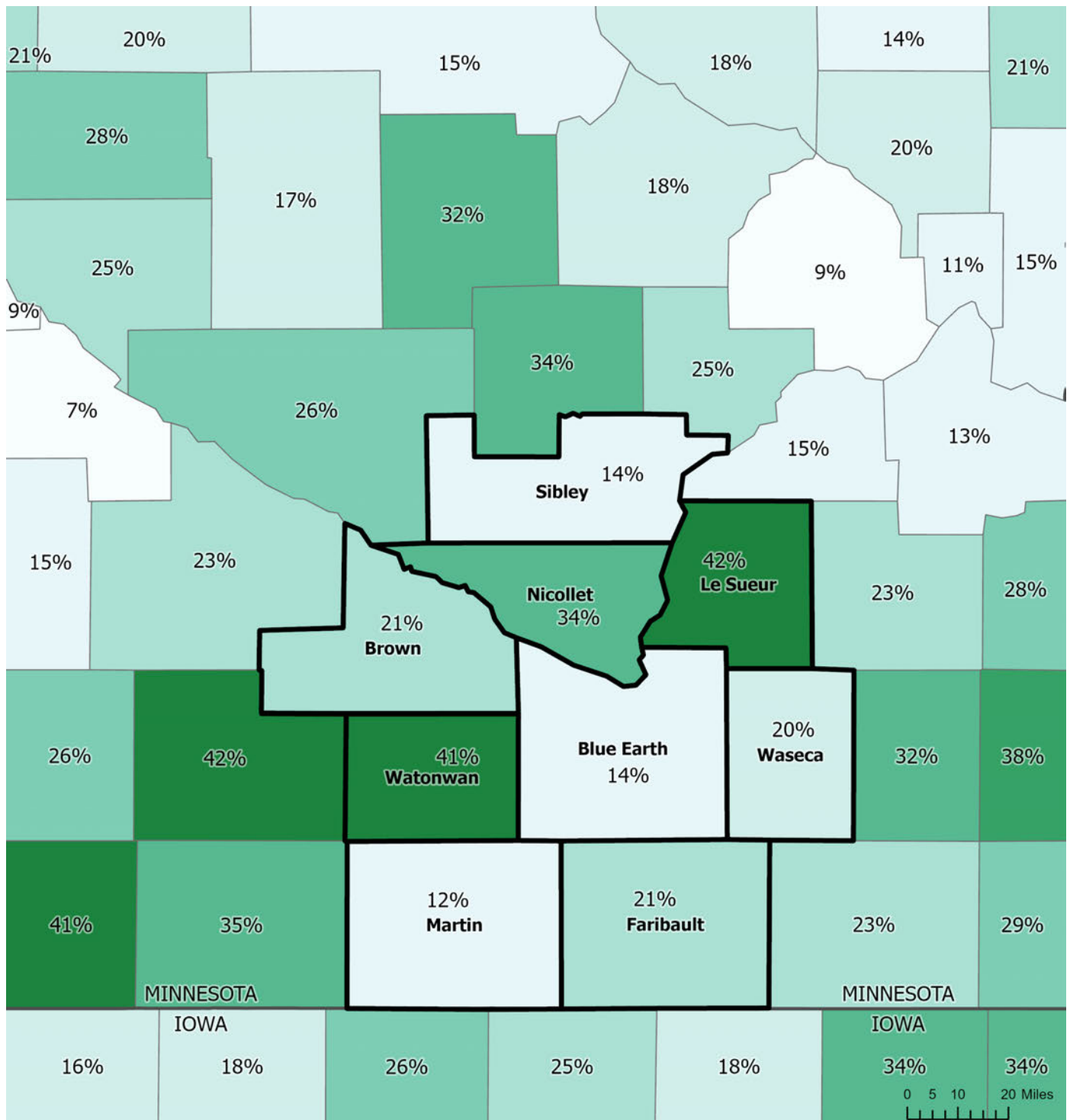


Aaron Pacheco
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Region Nine Development Commission
10 April 2023

U.S. Census Age Demographics 2022

All statistics are representative of regional averages by census tract
(data.census.gov)





