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NORTHERN COLORADO
REGIONAL CLUSTER STRATEGY

City of Fort Collins

LARIMER COUNTY

NoCo REDI
Northern Colorado Regional Economic Development Initiative

ALEXANDER
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ACKNOWLEDGMENTS

The Northern Colorado Regional Economic Development Initiative (NoCo REDI) represents a network of economic development organizations working to coordinate regional economic development efforts. NoCo REDI recognizes that economic benefits in one community benefit all, due to the interconnected nature of the regional economy. Working together allows for greater impact in the region—"We are one economy." The objective of this collaboration is to increase the region's economic resilience and improve the business ecosystem.

A huge thank you to the many members of NoCo REDI who contributed their time and intellect to this project.

City of Evans Economic Development
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City of Fort Lupton
City of Greeley Economic Health and Housing
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Larimer County Economic and Workforce Development
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ABOUT THE PROJECT SPONSORS AND CONSULTING TEAM

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LARIMER COUNTY
COMMITTED TO EXCELLENCE

Larimer County provided in-kind services through the dedication of its Economic Development staff. "Larimer County Economic and Workforce Development (LCEWD) connects people to meaningful work and businesses to talent and resources, improving our community's economic well being."

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Alexander Research & Consulting facilitated workshops of NoCo REDI partners and developed the strategy playbook. Alexander Research & Consulting provides insights and support to help organizations amplify their impact and reach new heights. It offers a wide range of services—research, analytics, program evaluation, strategic planning, and implementation support—with a specialization in community, economic, and workforce development.

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INTRODUCTION

In August 2019, the Northern Colorado Regional Economic Development Initiative (NoCo REDI) embarked on a process to develop a regional industry cluster strategy and playbook that enhances coordination and collaboration among regional partners to the benefit of the regional economy and the regional talent pipeline. The goal of aligning the regional economic development efforts around a shared set of industry clusters is to develop a common language, a unified message, and a laser-focused programmatic response that is targeted to the industry clusters that represent the region's areas of strength and greatest prospects for growth. This regional strategy is a continuation of many of the programs and activities that individual communities are already doing on their own and that NoCo REDI has already begun to formalize through its network of partners.

Industry clusters are defined as "geographic concentrations of interconnected companies, specialized suppliers, service providers, firms in related industries, and associated institutions."[1] Industry cluster strategies are a commitment to growing select industry clusters in a region or community. Successful strategies require a long-term commitment that can take, in many cases, 10 to 20 years. The focus on select industry clusters in the face of scarce resources helps improve the odds of success and maximize positive returns for investments in economic and talent development. This focus is important for the following reasons.

- It provides a lens for identifying areas of strength and areas of potential growth;
- It helps prioritize resources and build expertise;
- It provides a focus for economic development programming; and
- It provides a framework for aligning industry needs with education, training, and workforce development efforts.

This strategic framework lays out specific goals for NoCo REDI's industry cluster work, identifies the clusters to focus on, and provides strategies and actions for the NoCo REDI partners to explore and incorporate into their collaboration. This framework was developed through a series of workshops held in the fall of 2019.

The strategies and actions in this plan are meant to be used as a playbook. Each community can adopt the specific strategies and actions from the playbook that are most relevant to it while maintaining an aligned strategic direction across the region. This allows communities to act both individually and in partnerships with other regional communities in ways that strengthen and reinforce one another's efforts to grow select industry clusters in order to maximize both their collective and individual impacts. Each community can choose a subset of industry clusters to be its focus and a subset of strategies that it will implement. The regional partners can choose a subset of strategies to implement jointly and will support one another in their individual efforts through knowledge sharing and collaboration.

The region consists of a wide array of communities from urban to rural and metropolitan to micropolitan. The strategies and actions can be adapted for each type of community; the set of strategies a community chooses can evolve with the communities. For example, the communities that are transitioning from rural to exurban might initially spend more time and resources putting in place the planning tools to preserve land and sites for future industry growth. They might also focus on strategic infrastructure investments and the regulatory framework to support growth in the selected industry clusters. This will help them set the table for future growth and allow them to be in a position to actively encourage growth more successfully in the coming years. Conversely, more mature cities might choose to focus on a subset of industry clusters that have a strong presence in their communities and on the strategies and actions that are most relevant to these clusters and to the political realities of that community. These cities might spend more time actively promoting the growth of their clusters rather than fostering the conditions for growth. Appendix 1 includes three case studies that exemplify how the strategies can be adapted for each community's needs and for the region at large.

NoCo REDI can use a common reporting tool to track progress and measure its collective impact. This tool should be used for monitoring, troubleshooting, and measuring results. In this way, it can be used to identify where strategies could be tweaked or strengthened, where strategy implementation is going well, and where there is a need for more support. Through this process, NoCo REDI's partner communities can keep one another informed about their respective activities and initiatives, consult one another, and collaborate in this joint effort to develop the region's industry clusters.

1 Michael E. Porter. *The Competitive Advantage of Nations.* New York. 1990.

STRATEGIC FRAMEWORK

The strategic framework provides a set of overarching goals for the regional cluster initiative, defines the set of clusters that can be areas of focus, and lays out a set of strategies to encourage growth in the clusters.

GOALS FOR A REGIONAL INDUSTRY CLUSTER INITIATIVE

NoCo REDI identified three goals for its regional industry cluster initiative.

- **Economic opportunity/job creation:** To create more and better jobs for the residents of Northern Colorado.
- **Economic resilience:** To enhance the region's ability to anticipate, weather, and avoid economic shocks or disruptions.
- **Workforce alignment**: To improve the alignment of the regional workforce with the needs of industry.

These goals will serve as guides for the strategies and actions to ensure that the region's industry cluster work is leading toward these desired outcomes.

INDUSTRY CLUSTER IDENTIFICATION

NoCo REDI began regional cluster identification using the US Cluster Mapping Project benchmark cluster definitions. These definitions were slightly adjusted to align to Economic Modeling Specialists International (Emsi) data.[2] Emsi is a trusted labor market data provider whose products are widely used in economic development research and practice.

North American Industry Classification System (NAICS) is the standard industry identification used in US Bureau of Labor Statistics and US Census Bureau business data. These data sources provide the cornerstone of industry data available throughout the United States.

In the US Cluster Mapping Project, each industry cluster is defined as a grouping of nonoverlapping NAICS codes. These codes were originally assigned to each cluster using an algorithmic approach that addressed shared workforce skills, geographic colocation and other factors that indicate a high degree of relatedness. Each cluster is comprised of subclusters that describe related NAICS group within that cluster.[3]

The strength of the US Cluster Mapping Project approach is that clusters are defined based on the US as a whole and structured in a way that allows direct comparison of geographic regions; it doesn't require firm-scale knowledge. However, there are tradeoffs. For example, a local industry might differ in scope or focus from the national trend for that same industry. Additionally, NAICS does not capture emerging industries, and industrial data is categorized by a single establishment scale NAICS, which means a small company that encompasses activities across categories will only be recorded in the data in the primary NAICS assigned to it: a single-establishment company involved in manufacturing and distribution of differently classified products will only "appear" in the data for one aspect of its business, with all economic contributions (employee counts, wages) aggregated into a single NAICS. This becomes a larger influencer in available industry data at small (metro, county, city) geographic scales.

NoCo REDI began with a list of 23 clusters identified by the group as important industries for further exploration. This list was built from a combination of local knowledge, existing data, and industry clusters or key industries that had been defined by other organizations, including Colorado Office of Economic Development and International Trade (OEDIT) key industries and the Metro Denver Economic Development Corporation industry clusters. NoCo REDI explored traditional economic data metrics for these industries as a filter to identify 12 of these as strong industry clusters that are important to the region. This set was further refined to identify (1) those that are important to the economy but not good targets for a cluster growth strategy and (2) those clusters that are strong candidates for a growth strategy led by the economic development community.

[2] Emsi 2019.3. Industry Table and Input-Output, All Employees Class of Worker used throughout. Economicmodeling.com.
[3] US Cluster Mapping Project. Cluster Mapping Methodology documents. https://clustermapping.us/content/cluster-mapping-methodology.

All regional data was examined at nested geographic region scales for Northern Colorado (Larimer and Weld Counties) in addition to the northern Front Range region that comprises the majority of the laborshed (Larimer, Weld, Adams, Boulder and Broomfield Counties).

In this process, NoCo REDI modified the US Cluster Mapping Project definitions to add/remove subclusters to modify some cluster definitions to better reflect this unique industrial ecosystem, but still retain the benefits of using the US Cluster Mapping Project definition framework *(Appendix 2)*. Further refinement included mapping the connections among the clusters and other industries in Northern Colorado *(Appendix 4)*.

Figure 1 on page 4 summarizes comparative data for the clusters.

The clusters identified as strong candidates for a cluster-growth strategy represent industries that are the type of growth opportunity that have the highest potential to respond to coordinated efforts by the regional partners and have a higher likelihood of yielding returns and outcomes that align with the goals of this strategy. These clusters include bioscience & medical device, distribution & e-commerce, fabrication & production technology manufacturing, food processing & manufacturing+, information technology+, and plastics. All these clusters, with the exception of distribution & e-commerce, include manufacturers of various types. In addition, these clusters are supported by robust talent pools and pipelines that provide a competitive workforce to support industry growth.

In 2018, these clusters accounted for about 11 percent of all jobs in the region. These clusters have demonstrated solid growth over the past 5 years and are expected to continue this trajectory. They have a critical mass of payrolled business locations and make significant contributions to the region's gross regional product. More important, they represent primary jobs, which are jobs at companies that export a majority of their products or services outside of the local region, thereby infusing new dollars into the local economy.

The foundation of this framework includes three strategies, which are developed further on the subsequent pages. These strategies are as follows.

1. Foster the conditions to support growth in these clusters.
2. Actively encourage growth.
3. Communicate the importance of and successes in the select clusters.

In addition to the strategies, each of these clusters is profiled in Appendix 3.

The other clusters represent important economic drivers and sources of employment in the region. They are extremely important to the regional economy and should be the focus of economic development programming of each individual community outside of this regional cluster development strategy. These include agricultural production, inputs, & services; construction+; education & knowledge creation; energy; hospitality & tourism; and local health services.

Together, they represent about 26 percent of employment in the region, and they are expected to continue a strong positive growth trajectory. However, they are not candidates for a cluster growth strategy for various reasons—because they are primarily either resource-based, locally traded, or volatile, or they provide lower-wage economic opportunities, etc. Instead, these clusters should be integrated into community individual economic development work plans to track industry trends, build relationships, and ensure their ongoing economic health. For these clusters, it will be important for each of the regional economic development partners to undertake efforts to understand its clusters' risks and exposure and to explore means of diversification, enhancement, and strengthening. Individually or regionally, the communities can support workforce and talent development in each of these sectors with an emphasis on career mobility and transferrable skills.

