VIRGINIA INITIATIVE FOR GROWTH & OPPORTUNITY IN EACH REGION

GO Virginia Region 2

Growth and Diversification Plan

August 2017

Prepared by the Virginia Tech Office of Economic Development

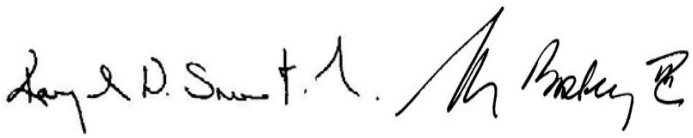
ACKNOWLEDGEMENTS

This document is submitted to the state GO Virginia Board by the Region 2 Council. Prepared in accordance with state Growth and Diversification plan guidelines, this plan was developed through substantive research and thoughtful deliberation on economic conditions and opportunities in the region.

Work on the plan began last spring with the inception of the Council. Data on the economy and labor markets, benchmarking of peer regions, and a complete analysis of existing regional economic and workforce development plans were presented to the Council at its first meeting. This provided a baseline for follow up meetings in each of the three areas that make up Region 2. In those fact-finding sessions regional leaders briefed the Council on their area's conditions and contributions to the Region 2 economy.

At the same time, issue-based work groups were formed. These consisted of Council members and civic leaders with specific expertise and interests, who met to discuss approaches to economic growth and diversification. On-line surveys were also distributed to expand sources of input into the conversation. These steps were instrumental in developing a rigorous understanding of strategic approaches and how the region might measure success in this program. This deliberative process informed goals and objectives found in this plan, as well as regionally-specific criteria for allocating GO Virginia funding.

This plan represents an extensive body of work completed over a short span of time. None of this would have occurred without the committed service of leaders from business, education, government and non-profits who have participated in the council and its work groups. These individuals are listed in the appendices of this report and have our appreciation for their contributions. Further thanks go to the leaders of our nine regional economic development, planning, and workforce organizations. Their previous research provided a strong starting point for this plan, and their fresh insights offered during the fact-finding process were appreciated. Lastly, we wish to thank Council staff for the energy and insights they brought to the process.



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EXECUTIVE SUMMARY

GO Virginia's objectives, as set by the state, are simple and provide a clear path for action. The program seeks to grow jobs that pay higher than the regional median wage, primarily through investment that is new to Virginia. This requires a focus on industries with high growth potential, featuring in-demand occupations with higher wages.

This Growth and Diversification plan, written for GO Virginia Region 2, provides a roadmap for utilizing GO Virginia funding for projects across this region, which includes the Lynchburg, New River Valley, and Roanoke-Alleghany sub-regions. Each of these areas has a strong history of local cooperation, and some experience with interregional collaboration, primarily between the New River and Roanoke Valleys. Together however, they all share many economic similarities: traditional industry strengths in manufacturing, transportation, and agriculture; emerging technology sectors; mixed urban and rural characteristics; and higher education and health care as economic and employment drivers.

This plan documents the concentration of different industries across this footprint, their job growth rates compared to the nation, their contributions to gross regional product, the number of higher than median wage jobs available in these industries, and assets unique to the region that drive opportunity.

The analysis of that data identifies four priority "clusters"—or geographic concentrations of businesses with common markets, suppliers, technologies, and workforce needs. These four interrelated industries offer the greatest potential for sustainable, scalable, future growth in the region:

- Manufacturing
- Life sciences and health care
- Food and beverage processing
- Emerging technology and IT

Together these clusters provide more than 100,000 jobs, almost one-third the total in the region. In the next five years that number is expected to grow at a rate higher than the rest of the economy. The median hourly wage across the four clusters is $22, also exceeding the rest of the economy. These clusters also generate close to $10 billion in economic activity, or slightly more than one-third of gross regional product.

To grow economic opportunity in these clusters, the plan identifies core strategies in four focus areas.