Manufacturing by Employment

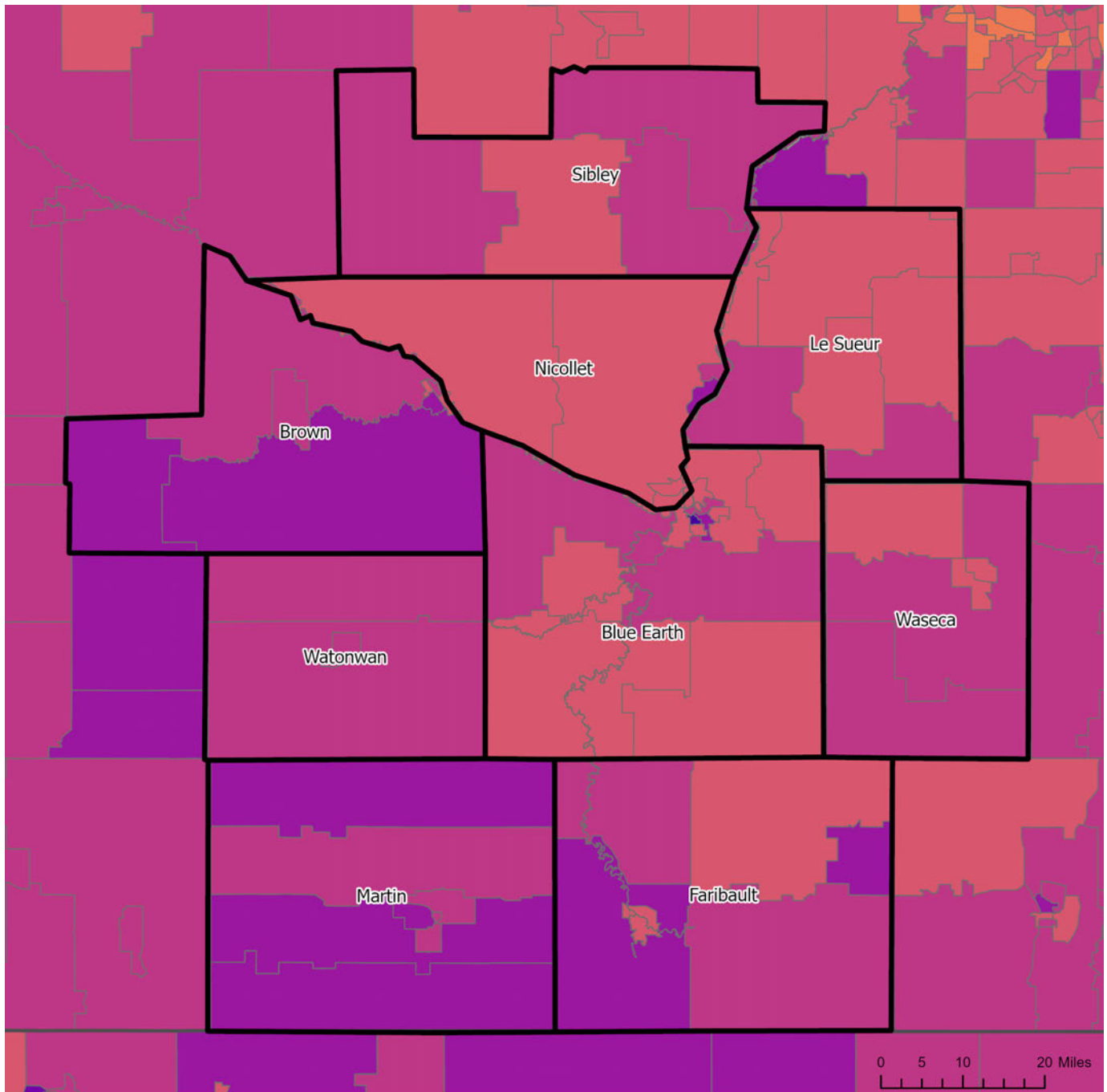


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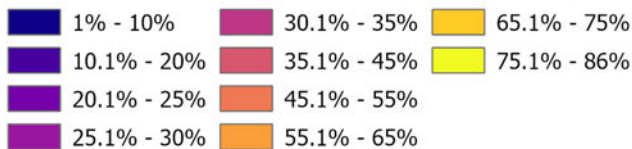
U.S. Census Quarterly Workforce Indicators 2023

Statistics representative of regional averages by county and all 2-digit NAICS . All employment data retrieved through QWI Explorer (census.gov) using latest quarter values (10 April 2023) and all 2-digit NAICS codes for all private ownership firms.