FIGURE 1. INDUSTRY CLUSTER SUMMARY

	2018 JOBS	GROWTH (2013–2018)	GROWTH (2018–2023)	LOCATION QUOTIENT	2018 PAYROLLED BUSINESS LOCATIONS (PBL)	PBL GROWTH (2013–2018)	2018 GRP (US$ MILLIONS)	2018 GRP PER WORKER (US$ K)	% DEMAND MET IN NOCO (2018)	% OF 5-COUNTY CLUSTER GRP (2018)	NOCO AS % OF TOTAL 5-COUNTY CLUSTER EMPLOYMENT (2018)
CANDIDATES FOR CLUSTER GROWTH STRATEGY *These clusters represent the type of industries that will be most likely to respond to a coordinated, regional cluster-growth strategy and will likely yield outcomes that align with the goals of economic opportunity, economic resilience, and workforce alignment.*											
Bioscience & Medical Devices*	1,823	24%	14%	1.16	50	-7%	$447	$245	17%	18%	23%
Distribution & E-Commerce	8,400	31%	16%	0.76	1,125	11%	$1,937	$231	37%	31%	26%
Fabrication & Production Technology Mfg.*	5,391	51%	18%	1.98	79	20%	$698	$129	19%	74%	74%
Food Processing & Manufacturing+*	7,835	19%	9%	2.48	145	61%	$1,230	$157	36%	63%	59%
Information Technology+*	8,091	23%	8%	1.16	893	31%	$1,818	$225	53%	22%	24%
Plastics*	1,528	18%	11%	1.22	38	-10%	$214	$140	17%	59%	55%
OTHER IMPORTANT ECONOMIC DRIVERS *These clusters are important industries that will continue to be part of regional communities' other economic development programming and activities. However, due to the nature of these sectors – whether they are locally-traded, resource-based, etc – they are not the focus of this regional industry cluster growth strategy.*											
Agricultural Production, Inputs, & Services	5,862	14%	7%	2.30	329	9%	$696	$119	63%	77%	72%
Construction+	5,984	37%	26%	1.83	262	27%	$639	$107	64%	38%	42%
Education & Knowledge Creation	23,620	11%	11%	1.94	230	28%	$1,195	$51	46%	29%	41%
Energy	9,519	39%	39%	4.05	351	46%	$2,902	$305	41%	55%	75%
Hospitality & Tourism	4,687	32%	17%	0.77	354	15%	$304	$65	46%	41%	46%
Local Health Services	26,880	27%	17%	0.80	1,319	12%	$2,135	$79	49%	32%	36%

** Includes manufacturers.*
Source: Emsi 2019.3, Industry Table. Economicmodeling.com.
Note: This cluster strategy function is a coordinated and collaborative effort within and across communities' more comprehensive economic development programs and strategies. While a cluster strategy focuses on a limited selection of important industry clusters within a region, its efforts might have spillover effects affecting additional clusters. See Appendix 4 for a visual representation of known industry interactions within these and other clusters in Northern Colorado.

STRATEGY 1. FOSTER CONDITIONS FOR GROWTH IN SELECT CLUSTERS

Ensuring that the foundations for growth are in place will position regional communities to encourage, capture, and manage growth in the target clusters that best fit them. These foundational factors include the regulatory structures and environment, real estate, workforce and workforce programs, support networks and ecosystems, and other business resources.

ACTIONS

1.1. Build technical expertise and knowledge in target industry clusters among regional partners.

1.1.1. Designate regional partners to become experts in one or two clusters each and provide the following.

- Track industry news and trends, including capital flows and company activities, such as mergers and acquisitions.
- Maintain a database of players (e.g., entrepreneurs) and companies to watch.
- Engage virtually or in-person with relevant industry associations to gain in-depth industry intelligence.
- Research and anticipate skills changes and reskilling needs related to the clusters' workforces.
- Serve as a resource for regional partners in their area(s) of expertise.

1.1.2. Convene industry cluster representatives in the region to build relationships, gain additional knowledge of the cluster, and assess the clusters' collective needs.

1.1.3. Hold a university showcase to educate regional economic developers on the research and expertise housed at Colorado State University (CSU) and the University of Northern Colorado (UNC). This should include research centers, CSU Ventures, Monfort College at UNC, incubator and accelerator space.

1.1.4. Organize tours of other regional assets that support industry cluster growth.

1.1.5. Hold a periodic forum that explores industry trends in addition to other relevant trends and their future implications on the target clusters and the regional economy. This should be open to cluster representatives and economic developers.

1.1.6. Create a community of learning for the regional partners to network and share knowledge.

1.2. Ensure that a diverse inventory of sites (greenfield to shovel ready) is available in the region to accommodate growth in the target clusters.

1.2.1. Work with commercial brokers/developers, site selectors, and existing businesses in the target clusters to establish key features needed for sites to support growth in the target clusters. Each community can use the list of features to make sure it can accommodate these types of sites (e.g., zoning and permitted uses, infrastructure and capital improvements plans, land banking).

1.2.2. Maintain an inventory of premier sites in the region that will be marketed to prospects in the target clusters. For each of these sites, package relevant information, including zoning, infrastructure availability, utility availability, any environmental assessments, etc. For example, Entergy, South Carolina Power Team, and the Tennessee Valley Authority (TVA) all have good models of how sites can be presented and packaged.

1.2.3. Maintain an inventory of soft-landing sites for graduates of regional incubators and accelerator programs and work with these graduates to find homes in the region after graduation (see also Strategy 2.3.4).

1.3. Prioritize and leverage public infrastructure investments in strategic areas to encourage growth in target clusters.

1.3.1. Engage with regional planning departments and planning organizations to advocate for the prioritization of investments that will support growth in the target clusters.

1.3.2. Seek opportunities to leverage public infrastructure investments to enhance their economic development potential. For example, Dig Once policies can help promote the expansion of broadband infrastructure.

1.4. Ensure the talent pipeline is aligned in ways that can support growth in the target clusters.

- 1.4.1. Identify critical occupations in the target clusters.
- 1.4.2. Inventory education/training programs that train career-ready workers for these critical occupations.
- 1.4.3. Identify any gaps in the training infrastructure and seek ways to bridge these gaps.
- 1.4.4. Create and promote career pathways that support these critical occupations, including those that require a full range of postsecondary education from continuing education to bachelor's degrees and beyond.
- 1.4.5. Partner with workforce and education to build awareness of careers in the clusters, especially for occupations and training programs with low enrollment.

1.5. Scaffold and tend the entrepreneurial ecosystem to foster innovation, business formation, and entrepreneurial growth in the target clusters.

- 1.5.1. Enable the building of regional expertise in innovation and business formation related to the target clusters.
- 1.5.2. Develop a map of the assets that support and promote innovation and entrepreneurship in the region.
- 1.5.3. Identify any gaps in services or resources to support entrepreneurs.
- 1.5.4. Catalyze responses or efforts to bridge any gaps.
- 1.5.5. Encourage connectivity, coordination, and collaboration among the many assets of the ecosystem.
- 1.5.6. Serve as a champion, convener, and promoter of the ecosystem.
- 1.5.7. Partner with CSU, UNC, Front Range Community College, Aims Community College, and any other major sources of innovation to spur more entrepreneurial activity and growth in the target clusters.

1.6. Monitor the regulatory environment, business climate, and policies that affect cluster growth.

- 1.6.1. Uphold the regional code of ethics that reflects the current landscape, guides the regional initiative, and provides a protocol for referrals and prospect management.
- 1.6.2. Continue to advocate for policies that support employee housing and enhanced transportation infrastructure.
- 1.6.3. Monitor land use and building code regulations and ensure that these regulations support future growth in the industry clusters.
- 1.6.4. Conduct an environmental scan of regional issues, identify any legislative barriers or opportunities, and jointly advocate to resolve any barriers and capitalize on opportunities that are related to target clusters and/or emerging industries within them.

STRATEGY 2. ACTIVELY ENCOURAGE GROWTH IN SELECT CLUSTERS

With strong foundations for growth, efforts to encourage growth in the target clusters will likely have an amplified impact. These efforts to encourage growth among existing regional businesses, new business formation, and diversification in the target clusters will enable communities to influence and mold their future economies to meet their goals to support economic opportunity and resilience.

ACTIONS

2.1. Conduct ongoing strategic outreach to employers in the select clusters for business engagement/relationship building.

- 2.1.1. Train/educate staff across the region as business concierges to help connect businesses in the target clusters with needed resources.
- 2.1.2. Convene existing businesses in each of the target clusters to identify their collective needs and challenges. Establish a response team to respond to any shared needs that emerge, as necessary.
- 2.1.3. Work with other departments across the local governments who are regularly in contact with local businesses to ensure the consistent collection and reporting of information gleaned from business contacts and improve referrals to economic development from other departments. This could include utilities, business licensing, planning/development, and health. This could also include other organizations that work with businesses, such as the Small Business Development Center.
- 2.1.4. Prioritize outreach to the major local and regional players in the target industry clusters to forge strong relationships with them and keep a pulse on their needs. Leverage these relationships to make contacts with industry peers who could be interested in relocating to or expanding in the region.
- 2.1.5. Document and share common pain points and common business themes to better support a healthy business community with interventions and assistance, improving “how we respond to the knowledge we gain from our businesses to support industry.”
- 2.1.6. Continue to apply the industry sector partnership model to clusters that have shared pain points, strong industry champions, and a critical mass of businesses who want to collaborate.
  (Note: this model doesn’t have to focus only on workforce matters.)

2.2. Facilitate the connection of employers in the select clusters with skilled workers in the region.

- 2.2.1. Expand the sector partnership model to include other selected clusters.
- 2.2.2. Serve as an intermediary between employers who are seeking workers and potential workers to strengthen connections and talent alignment in the select clusters. This can be through industry-specific online job boards, career road trips and fairs, internships, etc.

2.3. Strengthen the development and retention of entrepreneurial talent in the region.

- 2.3.1. Facilitate relationship building between regional entrepreneurs in the target clusters and other areas with a critical mass of entrepreneurial activity, capital, and contacts.
- 2.3.2. Identify outside innovators and entrepreneurs and work to attract them to the region.
- 2.3.3. Develop and implement an entrepreneur-centered loyalty program designed to anchor entrepreneurs to the region.
- 2.3.4. Assist graduates of regional accelerators, coworking spaces, and incubators to ensure they are retained in the region and have access to the space and talent they need to grow.

2.4. Diversify the regional economy and clusters through selective and intentional lead generation, prospect management, and business assistance.

2.4.1. Put in place a system for distributing and managing leads and a regional prospect response protocol that lays out a structure and roles/responsibilities for regional partners, contributes to the “no wrong door” operating model, and establishes a single touchpoint for leads and prospects.

2.4.2. Create a front door for the region with an informative website and other marketing collateral that presents a unified front and message for the region as a point of entry for leads.

2.4.3. Craft talking points that articulate regional competitive advantages for each target industry cluster. Package and publish these messages in profiles that contain compelling datapoints about the industry and its regional talent base. These can be used to market the region at relevant events and support other lead generation activities.

2.4.4. Leverage the networks of business leaders and influencers in the target sectors to identify leads and communicate the regional competitive advantages to these leads.