1. Talent or workforce development, attraction, and retention, which includes strengthening the pipeline from all levels of education to careers in the region, increasing the completion of relevant degrees, increasing the knowledge and access to complementary workforce and training services, and increasing employer engagement across the system.

2. Collaborative development of sites and buildings, which includes improving information about our supply of real estate and market demand, incentivizing collaboration among localities at all stages of development, and building partnerships to leverage the development potential of special assets like research facilities.

3. Entrepreneurship and business development, which includes growing the presence of and access to capital investors, expanding and better coordinating programs for mentorship and business training, and improving awareness of existing capital, mentorship & training resources.

4. Technology development, which includes increasing investments for innovative technologies, expanding rates of research commercialized in the private sector, supporting talent attraction efforts focused on individuals with technological skills, and growing the number of individuals entering training and education programs that develop technological skills.

The plan includes specific success metrics for projects that may be proposed in each of these focus areas. Such projects must connect to these strategies, promote higher paying jobs in the priority clusters, include substantive matching funds, and most importantly demonstrate an innovative and forward looking approach that doesn't simply represent business as usual.

SECTION 1: REGIONAL DEMOGRAPHICS AND GROWTH DATA

Region 2 of GO Virginia is located in western Virginia and spans across three metropolitan statistical areas (MSAs) and regional commissions: the Lynchburg, New River Valley, and Roanoke-Alleghany regions. In total, Region 2 is comprised of 18 jurisdictions including thirteen counties and five independent cities.[1] The region's population of 777,919 is about 9% of Virginia's 2016 total population.[2]

The region's industries provided roughly 6%[3] of the state's gross domestic product (GDP) in 2015.[4] Historically manufacturing, trade, transportation, and utilities industries have played a significant role in the region's economic activity, but recently the region has experienced growth in the health and education sectors. Along with this shift in economic activity, the region has experienced a 167% growth (1996 – 2015) in annual postsecondary graduates, growth driven by the region's higher education institutions. The region's growth in higher education and diversification in economic activities suggests the region is primed to take advantage of increases in investment outlined in GO Virginia.

Demographics

From 1996-2016, the region's population grew by 14.7% (Table 1), a slower rate of growth than the state (24.4%) and nation (20.3%).[5] Similar to national trends, Region 2 has a growing senior population with aging baby boomers. A distinct characteristic in this region, however, is the large college-age population that is 20-24 years old (9.2% of all age cohorts in 2016).[6] While the population of college-age or early career residents (20 to 34 year olds) in the region increased by 12% since the beginning of the Great Recession in 2008, the population of mid- to late-career individuals (35 to 54 year olds) decreased by 11%.[7] This demographic trend reflects the region's postsecondary education institutions attracting a younger population, although the region may be failing to retain these individuals or to attract mid-career workers and families.

The increase in the supply of postsecondary graduates is driven by the growth of the two public universities (Virginia Tech and Radford University); several private institutions (including Liberty University, Jefferson College of Health Sciences, Hollins University, Lynchburg College, Randolph College, Roanoke College, Ferrum College, and Sweet Briar College); and four community colleges (New River Community College, Virginia Western Community College, Dabney S. Lancaster Community College, and Central Virginia Community College). From 1996 -2015, the region has supplied more than 370,000 graduates with at least an associate's degree or a certificate (Figure 1). There has been a 46% increase in

[1] Counties include Alleghany, Amherst, Appomattox, Bedford, Botetourt, Campbell, Craig, Floyd, Franklin, Giles, Montgomery, Pulaski, and Roanoke. Independent cities include Covington, Lynchburg, Radford, Roanoke, and Salem
[2] U.S. Census Bureau (2017). Retrieved from hhtp://cra.gmu.edu/go-virginia
[3] GRP data is available for three Metropolitan Statistical Areas only. We've include the Blacksburg – Christiansburg – Radford, Lynchburg, and Roanoke MSAs found in the region. Alleghany County and the City of Covington are not part of the Roanoke MSA, so we have underestimated total contribution to state GPD.
[4] U.S. Bureau of Economic Analysis (BEA; 2017). GRP by State and by Metropolitan Area. Retrieved from https://www.bea.gov/regional/index.htm
[5] U.S. Census Bureau (2017). Retrieved from hhtp://cra.gmu.edu/go-virginia
[6] EMSI 2017.3; Quarterly Census of Employment and Wages (QCEW) Employees
[7] EMSI 2017.3; QCEW Employees