Prime Workforce Population (25 - 54 years old)

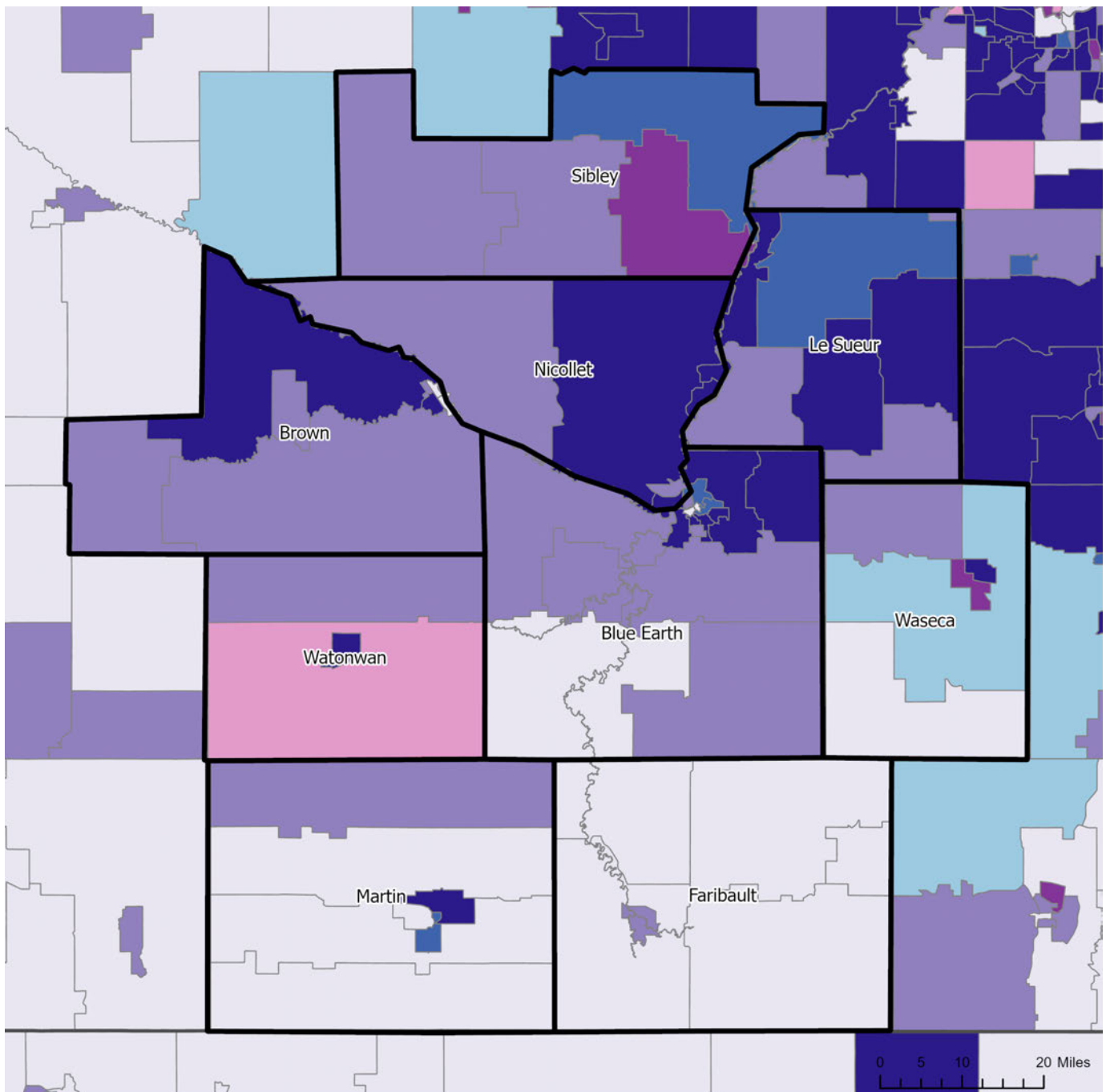


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U.S. Census Age Demographics 2022

All statistics are representative of regional averages by census tract (data.census.gov)
Prime working-age is defined by Bureau of Labor Statistics as 25-54 years old (bls.gov)