2.4.5. Identify companies that could address specific supply chain needs and business-community identified gaps and reach out to these companies to share relevant information and advantages of a Northern Colorado location.

2.4.6. Identify companies in target clusters that could benefit from the region’s unique geography/assets and reach out to these companies to share relevant information and advantages of a Northern Colorado location.

2.4.7. Utilize regional convention and visitors bureaus to reach external audiences and attract conferences that are relevant to the target clusters. At the conferences, take the opportunity to share relevant information and offer regional familiarization tours to interested attendees.

STRATEGY 3. COMMUNICATE THE IMPORTANCE OF AND SUCCESSES IN SELECT CLUSTERS

A communication strategy will be integral to building stakeholder support for the initiative among key audiences across the region. It will also be essential to creating a regional brand in the selected industry clusters in front of a wider, global audience of corporate decision-makers.

ACTIONS

3.1. Educate community leaders, elected officials, and general stakeholders about the importance of industry clusters and the benefit of the regional approach to industry cluster development.

- 3.1.1. Improve and build the language and storytelling to explain the principles, rationale, and value of the industry cluster approach to economic development—the spillover effects, multipliers, and intangible benefits.
- 3.1.2. Further develop concise flyers and a slide deck that can be used by regional partners in their efforts to build their community's knowledge and support for the regional cluster initiative.
- 3.1.3. Coordinate a regional outreach plan to ensure each community has the long-term political support needed for the cluster initiative.

3.2. Celebrate the successes of the regional cluster initiative.

- 3.2.1. Maintain a log of individual successes that includes rich descriptions and documents outcomes in addition to any press related to successful activities.
- 3.2.2. Track and report collective outcomes for the regional initiative.
- 3.2.3. Share these successes and outcomes on the NoCo REDI website and in educational/outreach activities.

3.3. Establish and promote the brands of the regional clusters.

- 3.3.1. Continue to build out the asset inventory, key advantages, and regional value proposition for each regional cluster.
- 3.3.2. Distribute the cluster profiles (See Strategy 2.4.3) to key stakeholders and make sure they understand the features of the NoCo clusters that distinguish them from other regions.
- 3.3.3. Pursue an earned media strategy to build a brand for the region around the selected clusters and to market the region to corporate decision-makers in these clusters.

3.4. Build awareness of career opportunities in select clusters to strengthen talent pipelines and alignment.

- 3.4.1. Develop and launch online cluster-specific resources that can inform potential workers of career opportunities in select clusters.
- 3.4.2. Through sector partnerships, create cluster ambassador programs that engage industry representatives in career awareness and exploration activities.

Appendix 1. CASE STUDIES

To illustrate how the strategies can be put in place, three case studies are included in this section. These cases illustrate how cluster-related activities might be driven by municipalities, private industry-led efforts, or broad coalitions.

In the first case study, the town of McKinney, Texas, which lies in the northern exurban area of the Dallas-Fort Worth Metroplex, put planning and land-use tools in place in the 1990s. This planning paved the way for infrastructure investments and industry cluster development that has happened over the course of the past 30 years. This case study provides an example of how different parts of Strategy 1 can help set the stage for future growth in some of the smaller, exurban and rural communities in NoCo REDI.

The second example is the Central Indiana Corporate Partnership, which was established in 1999 by regional CEOs to transition the region into the next century. The partnership embraced a model that united the private, public (including higher education), and philanthropic sectors around six initiatives to develop specific industry clusters. This example demonstrates the importance of industry engagement and specificity in industry cluster work and provides a model and sample structure for regional collaboration.

The third example is in St. Louis, Missouri, where BioSTL has led the strengthening of the innovation ecosystem in support of the agtech cluster. BioSTL includes a coalition of 50 leaders and is anchored by two dynamic organizations that provide leadership grounded in deep industry expertise. The BioSTL case study provides a solid example of innovation-led industry cluster work, which will likely be an important component of the NoCo REDI collaboration.

PLANNING FOR FUTURE BUSINESS GROWTH

MCKINNEY, TEXAS

In 1990, the city of McKinney designated a 4,200-acre area as the Regional Employment Center (REC) in its future land-use plan. The area is located on Highway 121, which connects McKinney with the Dallas/Fort Worth International Airport. At the time, McKinney was a town of 21,283 and a bedroom community for commuters working in Dallas and Plano. The city recognized the future commercial value of the REC as being a direct connection to the region's largest airport, and it recognized the need for the city to deliberately work to become a complete community with opportunities for residents to live, work, and play.

By 2000, McKinney had grown to 54,369 and many of these residents commuted outside of the city for work, and the REC area remained largely undeveloped. In the early 2000s, a developer created a 2,200-acre mixed-use master-planned community that incorporated much of the REC. Because of the overlay district at the REC and the infrastructure put in place, the developer integrated employment centers into the design and build-out strategy of Craig Ranch.

In 2009, Hwy 121 was expanded and became a 12-lane tollway, which greatly enhanced the commercial value of the land designated for employment centers. Over the years, Craig Ranch had strategically attracted key anchors to the development to provide employment opportunities and amenities for residents. In 2010, Craig Ranch announced a partnership with KDC (a national real estate development and investment company) to develop part of the REC into a 185-acre corporate employment district. The city of McKinney has designated the district as the city's corporate center and participated in funding infrastructure. The McKinney Economic Development Corporation has supported the corporate center through its industry cluster program that guides its marketing and business recruitment efforts. It has also supported the corporate center through its contribution of economic incentives for specific projects, such as a hotel and conference center.

By 2017, McKinney's population was 181,117. Had the pieces not been put into place to preserve these employment centers, the prime land would likely be strictly residential, and the highway frontage parcels would be retail-oriented uses rather than primary employment uses. After almost 30 years, the market is catching up. The corporate center is now home to the headquarters for Independent Financial (previously Independent Bank), a technology center for Barclays, HUB 121, and a headquarters for Traxxas.

ESTABLISHING A STRUCTURE FOR REGIONAL COLLABORATION IN INDUSTRY CLUSTER DEVELOPMENT

INDIANAPOLIS REGION, INDIANA

The Central Indiana Corporate Partnership (CICP) was founded in 1999 "to bring together the chief executives of Central Indiana's prominent corporations, foundations and universities in a strategic and collaborative effort dedicated to the region's continued prosperity and growth." Founded as a CEO-led organization, the CICP recognizes the important role of industry leaders in close coordination with higher education, philanthropy, and other public sector partners. The CICP functions as a holding company for robust talent and industry cluster initiatives, each of which are distinct interventions that are tailored to the specific needs of their cluster. These initiatives were launched gradually between 2003 and 2015. Some of these initiatives center on unique industry verticals (e.g., BioCrossroads and Energy Systems Network), while others are focused on cross-industry needs (e.g., Ascend Indiana—a talent initiative aimed at addressing the skills gap).

FIGURE 2. CICP CLUSTER INITIATIVES

Source: CICP Annual Report, 2018.

In general, the CICP has followed a strategic process for the design and launch of these initiatives. First, the CICP leads rigorous research and intelligence gathering to inform each of the industry interventions. Armed with a deep understanding of the needs and challenges of the cluster, the CICP leads the development of business plans that then guide the establishment of the initiatives in partnership with a range of stakeholders that include the private, public, higher education, and philanthropic sectors.

An important factor of the success of the CICP is the board of directors. The CICP has assembled chief executives of the region's most important, well-endowed companies, education and research institutions, and philanthropic organizations. Through its rigorous process, the CICP is able to secure the buy-in of its board members and tap into the board's willingness to commit resources toward successful implementation. Another important factor is the CICP staff and the leadership of the individual initiatives. CICP has hired industry experts who have a history of success in the industry and understand the public sector. The staff includes project-driven, outcome-oriented individuals with skills akin to management consultants. The competence of the staff and leadership has ensured value to the board, which keeps the board engaged at a high level, contributing to the success of the initiatives. The third factor is the ability of the CICP to secure significant resources to support its work through the support of the Lilly Endowment and the regional business community.

A detailed case study can be found at: https://www.brookings.edu/wp-content/uploads/2018/07/201807_Brookings-Metro_Rethinking-Clusters-Initiatives_CICP.pdf.

INNOVATION-LED CLUSTER DEVELOPMENT

ST. LOUIS, MISSOURI

The BioSTL Coalition was founded in 2001 and includes top academic, civic, philanthropic, and scientific leaders. BioSTL focuses on the agtech cluster; its leadership brings expertise that drives research, innovation, and entrepreneurship to advance economic development and commercial success in the cluster. It consists of a coalition of 50 cluster leaders who set the strategic vision of the cluster and foster a collaborative, trustful environment. The backbone and anchors of the coalition are BioSTL staff and the Donald Danforth Plant Science Center at Washington University.

The organization has embraced a multifaceted, integrated approach to cluster development through entrepreneurship. This approach emphasizes fostering a strong ecosystem that facilitates and encompasses commercialization of discoveries, startup creation, investment capital, capable entrepreneurs, innovation spaces, and supportive public policy.

The cultivation of an ecosystem has been accompanied by the creation of a physical hub—the Cortex—which is an urban innovation district. The development of the physical hub culminated in the openings of the new BioSTL headquarters in 2019 in a reimagined, historic building in the Cortex. This brings all the BioSTL programming under one roof.

BioSTL includes the following components.

- **BioGenerator:** the investment arm of BioSTL that invests in early-stage biotech.
- **BioGenerator Labs:** a shared lab space that supports a community of bioscience innovators.
- **Talent Development:** an entrepreneur-in-residence program, an entrepreneur development program, and an inclusion initiative.
- **GlobalSTL:** a targeted business attraction initiative aimed at enriching and expanding St. Louis innovation economy.
- **Public-Policy Advocacy:** an organized, unified voice that represents St. Louis innovation stakeholders.

The involvement of BioSTL and the Danforth center brings deep industry expertise that informs the strategic direction and priorities for the cluster. These organizations take the lead on advocating for the cluster and educating the region about the importance of the cluster. The regional economic development organizations have participated by ensuring that their resources are deployed in support of the cluster. The deep expertise that the two anchor organizations bring is one key to the success of the initiative.

Another important key to success is the long-term commitment to building the cluster. The industry has been a focus of the region for nearly 20 years. The leadership recognizes that developing the cluster to self-sufficiency takes more than 20 years. However, the efforts have led to significant growth in the sector and national recognition of the cluster as an agtech hub. This is exemplified by the recent decision of the Bill & Melinda Gates Foundation to establish the headquarters of its new agriculture nonprofit in St. Louis.

For more information, visit: www.biostl.org.

Appendix 2. INDUSTRY CLUSTER DEFINITIONS

NoCo REDI began the cluster identification process using the US Cluster Mapping industry cluster definitions. Through an interactive workshop process that incorporated quantitative and qualitative data, the group refined the cluster definitions to be more relevant to the Northern Colorado economy.

Clusters are defined by unique codes associated with the North American Industry Classification System (NAICS) that are not reused across cluster definitions. Decisions to include or exclude a NAICS industry were made at the US Cluster Mapping subcluster definition level. In the tables in this appendix, NAICS are presented within their respective subclusters.