the annual number of graduates receiving a degree since 2006. All degrees have increased over this time (including associates, certificates, bachelors, and professional and graduate degrees). The annual number of graduates receiving a graduate and professional degree has increased in particular from 3,067 to 6,467 (111%). This increase is due in part to a surge in graduates during and after the recession, when individuals delayed entering the labor market.

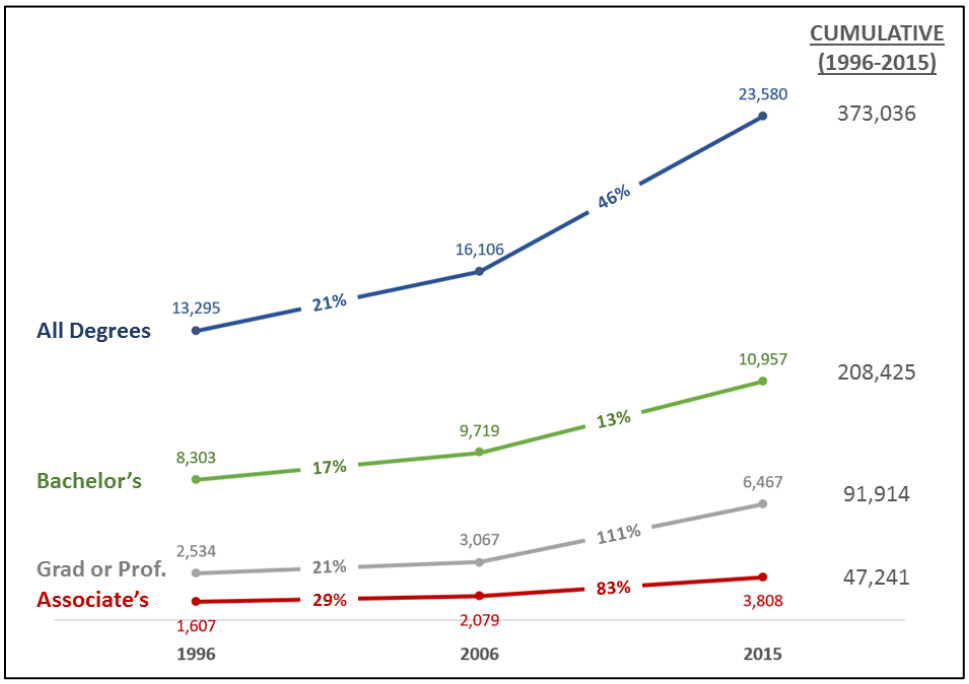

Figure 1: Region 2 1996, 2006, and 2015 Annual Graduates by Degree and Percent Change in Graduates[8]

Despite the decline in the number of Region 2 workers in the 35 to 54 year old demographic, a labor-shed analysis reveals the region's workers include a growing number of commuters from just outside the region. The number of total commuters has increased for the past 15 years, and between 2008 and 2014 net commuter inflow grew to 17,039 people, an increase of 20%.[9] Of the 325,627 workers in Region 2, 77% live in the region and 23% commuted into the region for work.[10] Moreover, the region's three metropolitan statistical areas are connected through intra-regional commuting, as illustrated in Figure 2.