FEMALES

MALES

High

Low



Low High

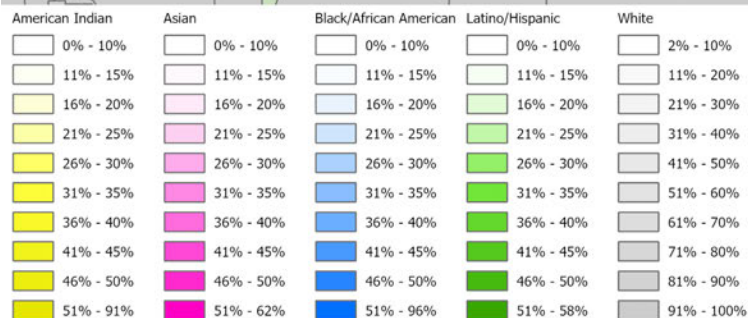
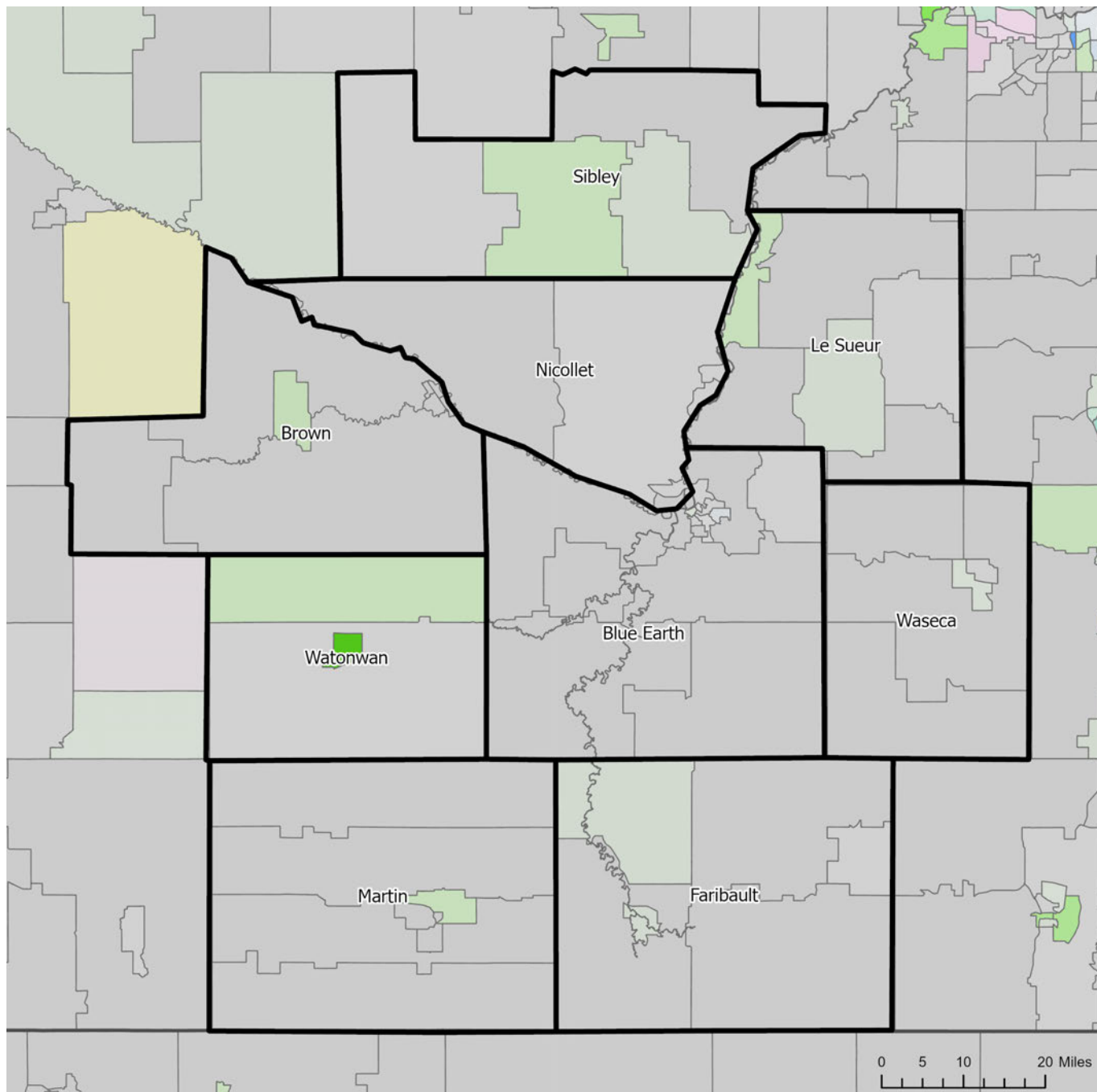
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10 April 2023

N



U.S. Census Male-Female Demographics 2022

All statistics are representative of regional averages and limited to binary source data
(Data source: data.census.gov)



U.S. Census Race/Ethnicity Demographics 2022

All statistics are representative of regional averages displaying groups with largest presence. Other categories and groups may be present in the data but with values under the above visualization thresholds. (Data source: data.census.gov)

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10 April 2023



NOTES