CLUSTERS FOR GROWTH STRATEGY

BIOSCIENCE AND MEDICAL DEVICES
Biological Products
325414 Biological Product (except Diagnostic) Manufacturing
Biopharmaceutical Products
325411 Medicinal and Botanical Manufacturing
325412 Pharmaceutical Preparation Manufacturing
Research and Development in Biotechnology (except Nanobiotechnology)
541714 Research and Development in Biotechnology (except Nanobiotechnology)
Medical Apparatus
334510 Electromedical and Electrotherapeutic Apparatus Manufacturing
334517 Irradiation Apparatus Manufacturing
Optical Instruments and Ophthalmic Goods
339115 Ophthalmic Goods Manufacturing
333314 Optical Instrument and Lens Manufacturing
Surgical and Dental Instruments and Supplies
339114 Dental Equipment and Supplies Manufacturing
339112 Surgical and Medical Instrument Manufacturing
339113 Surgical Appliance and Supplies Manufacturing

This cluster is composed of selected subclusters from the US Cluster Mapping: Biopharmaceuticals, Education and Knowledge Creation, Information Technology and Analytical Instruments, and Medical Devices cluster definitions.

DISTRIBUTION AND E-COMMERCE	
Electronic and Catalog Shopping	
425110	Business to Business Electronic Markets
454110	Electronic Shopping and Mail-Order Houses
Rental and Leasing	
532411	Commercial Air, Rail, and Water Transportation Equipment Rental and Leasing
532412	Construction, Mining, and Forestry Machinery and Equipment Rental and Leasing
532420	Office Machinery and Equipment Rental and Leasing
532490	Other Commercial and Industrial Machinery and Equipment Rental and Leasing
Support Services	
561499	All Other Business Support Services
561910	Packaging and Labeling Services
Warehousing and Storage	
493110	General Warehousing and Storage
493190	Other Warehousing and Storage
493120	Refrigerated Warehousing and Storage
Wholesale of Apparel and Accessories	
424340	Footwear Merchant Wholesalers
424320	Men's and Boys' Clothing and Furnishings Merchant Wholesalers
424310	Piece Goods, Notions, and Other Dry Goods Merchant Wholesalers
424330	Women's, Children's, and Infants' Clothing and Accessories Merchant Wholesalers
Wholesale of Books, Periodicals, and Newspapers	
424920	Book, Periodical, and Newspaper Merchant Wholesalers
Wholesale of Chemical and Allied Products	
424690	Other Chemical and Allied Products Merchant Wholesalers
424610	Plastics Materials and Basic Forms and Shapes Merchant Wholesalers
Wholesale of Construction and Mining Machinery and Equipment	
423810	Construction and Mining (except Oil Well) Machinery and Equipment Merchant Wholesalers
Wholesale of Drugs and Druggists' Sundries	
424210	Drugs and Druggists' Sundries Merchant Wholesalers
Wholesale of Electrical and Electronic Goods	
423610	Electrical Apparatus and Equipment, Wiring Supplies, and Related Equipment Merchant Wholesalers
423620	Household Appliances, Electric Housewares, and Consumer Electronics Merchant Wholesalers
423690	Other Electronic Parts and Equipment Merchant Wholesalers
Wholesale of Farm and Garden Machinery and Equipment	
423820	Farm and Garden Machinery and Equipment Merchant Wholesalers
Wholesale of Farm Products and Supplies	
493130	Farm Product Warehousing and Storage
424910	Farm Supplies Merchant Wholesalers
424930	Flower, Nursery Stock, and Florists' Supplies Merchant Wholesalers
424590	Other Farm Product Raw Material Merchant Wholesalers
424940	Tobacco and Tobacco Product Merchant Wholesalers
Wholesale of Food Products	
424460	Fish and Seafood Merchant Wholesalers
424480	Fresh Fruit and Vegetable Merchant Wholesalers

DISTRIBUTION AND E-COMMERCE
424470 Meat and Meat Product Merchant Wholesalers
424440 Poultry and Poultry Product Merchant Wholesalers
424820 Wine and Distilled Alcoholic Beverage Merchant Wholesalers
Wholesale of Furniture and Home Furnishing
423210 Furniture Merchant Wholesalers
423220 Home Furnishing Merchant Wholesalers
Wholesale of Industrial Machinery, Equipment, and Supplies
423830 Industrial Machinery and Equipment Merchant Wholesalers
423840 Industrial Supplies Merchant Wholesalers
Wholesale of Jewelry, Watches, Precious Stones, and Precious Metals
423940 Jewelry, Watch, Precious Stone, and Precious Metal Merchant Wholesalers
Wholesale of Metals and Minerals (except Petroleum)
423520 Coal and Other Mineral and Ore Merchant Wholesalers
423510 Metal Service Centers and Other Metal Merchant Wholesalers
Wholesale of Other Merchandise
424990 Other Miscellaneous Nondurable Goods Merchant Wholesalers
424950 Paint, Varnish, and Supplies Merchant Wholesalers
Wholesale of Paper and Paper Products
424130 Industrial and Personal Service Paper Merchant Wholesalers
424110 Printing and Writing Paper Merchant Wholesalers
424120 Stationery and Office Supplies Merchant Wholesalers
Wholesale of Petroleum and Petroleum Products
424720 Petroleum and Petroleum Products Merchant Wholesalers (except Bulk Stations and Terminals)
424710 Petroleum Bulk Stations and Terminals
Wholesale of Professional and Commercial Equipment and Supplies
423430 Computer and Computer Peripheral Equipment and Software Merchant Wholesalers
423450 Medical, Dental, and Hospital Equipment and Supplies Merchant Wholesalers
423420 Office Equipment Merchant Wholesalers
423460 Ophthalmic Goods Merchant Wholesalers
423440 Other Commercial Equipment Merchant Wholesalers
423490 Other Professional Equipment and Supplies Merchant Wholesalers
423410 Photographic Equipment and Supplies Merchant Wholesalers
Wholesale of Service Establishment Equipment, and Supplies
423850 Service Establishment Equipment and Supplies Merchant Wholesalers
Wholesale of Sporting and Recreational Goods and Supplies
423910 Sporting and Recreational Goods and Supplies Merchant Wholesalers
Wholesale of Toy and Hobby Goods and Supplies
423920 Toy and Hobby Goods and Supplies Merchant Wholesalers
Wholesale of Transportation Equipment and Supplies (except Motor Vehicles)
423860 Transportation Equipment and Supplies (except Motor Vehicle) Merchant Wholesalers
Wholesale Trade Agents and Brokers
425120 Wholesale Trade Agents and Brokers

This cluster maps directly to the US Cluster Mapping definition.

FABRICATION AND PRODUCTION TECHNOLOGY MANUFACTURING	
Fasteners	
332722	Bolt, Nut, Screw, Rivet, and Washer Manufacturing
332721	Precision Turned Product Manufacturing
Hand Tools	
333991	Power-Driven Handtool Manufacturing
Machine Tools and Accessories	
333515	Cutting Tool and Machine Tool Accessory Manufacturing
333517	Machine Tool Manufacturing
Metal Processing (MT)	
327910	Abrasive Product Manufacturing
332813	Electroplating, Plating, Polishing, Anodizing, and Coloring
332812	Metal Coating, Engraving (except Jewelry and Silverware), and Allied Services to Manufacturers
332811	Metal Heat Treating
332313	Plate Work Manufacturing
Metalworking Machinery	
333511	Industrial Mold Manufacturing
333519	Rolling Mill and Other Metalworking Machinery Manufacturing
333514	Special Die and Tool, Die Set, Jig, and Fixture Manufacturing
333992	Welding and Soldering Equipment Manufacturing
Agricultural and Construction Machinery and Components	
333120	Construction Machinery Manufacturing
333111	Farm Machinery and Equipment Manufacturing
333112	Lawn and Garden Tractor and Home Lawn and Garden Equipment Manufacturing
333613	Mechanical Power Transmission Equipment Manufacturing
333131	Mining Machinery and Equipment Manufacturing
333618	Other Engine Equipment Manufacturing
336510	Railroad Rolling Stock Manufacturing
333612	Speed Changer, Industrial High-Speed Drive, and Gear Manufacturing
333611	Turbine and Turbine Generator Set Units Manufacturing
Air Handling Equipment	
333415	Air-Conditioning and Warm Air Heating Equipment and Commercial and Industrial Refrigeration Equipment Manufacturing
333414	Heating Equipment (except Warm Air Furnaces) Manufacturing
333413	Industrial and Commercial Fan and Blower and Air Purification Equipment Manufacturing
Commercial and Service Industry Machinery	
333318	Other Commercial and Service Industry Machinery Manufacturing
Industrial Machinery	
333999	All Other Miscellaneous General Purpose Machinery Manufacturing
333241	Food Product Machinery Manufacturing
333249	Other Industrial Machinery Manufacturing
333993	Packaging Machinery Manufacturing
333244	Printing Machinery and Equipment Manufacturing
333243	Sawmill, Woodworking, and Paper Machinery Manufacturing
Measuring, Dispensing, and Other Pumping Equipment Manufacturing	
333914	Measuring, Dispensing, and Other Pumping Equipment Manufacturing

FABRICATION AND PRODUCTION TECHNOLOGY MANUFACTURING	
Moving and Material Handling Equipment	
333922	Conveyor and Conveying Equipment Manufacturing
333921	Elevator and Moving Stairway Manufacturing
333924	Industrial Truck, Tractor, Trailer, and Stacker Machinery Manufacturing
333923	Overhead Traveling Crane, Hoist, and Monorail System Manufacturing
Process Equipment and Components	
333912	Air and Gas Compressor Manufacturing
332991	Ball and Roller Bearing Manufacturing
333995	Fluid Power Cylinder and Actuator Manufacturing
333996	Fluid Power Pump and Motor Manufacturing
332912	Fluid Power Valve and Hose Fitting Manufacturing
339991	Gasket, Packing, and Sealing Device Manufacturing
333994	Industrial Process Furnace and Oven Manufacturing
332911	Industrial Valve Manufacturing
332919	Other Metal Valve and Pipe Fitting Manufacturing
333997	Scale and Balance Manufacturing

This cluster is composed of two US Cluster Mapping clusters: Production Technology and Heavy Machinery and Metalworking Technology.