[8] Dept of Education, NCES IPEDS, adjusted for non-resident programs
[9] US Census Bureau, Longitudinal Employer-Household Dynamics OnTheMap, 2002, 2008, and 2014. Retrieved from https://onthemap.ces.census.gov/
[10] US Census Bureau (2014) Longitudinal Employer-Household Dynamics OnTheMap, Retrieved from https://onthemap.ces.census.gov/

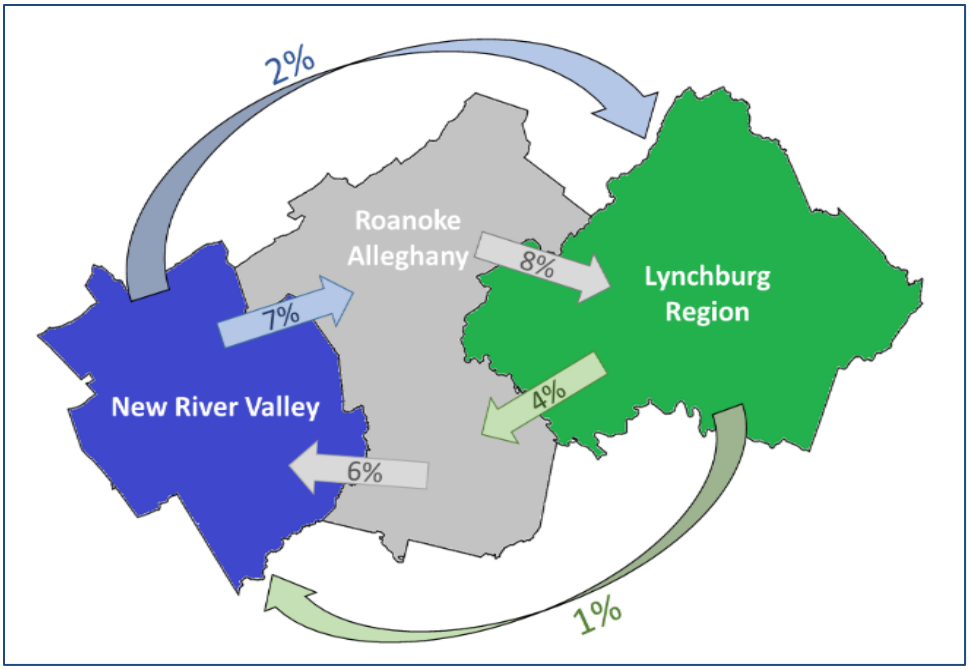

Figure 2: Employee Commuting Patterns[11]

Economic Growth

Similar to population growth, the region's total economic output has increased more slowly than the state and nation. The region displayed 8% growth in real gross regional product (GRP) from 2001 – 2015, compared to 25% growth in Virginia and 26% in the US (Table 2). Within the region, there have been differences in economic performance, with the Blacksburg-Christiansburg-Radford MSA being the smallest MSA in terms of real GRP but having the fastest growth rates in the region (Table 2).

Table 1: Population and Population Growth[12]

	Population (1996)	Population (2016)	Cumulative Change (1996 - 2016)	Avg. Annual Growth Rate
Region 2	678,200	777,919	14.7%	0.7%
Virginia	6,759,800	8,411,808	24.4%	1.1%
United States	268,582,017	323,127,513	20.3%	0.9%

[11] Source: US Census Bureau, Longitudinal Employer-Household Dynamics OnTheMap, 2014. Retrieved from https://onthemap.ces.census.gov/. Note: Overlay arrows do not indicate directionality of worker flow between home and employment locations.
[12] U.S. Census Bureau (2017). Retrieved from hhtp://cra.gmu.edu/go-virginia

Table 2: Real GRP and Percent Change, from 2001 - 2007, 2008 - 2015, and 2001 -2015[13]

	Real GRP (millions of 2009 chained dollars)		Growth in Real GRP		
	2001	2015	2001 - 2007	2008 - 2015	2001 - 2015
Region 2 Total	25,172	27,121	11.8%	-1.6%	7.7%
Blacksburg-Christiansburg-Radford MSA[14]	5,096	5,888	18.2%	5.3%	15.5%
Lynchburg MSA[15]	7,844	8,286	9.4%	-2.4%	5.6%
Roanoke MSA[16]	12,232	12,947	10.7%	-3.9%	5.8%
Virginia	346,918	432,742	17.6%	6.3%	24.7%
United States	12,735,110	16,094,516	16.2%	9.4%	26.4%