FOOD PROCESSING AND MANUFACTURING+	
Animal Foods	
311111	Dog and Cat Food Manufacturing
311119	Other Animal Food Manufacturing
Baked Goods	
311230	Breakfast Cereal Manufacturing
311821	Cookie and Cracker Manufacturing
311824	Dry Pasta, Dough, and Flour Mixes Manufacturing from Purchased Flour
311211	Flour Milling
311813	Frozen Cakes, Pies, and Other Pastries Manufacturing
311919	Other Snack Food Manufacturing
311830	Tortilla Manufacturing
Candy and Chocolate	
311351	Chocolate and Confectionery Manufacturing from Cacao Beans
311352	Confectionery Manufacturing from Purchased Chocolate
311340	Nonchocolate Confectionery Manufacturing
Coffee and Tea	
311920	Coffee and Tea Manufacturing
Dairy Products	
311513	Cheese Manufacturing
311512	Creamery Butter Manufacturing
311514	Dry, Condensed, and Evaporated Dairy Product Manufacturing
311511	Fluid Milk Manufacturing
311520	Ice Cream and Frozen Dessert Manufacturing
Distilleries	
312140	Distilleries
Farm Wholesalers	
424510	Grain and Field Bean Merchant Wholesalers
Glass Containers	
327213	Glass Container Manufacturing
Malt Beverages	
312120	Breweries
311213	Malt Manufacturing
Milling and Refining of Cereals and Oilseeds	
311225	Fats and Oils Refining and Blending
311212	Rice Milling
311224	Soybean and Other Oilseed Processing
311221	Wet Corn Milling
Milling and Refining of Sugar	
311313	Beet Sugar Manufacturing
311314	Cane Sugar Manufacturing
Packaged Fruit and Vegetables	
311423	Dried and Dehydrated Food Manufacturing
311411	Frozen Fruit, Juice, and Vegetable Manufacturing
311421	Fruit and Vegetable Canning

FOOD PROCESSING AND MANUFACTURING+	
311911	Roasted Nuts and Peanut Butter Manufacturing
Soft Drinks and Ice	
312112	Bottled Water Manufacturing
312113	Ice Manufacturing
312111	Soft Drink Manufacturing
Specialty Foods and Ingredients	
311999	All Other Miscellaneous Food Manufacturing
311930	Flavoring Syrup and Concentrate Manufacturing
311412	Frozen Specialty Food Manufacturing
311941	Mayonnaise, Dressing, and Other Prepared Sauce Manufacturing
311991	Perishable Prepared Food Manufacturing
311422	Specialty Canning
311942	Spice and Extract Manufacturing
Wineries	
312130	Wineries
Meat Processing	
311611	Animal (except Poultry) Slaughtering
311612	Meat Processed from Carcasses
311615	Poultry Processing
311613	Rendering and Meat Byproduct Processing

This cluster is composed of the Food Processing and Manufacturing US Cluster Mapping cluster and a subcluster from the Livestock Processing cluster.

INFORMATION TECHNOLOGY+	
Computer Services	
541513	Computer Facilities Management Services
541512	Computer Systems Design Services
541511	Custom Computer Programming Services
518210	Data Processing, Hosting, and Related Services
541519	Other Computer Related Services
Audio and Video Equipment	
334310	Audio and Video Equipment Manufacturing
Computers and Peripherals	
334112	Computer Storage Device Manufacturing
334118	Computer Terminal and Other Computer Peripheral Equipment Manufacturing
334111	Electronic Computer Manufacturing
333316	Photographic and Photocopying Equipment Manufacturing
Electronic Components	
334412	Bare Printed Circuit Board Manufacturing
334416	Capacitor, Resistor, Coil, Transformer, and Other Inductor Manufacturing
334417	Electronic Connector Manufacturing
334419	Other Electronic Component Manufacturing
334418	Printed Circuit Assembly (Electronic Assembly) Manufacturing
Process and Laboratory Instruments	
334516	Analytical Laboratory Instrument Manufacturing
334512	Automatic Environmental Control Manufacturing for Residential, Commercial, and Appliance Use
334515	Instrument Manufacturing for Measuring and Testing Electricity and Electrical Signals
334513	Instruments and Related Products Manufacturing for Measuring, Displaying, and Controlling Industrial Process Variables
334519	Other Measuring and Controlling Device Manufacturing
334514	Totalizing Fluid Meter and Counting Device Manufacturing
Semiconductors	
334413	Semiconductor and Related Device Manufacturing
333242	Semiconductor Machinery Manufacturing
Software Publishers	
511210	Software Publishers
Software Reproducing	
334613	Blank Magnetic and Optical Recording Media Manufacturing
334614	Software and Other Prerecorded Compact Disc, Tape, and Record Reproducing

This cluster is composed of selected subclusters from the US Cluster Mapping clusters: Business Services and Information Technology and Analytical Instruments.

PLASTICS	
Plastic Materials and Resins	
326130	Laminated Plastics Plate, Sheet (except Packaging), and Shape Manufacturing
325211	Plastics Material and Resin Manufacturing
326112	Plastics Packaging Film and Sheet (including Laminated) Manufacturing
326113	Unlaminated Plastics Film and Sheet (except Packaging) Manufacturing
326121	Unlaminated Plastics Profile Shape Manufacturing
Plastic Products	
326199	All Other Plastics Product Manufacturing
339994	Broom, Brush, and Mop Manufacturing
326111	Plastics Bag and Pouch Manufacturing
326160	Plastics Bottle Manufacturing
326122	Plastics Pipe and Pipe Fitting Manufacturing
326191	Plastics Plumbing Fixture Manufacturing
326140	Polystyrene Foam Product Manufacturing
326150	Urethane and Other Foam Product (except Polystyrene) Manufacturing

This cluster maps directly to the US Cluster Mapping definition.

OTHER REGIONALLY IMPORTANT CLUSTERS

AGRICULTURAL PRODUCTION, INPUTS, AND SERVICES	
Agricultural Production	
112000	Animal Production
111000	Crop Production
Agricultural Services	
115111	Cotton Ginning
115113	Crop Harvesting, Primarily by Machine
115114	Postharvest Crop Activities (except Cotton Ginning)
115112	Soil Preparation, Planting, and Cultivating
115210	Support Activities for Animal Production
Farm Management and Labor Services	
115115	Farm Labor Contractors and Crew Leaders
115116	Farm Management Services
Fertilizers	
325314	Fertilizer (Mixing Only) Manufacturing
325311	Nitrogenous Fertilizer Manufacturing

This cluster maps directly to the US Cluster Mapping definition for Agricultural Inputs and Services and includes Agricultural Production.

CONSTRUCTION+	
Construction	
236210	Industrial Building Construction
237120	Oil and Gas Pipeline and Related Structures Construction
237990	Other Heavy and Civil Engineering Construction
237130	Power and Communication Line and Related Structures Construction
Construction Components	
327999	All Other Miscellaneous Nonmetallic Mineral Product Manufacturing
327310	Cement Manufacturing
327331	Concrete Block and Brick Manufacturing
327332	Concrete Pipe Manufacturing
327991	Cut Stone and Stone Product Manufacturing
327420	Gypsum Product Manufacturing
327410	Lime Manufacturing
327993	Mineral Wool Manufacturing
Construction Materials	
324121	Asphalt Paving Mixture and Block Manufacturing
324122	Asphalt Shingle and Coating Materials Manufacturing
Construction Products	
332996	Fabricated Pipe and Pipe Fitting Manufacturing
332420	Metal Tank (Heavy Gauge) Manufacturing
332913	Plumbing Fixture Fitting and Trim Manufacturing
332410	Power Boiler and Heat Exchanger Manufacturing
Water, Sewage, and Other Systems	
221330	Steam and Air-Conditioning Supply
221310	Water Supply and Irrigation Systems
Construction Materials Wholesaling	
423320	Brick, Stone, and Related Construction Material Merchant Wholesalers
423310	Lumber, Plywood, Millwork, and Wood Panel Merchant Wholesalers
423390	Other Construction Material Merchant Wholesalers
423330	Roofing, Siding, and Insulation Material Merchant Wholesalers
Highway and Street Construction	
237310	Highway, Street, and Bridge Construction
Water and Sewer Line Construction	
237110	Water and Sewer Line and Related Structures Construction

This cluster is composed of selected subclusters from the US Cluster Mapping: Construction Products and Services and Local Real Estates, Construction, and Development cluster definitions.

EDUCATION AND KNOWLEDGE CREATION
Colleges, Universities, and Professional Schools
611310 Colleges, Universities, and Professional Schools
903612 Colleges, Universities, and Professional Schools (Local Government)
902612 Colleges, Universities, and Professional Schools (State Government)
611210 Junior Colleges
Educational Support Services
611710 Educational Support Services
Professional Organizations
813920 Professional Organizations
Research and Development in Nanotechnology
541713 Research and Development in Nanotechnology
Research and Development in the Physical, Engineering, and Life Sciences (except Nanotechnology and Biotechnology)
541715 Research and Development in the Physical, Engineering, and Life Sciences (except Nanotechnology and Biotechnology)
Research Organizations
541720 Research and Development in the Social Sciences and Humanities
Training Programs
611699 All Other Miscellaneous Schools and Instruction
903619 All Other Schools and Educational Support Services (Local Government)
902619 All Other Schools and Educational Support Services (State Government)
611513 Apprenticeship Training
611410 Business and Secretarial Schools
611420 Computer Training
611691 Exam Preparation and Tutoring
611512 Flight Training
611630 Language Schools
611430 Professional and Management Development Training

This cluster contains selected subclusters from the US Cluster Mapping Education and Knowledge Creation cluster.

ENERGY
Alternative Electric Power
221117 Biomass Electric Power Generation
221116 Geothermal Electric Power Generation
221111 Hydroelectric Power Generation
221113 Nuclear Electric Power Generation
221118 Other Electric Power Generation
221114 Solar Electric Power Generation
221115 Wind Electric Power Generation
Electric Power Transmission
221121 Electric Bulk Power Transmission and Control
Fossil Fuel Electric Power
221112 Fossil Fuel Electric Power Generation
Electric Power Distribution
221122 Electric Power Distribution
Heating Oil and Other Fuel Dealers
454310 Fuel Dealers
Natural Gas Distribution
221210 Natural Gas Distribution
Drilling Wells
213111 Drilling Oil and Gas Wells
Oil and Gas Extraction
211120 Crude Petroleum Extraction
211130 Natural Gas Extraction
Oil and Gas Machinery
333132 Oil and Gas Field Machinery and Equipment Manufacturing
Petroleum Processing
324199 All Other Petroleum and Coal Products Manufacturing
324110 Petroleum Refineries
Pipeline Transportation
486990 All Other Pipeline Transportation
486110 Pipeline Transportation of Crude Oil
486210 Pipeline Transportation of Natural Gas
486910 Pipeline Transportation of Refined Petroleum Products
Support Activities for Oil and Gas Operations
541360 Geophysical Surveying and Mapping Services
213112 Support Activities for Oil and Gas Operations

This cluster is composed of US Cluster Mapping clusters: Oil and Gas Production and Transportation, Electric Power Generation and Transmission, and Local Utilities.