Some GRP growth may be due to increases in state expenditures. In per capita terms, cumulative expenditure growth has increased by 18% since 2001, from $2,806 to $3,309 (accounting for inflation). Spending is not evenly distributed, however. Eleven localities had positive changes in state expenditures from 2001-2016 (Alleghany, Amherst, Botetourt, Craig, Franklin, Giles, Montgomery, Pulaski, Roanoke, Radford City and Salem City), while per capita state expenditures declined in seven jurisdictions (Appomattox, Bedford, Campbell, Floyd, Covington City, Lynchburg City and Roanoke City).[17]

Slow change in personal wealth is another reflection of slower economic growth. The region's population experienced relatively slow year-to-year growth of personal income since 1996 (Figure 3). Average personal income, however, increased by 26% from $30,258 to $38,005 (1996-2015).[18] Wealth varies within Region 2. In 2015, five localities had above the regional average personal income per capita (Roanoke City, Salem City, Bedford, Botetourt and Roanoke Counties). Three localities had an average personal income per capita lower than $34,000 (Radford, Amherst and Montgomery Counties). Note that Radford and Montgomery have high proportions of post-secondary students, which skews income numbers.

[13] BEA (2017). GDP by State and by Metropolitan Area. Retrieved from https://www.bea.gov/regional/index.htm
[14] Includes Radford City, Montgomery, Pulaski, Giles, and Floyd Counties
[15] Includes Lynchburg City, Amherst, Appomattox, Campbell, and Bedford Counties
[16] Includes Roanoke City, Salem City, and Craig, Franklin, Botetourt, and Roanoke Counties
[17] Virginia Auditor of Public Accounts. Retrieved from hhtp://cra.gmu.edu/go-virginia
[18] U.S. Census Bureau (2017). Retrieved from hhtp://cra.gmu.edu/go-virginia

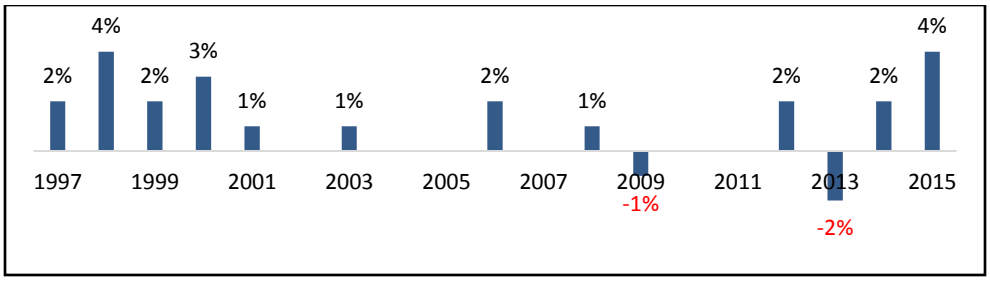

Figure 3: Annual Change in Average Personal Income[19]

Firm Growth, Employment and Primary Industries

Another economic indicator is the health of regional firms, measured as firm destruction and creation, and the age of firms. Overall, firm creation has declined by 26% since 1996, with a particularly significant decline during the recession.[20] Meanwhile, the number of firms closing has remained relatively constant.[21] Figure 4 shows the total jobs created annually (primary vertical axis) and the percent of jobs created (secondary vertical axis) from old and young firms. Young firms are five years old or less, while old firms are over ten years old. Region 2's employment growth is due largely to the expansion of old firms. From 1999-2015 young firms provided on average, just 21% of annual job creation. Region 2 is underperforming when compared to state and national levels, which show young firms on average account for 24% and 27% of total new jobs, respectively.