HOSPITALITY AND TOURISM	
Accommodations and Related Services	
721199	All Other Traveler Accommodation
721191	Bed-and-Breakfast Inns
721120	Casino Hotels
561591	Convention and Visitors Bureaus
721110	Hotels (except Casino Hotels) and Motels
721310	Rooming and Boarding Houses, Dormitories, and Workers' Camps
721211	RV (Recreational Vehicle) Parks and Campgrounds
Amusement Parks and Arcades	
713110	Amusement and Theme Parks
713120	Amusement Arcades
Cultural and Educational Entertainment	
453920	Art Dealers
712120	Historical Sites
712110	Museums
712190	Nature Parks and Other Similar Institutions
712130	Zoos and Botanical Gardens
Gambling Facilities	
713210	Casinos (except Casino Hotels)
713290	Other Gambling Industries
Other Tourism Attractions	
713990	All Other Amusement and Recreation Industries
114210	Hunting and Trapping
713930	Marinas
721214	Recreational and Vacation Camps (except Campgrounds)
713920	Skiing Facilities
Recreational Goods Rental	
532284	Recreational Goods Rental
Spectator Sports	
711219	Other Spectator Sports
711212	Racetracks
711211	Sports Teams and Clubs
Tourism Related Services	
561599	All Other Travel Arrangement and Reservation Services
487110	Scenic and Sightseeing Transportation, Land
487990	Scenic and Sightseeing Transportation, Other
487210	Scenic and Sightseeing Transportation, Water
561520	Tour Operators
561510	Travel Agencies

This cluster maps directly to the US Cluster Mapping definition.

LOCAL HEALTH SERVICES	
Drug Stores	
446110	Pharmacies and Drug Stores
Funeral Service and Crematories	
812220	Cemeteries and Crematories
812210	Funeral Homes and Funeral Services
Healthcare Provider Offices	
621999	All Other Miscellaneous Ambulatory Health Care Services
621498	All Other Outpatient Care Centers
621991	Blood and Organ Banks
621410	Family Planning Centers
621493	Freestanding Ambulatory Surgical and Emergency Centers
621491	HMO Medical Centers
621492	Kidney Dialysis Centers
621399	Offices of All Other Miscellaneous Health Practitioners
621310	Offices of Chiropractors
621210	Offices of Dentists
621330	Offices of Mental Health Practitioners (except Physicians)
621320	Offices of Optometrists
621340	Offices of Physical, Occupational and Speech Therapists, and Audiologists
621111	Offices of Physicians (except Mental Health Specialists)
621112	Offices of Physicians, Mental Health Specialists
621391	Offices of Podiatrists
621420	Outpatient Mental Health and Substance Abuse Centers
Home and Residential Care	
623312	Assisted Living Facilities for the Elderly
623311	Continuing Care Retirement Communities
621610	Home Health Care Services
623110	Nursing Care Facilities (Skilled Nursing Facilities)
623990	Other Residential Care Facilities
623210	Residential Intellectual and Developmental Disability Facilities
623220	Residential Mental Health and Substance Abuse Facilities
Home Health Equipment Rental	
532283	Home Health Equipment Rental
Hospitals	
622110	General Medical and Surgical Hospitals
903622	Hospitals (Local Government)
902622	Hospitals (State Government)
622210	Psychiatric and Substance Abuse Hospitals
622310	Specialty (except Psychiatric and Substance Abuse) Hospitals
Medical Laboratories	
339116	Dental Laboratories
621512	Diagnostic Imaging Centers
621511	Medical Laboratories
Optical Goods Retailing	
446130	Optical Goods Stores

This cluster maps directly to the US Cluster Mapping definition.

Appendix 3. GROWTH CLUSTER PROFILES

For each of the selected clusters that are part of the cluster growth strategy, this appendix presents a description of the subclusters and types of businesses within Northern Colorado that appear in these clusters. It also shares selected economic statistics broken out by subcluster to show the current balance of the Northern Colorado business and employment portfolio for each cluster. Overall comparisons of clusters are presented in Figure 1 on page 4. The profiles provide a list of representative companies, which include a blend of local anchors, startups, and other businesses that are examples of the types of businesses and range of business activity within the regional cluster. Additionally, there is a list of regional assets that relate to business ecosystem supports directly relevant to a cluster.

NoCo REDI views the strengths of regional clusters both within and between clusters. A cluster's strength is based on the businesses, employment, and economic contributions for business activities centrally grounded within the industry cluster definition, and also the strengths of the activities and opportunities that occur at the intersections of different industries or clusters. Linkages to other clusters within the region are summarized and presented graphically in Appendix 3. NAICS-based definitions of the 12 clusters and their subclusters are presented in Appendix 1. This report mentions linkages to some clusters that are not defined within this report. Those clusters were not explored as candidates for this cluster-growth strategy and their definitions can be found in the US Cluster Mapping Project methodology.

BIOSCIENCE AND MEDICAL DEVICES

Broadly, this cluster includes industries that are involved in the development and manufacturing of biological and biopharmaceutical products in addition to medical devices.

Within Northern Colorado, this cluster shares strong links to Agricultural Inputs and Services, Education & Knowledge Creation, Food Processing & Manufacturing+, Information Technology+, Fabrication & Production Technology Manufacturing, and Plastics.

A particularly strong niche industry defined by Northern Colorado's unique portfolio of companies and institutions in Northern Colorado is related to animal health and translational medicine. Multiple manufacturers in this space utilize or produce innovative plastics. Multiple manufacturers have activities that include 3D printing technologies.

In two counties of Northern Colorado, businesses are generally small or they represent relatively small operations of much larger national or international firms. However, large pharmaceutical and medical device companies have a greater presence in adjacent counties and the Denver Metro.

FIGURE 3. OVERVIEW BY SUBCLUSTER

SUBCLUSTER	JOBS 2018	GROWTH 2013–2018	PROJECTED GROWTH 2018–2023	LQ	PAYROLLED BUSINESS LOCATIONS	GDP IN $MILLIONS	% OF DEMAND MET IN REGION	NOCO AS % OF 5-COUNTY SUBCLUSTER EMPLOYMENT
Biopharmaceutical Products	733	110%	29%	1.68	11	191	28%	29%
Medical Apparatus	643	12%	12%	4.12	2	187	19%	22%
Surgical & Dental Instruments & Supplies	218	-10%	-10%	0.47	16	42	8%	41%
Optical Instruments & Ophthalmic Goods	186	159%	19%	2.16	5	16	12%	24%
Research & Development in Biotechnology (except Nanobiotechnology)	28	-86%	-96%	0.08	12	5	4%	3%
Biological Products	15	-58%	-82%	0.22	4	6	11%	6%

Source: Emsi 2019.3, Industry Table. Economicmodeling.com.
Note: Maximum value per column is highlighted.

CLUSTER LINKAGES

FOOD PROCESSING AND MANUFACTURING+

Food and Drug Administration (FDA) certified facility connection (workforce, supply chain)

PLASTICS

Medical plastics

INFORMATION TECHNOLOGY+

3D printing of medical components, integrated printed circuit boards in medical devices, software used to manage technologies, and intersection of optics/lasers used in this industry and other high-tech applications

EDUCATION AND KNOWLEDGE CREATION—RESEARCH AND DEVELOPMENT (R&D)

R&D in biotechnology, nanotechnology, and the physical and life sciences

AGRICULTURAL PRODUCTION, INPUTS, AND SERVICES

Crop science: plant genomics and seed innovations, botanical extracts, industrial hemp, and cannabis
Animal science: animal derived product components (supply chain), R&D, and products relevant to vet med and livestock production

DOWNSTREAM CHEMICALS

Major supply chain component, anchor companies like Boulder Scientific (Weld County) produce chemicals for this and other clusters, notable IT+, aerospace, and plastics

REPRESENTATIVE COMPANIES AND REGIONAL ASSETS

COMPANIES IN NOCO AND SURROUNDING AREA	ASSETS AND UNIQUE STRENGTHS
Agilent Technologies	Centers for Disease Control and Prevention Division of Vector-Borne Diseases
Beckman Coulter Life Sciences	Colorado State University
Carestream Health	College of Veterinary Medicine and Biomedical Sciences
Meadowlark Optics	Department of Chemical and Biological Engineering
Medtronic	Department of Biochemistry and Molecular Biology
Pneuline Supply	Department of Biology
Sparton Medical Systems	Department of Chemistry
St. Renatus	College of Agricultural Sciences (soil and crop sciences, bioinformatics)
Tolmar	Department of Physics (optics)
Whip Mix	Department of Electrical and Computer Engineering (laser/optics)
WilMarc Medical	
Xiant Technologies	NoCo Bioscience Cluster (Fort Collins based)
In Adjacent Counties	Regional expertise exhibited in companies and research organizations include animal health, translational medicine, vector-borne disease, plant genetics/biotech, and pharma/devices related to diabetes, cancer, and dental applications.
CordenPharma Colorado	University of Colorado Boulder
KBI Biopharma	Center for Pharmaceutical Biotechnology
Research Electro-Optics	Bioengineering Graduate Program (Anschutz)
SomaLogic	BioFrontiers Institute

DISTRIBUTION AND ELECTRONIC COMMERCE

This cluster includes wholesale of all goods, catalog businesses, and warehousing and regional distribution of a range of goods.

This is a diverse cluster that has multiple drivers. Part of this cluster is primarily driven by Colorado's growing population and the proportional demand to distribute goods throughout the region. However, another part of this cluster is strongly linked to the clusters identified as growth strategy targets and other regionally important clusters. This includes obvious supply chain relationships, but also reflects an artifact of how business establishments are classified within the NAICS system. Multi-establishment firms might have an establishment classified in another industry cluster with their wholesale operations in the region. Single establishment businesses that would be assumed to be manufacturers, but who outsource the majority of their product manufacturing, might be classified within this cluster.

This cluster has close linkages to all clusters considered in this strategy and could be viewed as a common interconnection between all identified clusters. Northern Colorado's subcluster strengths within this cluster are related to other growth strategy clusters and important industry clusters. The rental and leasing subcluster is particularly focused on equipment used by the energy and construction+ clusters.

FIGURE 4. OVERVIEW BY SUBCLUSTER

SUBCLUSTER	JOBS 2018	GROWTH 2013–2018	PROJECTED GROWTH 2018–2023	LQ	PAYROLLED BUSINESS LOCATIONS	GDP IN $MILLIONS	% OF DEMAND MET IN REGION	NOCO AS % OF 5-COUNTY SUBCLUSTER EMPLOYMENT
Wholesale of Farm Products & Supplies	1,463	74%	23%	3.76	3	370	76%	65%
Warehousing & Storage	1,376	39%	13%	0.64	20	88	50%	23%
Wholesale of Industrial Machinery, Equipment, & Supplies	875	39%	24%	1.10	150	140	68%	40%
Wholesale of Professional & Commercial Equipment & Supplies	783	50%	22%	0.61	161	141	13%	24%
Rental & Leasing	663	77%	37%	2.16	49	220	90%	42%
Wholesale of Farm & Garden Machinery & Equipment	372	22%	9%	1.95	42	52	72%	63%
Wholesale of Petroleum & Petroleum Products	336	33%	0%	1.73	19	428	68%	58%
Wholesale of Chemical & Allied Products	275	34%	16%	0.99	44	52	54%	41%
Wholesale of Metals & Minerals (except Petroleum)	263	26%	16%	1.03	20	29	34%	30%
Wholesale of Electrical & Electronic Goods	255	14%	1%	0.38	74	63	10%	16%
Wholesale Trade Agents & Brokers	252	-60%	-49%	0.26	113	37	20%	22%
Electronic & Catalog Shopping	236	-4%	2%	0.29	84	46	17%	13%
Wholesale of Construction & Mining Machinery & Equipment	222	58%	18%	1.30	12	36	69%	18%
Wholesale of Paper & Paper Products	182	7%	5%	0.74	14	36	45%	36%
Wholesale of Drugs & Druggists' Sundries	162	90%	18%	0.36	47	71	12%	14%
Wholesale of Food Products	156	-16%	-4%	0.30	29	34	24%	10%
Support Services	96	149%	44%	0.37	30	11	59%	8%

Source: Emsi 2019.3, Industry Table. Economicmodeling.com.
Notes: Maximum value per column is highlighted. Table excludes subclusters: Wholesale of Sporting and Recreational Goods and Supplies; Wholesale of Other Merchandise; Wholesale of Furniture and Home Furnishing; Wholesale of Apparel and Accessories; Wholesale of Service Establishment Equipment and Supplies; Wholesale of Transportation Equipment and Supplies (except Motor Vehicles); Wholesale of Jewelry, Watches, Precious Stones, and Precious Metals; Wholesale of Toy and Hobby Goods and Supplies; Wholesale of Books, Periodicals, and Newspapers.

CLUSTER LINKAGES

ALL GROWTH STRATEGY CLUSTERS

Supply chain component serving each cluster

IMPORTANT CLUSTERS: CONSTRUCTION+; ENERGY; AGRICULTURAL PRODUCTION, INPUTS, AND SERVICES; LOCAL HEALTH SERVICES

Supply chain component serving each cluster

LOCAL RETAILING OF CLOTHING AND GENERAL MERCHANDISE AND LOCAL FOOD AND BEVERAGE PROCESSING AND DISTRIBUTION

Distribution to big box stores, supermarkets, and beverage sellers (related to population and demographics)

REPRESENTATIVE COMPANIES AND REGIONAL ASSETS

COMPANIES IN NOCO AND SURROUNDING AREA	ASSETS AND UNIQUE STRENGTHS
Animal Health International Amazon (distribution facility) Food Services of America High Country Beverage LoCo Food Distribution McLane Western Rain for Rent Renewable Fiber Swire Coca-Cola United Parcel Service (distribution) Walmart (distribution) In Adjacent Counties Breakthru Beverage Group Shamrock Foods	Adequate commercial driver's license (CDL) training program capacity Colorado State University College of Business (supply chain management) Local presence of large international companies via their distribution facilities Strengths (based on subcluster employment) are heavily focused in traded clusters (rather than distribution of locally consumed retail goods)

FABRICATION AND PRODUCTION TECHNOLOGY MANUFACTURING

This cluster includes establishments that fabricate various metals and metal components and that develop and manufacture industrial or heavy machinery.

Northern Colorado's portfolio of companies has particular strengths in agricultural or construction machinery in addition to the manufacturing of industrial robots and industrial machinery, turbines and generators, mold-making, and component fabrication.

Within the region, there are particularly strong linkages to agricultural production, inputs, & services; food Processing & manufacturing; and plastics.

FIGURE 5. OVERVIEW BY SUBCLUSTER

SUBCLUSTER	JOBS 2018	GROWTH 2013–2018	PROJECTED GROWTH 2012023	LQ	PAYROLLED BUSINESS LOCATIONS	GDP IN $MILLIONS	% OF DEMAND MET IN REGION	NOCO AS % OF 5-COUNTY SUBCLUSTER EMPLOYMENT
Agricultural & Construction Machinery & Components	4,149	63%	19%	7.83	14	554	42%	96%
Metalworking Machinery	386	3%	-3%	1.57	14	47	29%	67%
Industrial Machinery	322	48%	10%	1.08	19	34	18%	62%
Air Handling Equipment	191	86%	47%	0.76	2	18	8%	72%
Metal Processing (MT)	120	0%	34%	0.32	15	15	8%	26%
Moving & Material Handling Equipment	63	-3%	-2%	0.39	2	9	5%	45%
Machine Tools & Accessories	60	44%	19%	0.48	2	6	7%	74%
Measuring, Dispensing, & Other Pumping Equipment Manufacturing	25	64%	37%	0.45	1	3	6%	100%
Fasteners	23	-51%	2%	0.15	3	4	8%	31%
Hand Tools	21	-16%	-17%	1.14	1	3	37%	100%
Process Equipment & Components	17	2%	22%	0.04	3	3	2%	3%
Commercial & Service Industry Machinery	13	NA	54%	0.11	3	2	5%	8%

Source: Emsi 2019.3, Industry Table. Economicmodeling.com and Quarterly Census of Employment and Wages (QCEW) data.
Note: Maximum value per column is highlighted.

CLUSTER LINKAGES

BIOSCIENCE AND MEDICAL DEVICES
Production equipment

FOOD PROCESSING AND MANUFACTURING+
Industrial equipment used in food and beverage manufacturing

PLASTICS
High tech components in medical devices

AGRICULTURAL PRODUCTION, INPUTS, AND SERVICES
Manufacturing of equipment used in this cluster

CONSTRUCTION+
Manufacturing of equipment used in this cluster

EDUCATION AND KNOWLEDGE CREATION—RESEARCH AND DEVELOPMENT (R&D)
R&D in physical and life sciences

ENERGY
Manufacturing of equipment used in this cluster

BUSINESS SERVICES—ENGINEERING SERVICES AND CONSULTING SERVICES
Includes turnkey component or device design and manufacturing services and engineering consulting for this industry

LIGHTING—ELECTRICAL COMPONENTS AND EQUIPMENT
Switchgears and custom power supplies for industrial applications are produced in this cluster

INFORMATION TECHNOLOGY+
Software/hardware control devices for industry

REPRESENTATIVE COMPANIES AND REGIONAL ASSETS

COMPANIES IN NOCO AND SURROUNDING AREA	ASSETS AND UNIQUE STRENGTHS
Aqua-Hot Heat Systems Burrows Enterprises Czero Eclipse Engineering Forney Industries Noffsinger Manufacturing Snaptron SuperTurbo Technologies Vestas Blades Walker Manufacturing Wolf Robotics	Colorado FIRST and Existing Industry Job Training Programs (CFEI) are geared toward companies in this cluster. Colorado State University Energy Institute Powerhouse Energy Campus Department of Mechanical Engineering Department of Systems Engineering Community College workforce pipeline Front Range Community College (FRCC) Manufacturing Institute Aims Community College Applied Technology and Trades Center NoCo Manufacturing Partnership Warehouse Business Accelerator University of Colorado Boulder Department of Mechanical Engineering

FOOD PROCESSING AND MANUFACTURING+

This cluster includes the manufacturing of foods for animal or human consumption. In addition to finished processed food and beverage products, this also includes protein processing and refining of agricultural products (grain, oil seeds). In addition, it includes the manufacture of metal and glass containers for food and beverage.

Northern Colorado's largest employers in this industry manufacture beef products, beer, and dairy products, including liquid milk, cheese, and yogurt. The region's smaller companies and startups include a large number of malt beverage breweries in addition to distilleries, snack foods, and sauces. Food manufacturing with close relationships to regional agriculture is common with proteins and also with flour milling and seed oil processing in the region.

In adjacent counties, Boulder serves as a hub for natural and special-diet food manufacturing, which enhances the overall ecosystem for innovative food product development.

In this region, the cluster has linkages to the bioscience & medical device cluster, notably through industrial hemp and cannabis derived products at various stages in the processing cycle. It links to plastics via manufacture of plastic films used in food packaging. The cluster remains linked to agricultural production, inputs, & services via intraregion supply chain in addtion to distribution & e-commerce. The strength of Northern Colorado's craft beer industry creates positive spillover effects for hospitality & tourism.

FIGURE 6. OVERVIEW BY SUBCLUSTER

SUBCLUSTER	JOBS 2018	GROWTH 2013–2018	PROJECTED GROWTH 2018–2023	LQ	PAYROLLED BUSINESS LOCATIONS	GDP IN $MILLIONS	% OF DEMAND MET IN REGION	NOCO AS % OF 5-COUNTY SUBCLUSTER EMPLOYMENT
Meat Processing	4,317	3%	4%	4.39	13	366	54%	95%
Malt Beverages	1,500	34%	7%	10.03	48	521	77%	64%
Dairy Products	821	106%	29%	2.96	4	129	46%	85%
Animal Foods	358	85%	19%	3.02	16	57	32%	65%
Specialty Foods & Ingredients	219	150%	40%	0.54	8	32	11%	17%
Glass Containers	191	4%	-3%	7.34	1	40	63%	100%
Farm Wholesalers	151	10%	-3%	1.77	13	33	97%	95%
Distilleries	100	472%	42%	3.35	12	40	68%	76%
Candy & Chocolate	74	119%	21%	0.62	10	3	13%	11%
Packaged Fruit & Vegetables	52	-33%	-9%	0.23	6	4	8%	57%
Baked Goods	18	-88%	6%	0.06	4	1	2%	1%
Wineries	18	269%	26%	0.14	4	2	9%	13%

Source: Emsi 2019.3, Industry Table. Economicmodeling.com.
Notes: Maximum value per column is highlighted. Table excludes subclusters: Soft Drinks and Ice, Coffee and Tea, Milling and Refining of Cereals and Oilseeds, Milling and Refining of Sugar.

CLUSTER LINKAGES

BIOSCIENCE AND MEDICAL DEVICES
Food and Drug Administration (FDA) certified facility connection (workforce, supply chain)

PLASTICS
Packaging (containers, films)

INFORMATION TECHNOLOGY+
Startups like The Food Corridor connect food businesses to niche technologies

FABRICATION AND PRODUCTION TECHNOLOGY MANUFACTURING
Industrial equipment used in food and beverage manufacturing

AGRICULTURAL PRODUCTION, INPUTS, AND SERVICES
Local supply chain for products, particularly beef and dairy cattle

HOSPITALITY AND TOURISM
Alco-tourism—craft beer and distillery-related tourism

REPRESENTATIVE COMPANIES AND REGIONAL ASSETS

COMPANIES IN NOCO AND SURROUNDING AREA	ASSETS AND UNIQUE STRENGTHS
Anheuser Busch	Availability of local agricultural inputs
Aurora Organic Dairy	Colorado Brewers Guild (Denver)
Canyon Bakehouse	Colorado State University
Cargill Specialty Seeds and Oils Innovation Center	Fermentation Science and Technology
Colorado Premium	Meat Science
JBS	Dairy Management Systems (includes beef and dairy)
J. M. Smucker Company	Colorado State University Extension and Outreach Food System
Leprino Foods	Community of boutique food producers with regional or national market penetration in Erie, Fort Collins, Loveland, and Timnath
New Belgium Brewing Company	NoCo Manufacturing Partnership
Noosa Yoghurt	Proximity to Boulder (a regional hub for natural food companies)
Rice Local Hive Honey	The Food Corridor (commissary logistics startup)
Rocky Mountain Milling (flour)	
Teasdale Foods	
WeldWerks Brewing Company	
Wild Zora	
In Adjacent Counties	
Cargill (beef processing)	
Hain Celestial Group (food products)	

INFORMATION TECHNOLOGY+

This cluster includes a range of manufacturing and services related to computers, hardware and electronic components, high-tech laboratory and process equipment, software development, and software publishing.