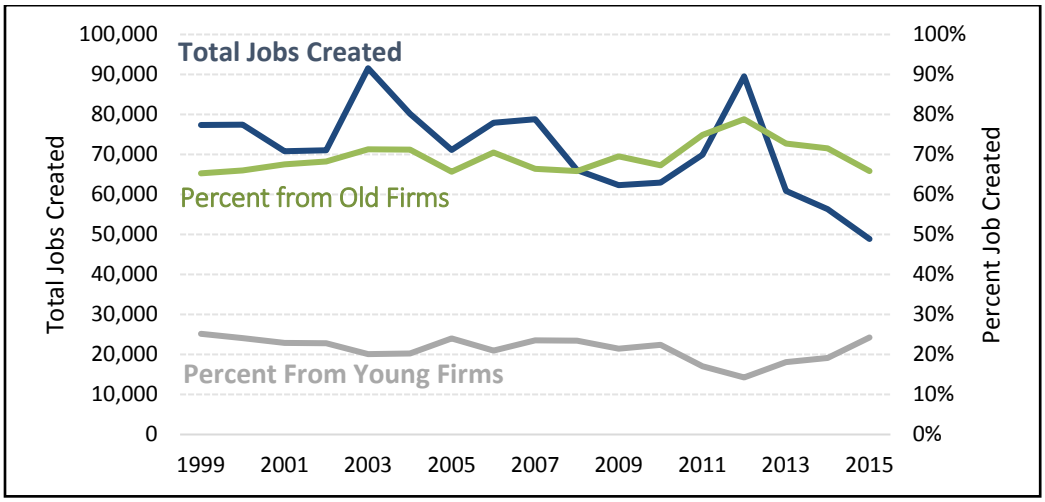

Figure 4: Total Annual Jobs Created, and Percent from Old and Young Firms[22]

Region 2's unemployment rate has bounced back since the recession, and is lower than the national unemployment rate (Figure 5). Since the recession, the unemployment rate has fallen 4.2% from peak unemployment of 8.8% in 2010. Though the region has maintained a lower unemployment rate relative

[19] BEA (2017). Retrieved from hhtp://cra.gmu.edu/go-virginia
[20] U.S. Census Bureau (2017). Longitudinal Business Database (LBD). Retrieved from https://www.census.gov
[21] U.S. Census Bureau (2017). LBD. Retrieved from https://www.census.gov/ces/dataproducts/datasets/lbd.html
[22] U.S. Census Bureau (2017). Longitudinal Employer-Household Dynamics LEHD, QCEW. Retrieved from hhtp://cra.gmu.edu/go-virginia

to the nation, unemployment has remained higher compared to the state. The total amount of jobs have increased by 6% since 1996 (Figure 6). These low unemployment and job growth numbers suggest the region's ability to adapt from an economic downturn compared to the nation, however the numbers may also include individuals who are underemployed. Underemployed workers includes those individuals who are highly skilled but working in low paying jobs, low skill jobs, or as part-time workers who would prefer to be full time.

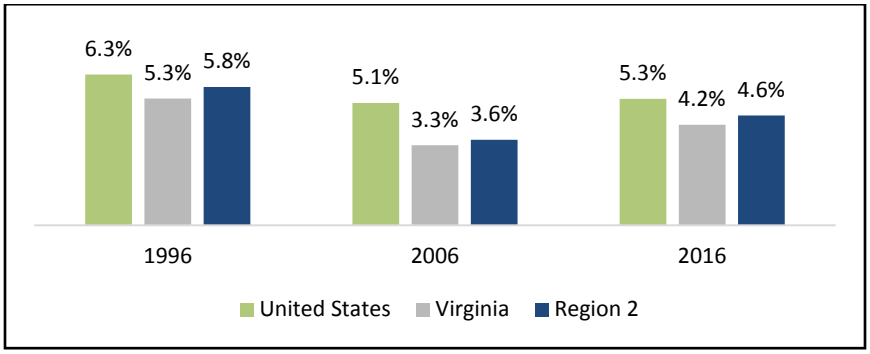

Figure 5: Unemployment Rate[23]