Northern Colorado's portfolio of companies is diverse. The region has a long history of microprocessor and other hardware component manufacturing and R&D. The roster of technology companies with R&D offices in the region includes Hewlett-Packard (HP), Microsoft, Intel, Advanced Micro Devices (AMD), and others. A range of small firms and startups deliver software and services for regionally important industries and clusters such as energy, beverage manufacturing, wholesale (logistics), and education & knowledge creation. Major tech companies such as IBM, Google, and Apple house offices in adjacent Boulder County.

FIGURE 7. OVERVIEW BY SUBCLUSTER

SUBCLUSTER	JOBS 2018	GROWTH 2013–2018	PROJECTED GROWTH 2018–2023	LQ	PAYROLLED BUSINESS LOCATIONS	GDP IN $MILLIONS	% OF DEMAND MET IN REGION	NOCO AS % OF 5-COUNTY SUBCLUSTER EMPLOYMENT
Computer Services	3,394	17%	13%	0.72	791	585	65%	18%
Process & Laboratory Instruments	1,558	2%	-8%	4.12	28	408	36%	45%
Computers & Peripherals	1,555	35%	3%	4.98	4	448	50%	45%
Electronic Components	711	42%	8%	2.02	14	191	38%	41%
Software Publishers	697	290%	39%	0.90	46	144	38%	13%
Semiconductors	175	-42%	-43%	0.45	9	41	27%	28%
Audio & Video Equipment	0	-96%	9%	0.01	1	1	5%	7%
Software Reproducing	< 10	NA	NA	0.00	0	0	1%	0%

Source: Emsi 2019.3, Industry Table. Economicmodeling.com.
Note: Maximum value per column is highlighted.

CLUSTER LINKAGES

BIOSCIENCE AND MEDICAL DEVICES
High tech components in medical devices

PLASTICS
Specialty composite components

FABRICATION AND PRODUCTION TECHNOLOGY MANUFACTURING
Uses software/hardware control devices and internet of things (IoT)

EDUCATION AND KNOWLEDGE CREATION—RESEARCH AND DEVELOPMENT (R&D)
R&D in computer science and engineering

BUSINESS SERVICES—ENGINEERING SERVICES AND CONSULTING SERVICES
Includes turnkey component or device design and manufacturing services, information technology (IT)-related consulting and customization of third-party software

LIGHTING—ELECTRICAL COMPONENTS AND EQUIPMENT
Switchgears and custom power supplies for IT applications

AEROSPACE AND DEFENSE
Analytical instruments subcluster supplies components

REPRESENTATIVE COMPANIES AND REGIONAL ASSETS

COMPANIES IN NOCO AND SURROUNDING AREA	ASSETS AND UNIQUE STRENGTHS
Advanced Energy	Colorado FIRST and Existing Industry Job Training Programs (CFEI) are geared toward companies in this cluster.
Advanced Micro Devices	
Beacon Integrated Technologies	Colorado's strength in printed circuit board manufacturing with multiple niche producers
BillGO	
Bongo	Colorado State University
Broadcom	Department of Computer Science
Community Funded	Department of Computer Information Systems
Encompass Technologies	Department of Electrical and Computer Engineering
Hach Company	
Hewlett Packard Enterprise	Colorado State University Ventures
Hewlett Packard Inc.	
Intel	Community Colleges (FRCC and Aims) have strong pipeline programs for entry level information technology (IT).
Keysight Technologies	
Madwire	Harmony Technology Park (tech corridor)
Numerica Corporation	
Rockton Software	Innosphere Ventures
TiLT	
TurboTenant	Legacy of chip and processor design
Xiant Technologies	
	Municipal broadband initiatives in Fort Collins, Loveland, and Longmont
In Adjacent Counties	
IBM Boulder (data center)	NoCo Manufacturing Partnership
Oracle	
	Rocky Mountain Center for Innovation and Technology
	Strong presences of cluster in surrounding counties and Denver Metro.
	University of Colorado Boulder
	Department of Computer Science
	Department of Electrical, Computer and Energy Engineering
	Warehouse Business Accelerator

PLASTICS

This cluster includes businesses that develop and manufacture plastic materials and resins in addition to those that manufacture products that are primarily defined by the plastic materials or plastic-specific processes required. While a major anchor company in Northern Colorado is a retail consumer plastic product producer, many companies in the region supply the production industry or produce plastics for medical purposes. Because of this, a number of companies categorized in this cluster via published economic data sources would likely self-identify within bioscience & medical or manufacturing production and fabrication clusters. Additionaly, these companies might supply any other industry cluster with composite material needs , including aerospace & defense and information technology+.

This cluster also includes companies that perform R&D and innovation in consumer plastic products and those that use 3D printing technology for custom component fabrication utilized across a range of industries.

FIGURE 8. OVERVIEW BY SUBCLUSTER

SUBCLUSTER	JOBS 2018	GROWTH 2013–2018	PROJECTED GROWTH 2018–2023	LQ	PAYROLLED BUSINESS LOCATIONS	GDP IN $MILLIONS	% OF DEMAND MET IN REGION	NOCO AS % OF 5-COUNTY SUBCLUSTER EMPLOYMENT
Plastic Products	1,437	14%	11%	1.53	34	196	26%	56%
Plastic Materials & Resins	91	146%	9%	0.29	4	18	5%	48%

Source: Emsi 2019.3, Industry Table. Economicmodeling.com.
Note: Maximum value per column is highlighted.

CLUSTER LINKAGES

BIOSCIENCE AND MEDICAL DEVICES
Product components and medical grade plastics

FOOD PROCESSING AND MANUFACTURING+
Containers and films

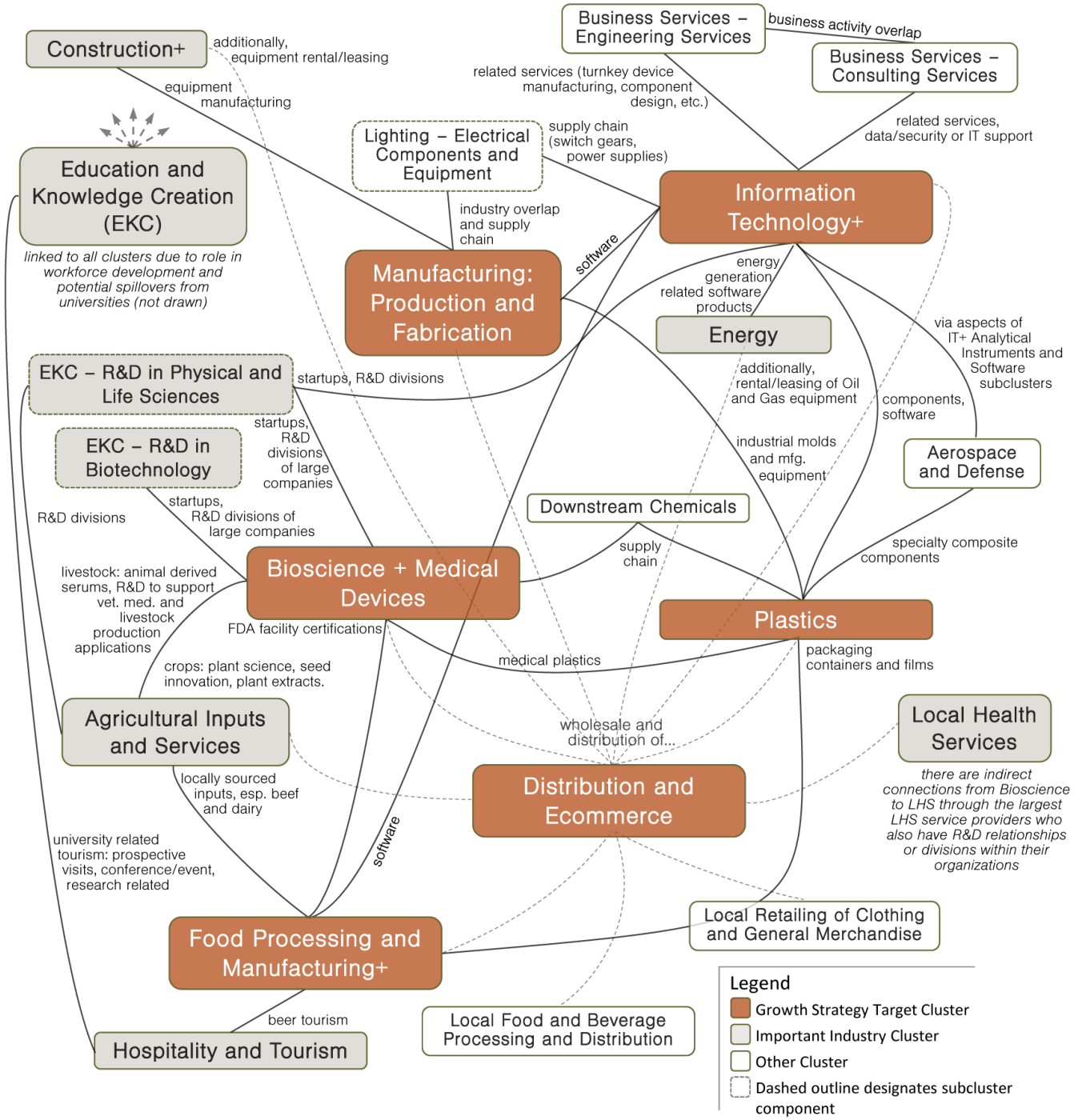
FABRICATION AND PRODUCTION TECHNOLOGY MANUFACTURING
Supply chain relationships related to mold making for plastics and components

LOCAL HEALTH SERVICES
Production of products that supply the local healthcare system

AEROSPACE AND DEFENSE
Specialty composite components

INFORMATION TECHNOLOGY+
Specialty composite components

REPRESENTATIVE COMPANIES AND REGIONAL ASSETS

COMPANIES IN NOCO AND SURROUNDING AREA	ASSETS AND UNIQUE STRENGTHS
Ability Composites	Colorado State University
Amerimax	School of Advanced Materials Discovery
Avid Product Development	Idea2Product (I2P) Lab
Creative Foam	University of Colorado Boulder
Genesis Plastics Technologies	Materials Science and Engineering
Hexcel Corporation	Manufacturer's Edge
Muller Technology	NoCo Manufacturing Partnership
Nordson MEDICAL	Supply chain: industrial applications of plastic materials in companies like JBS, Leprino, OtterBox, and Vestas
OtterBox	
Parkway Products	
PureVision Technology	
SurgiReal	
X2F, XTRUDE2FILL	

Appendix 4. INDUSTRY CLUSTER LINKAGES