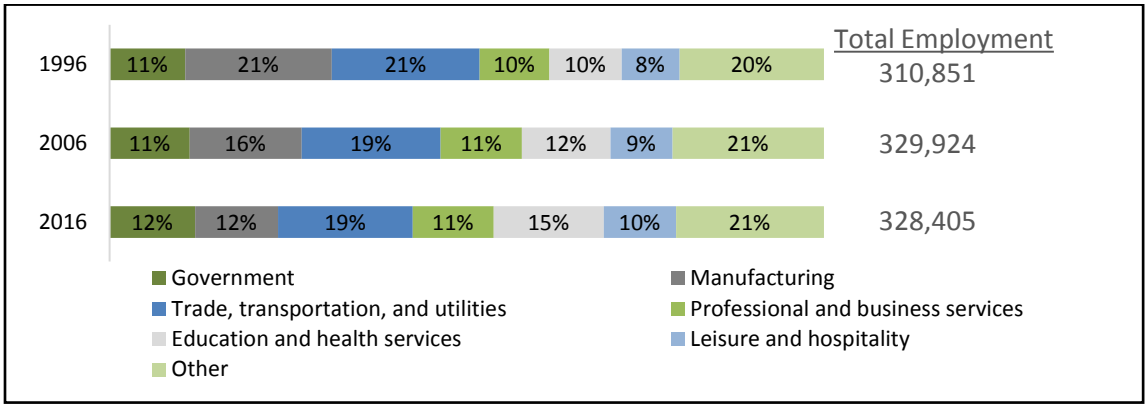

Figure 6: Total Employment and Share by Industries in Region 2[24]

Figure 5 outlines the total employment and the employment share of the region's largest industries. Shares of employment from the government sector; the trade, transportation, and utilities sector; the professional and business services sector; and the leisure and hospitality sector have remained relatively constant throughout the last two decades. However, the historically important manufacturing sector has declined since 1996. Over the same time, the region saw increased employment shares from the education sector, and the health care and social services sector.

This economic diversification is at least partly a result of the recession. Industries hit hardest by the recession included the construction, information, and manufacturing sectors, in which jobs decreased 21%, 32%, and 8% respectively from 2008-2016. Since these jobs are susceptible to economic booms and

[23] U.S. Bureau of Labor Statistics (2017). Retrieved from hhtp://cra.gmu.edu/go-virginia
24 U.S. Bureau of Labor Statistics (2017). Retrieved from http://cra.gmu.edu/go-virginia; EMSI 2017.3 Class of Worker dataset, Retrieved from http://www.economicmodeling.com. Note: Other includes natural resource, mining, construction, information, and other services industries.

busts, shifting away from these jobs represents more financial security for the region's workforce; however, these industries also generally pay higher wages (Table 3), with median hourly earnings above the regional median ($18.66). Meanwhile, the quickly growing education sector tends to pay less than $18.66 an hour on average, or $38.9K annually. Crop and animal production (i.e. natural resources), education, health care and social assistance, leisure and hospitality, and other services have gained workers (Table 3). Despite a 4% decline since its 2007 employment peak (66,817), the trade, transportation, and utilities sector is still the largest employing sector in Region 2, largely due to retail trade. However, the industry as a whole pays substantially less than median wage.[25]

Table 3: Employment by Industry, and 2001, 2016 Median Hourly Wage[26]

Industry	Employment (2016)	% Change in Jobs (2008-2016)	Median Hourly Wage (2016)
Natural Resources and Mining	1,738	8%	16.19
Construction	16,733	(21%)	19.31
Manufacturing	43,610	(8%)	20.17
Trade, Transportation and Utilities	64,287	(3%)	15.14
Information	2,964	(32%)	21.75
Financial Services	14,331	(7%)	21.34
Professional and Business Services	37,365	(5%)	21.38
Educational Services	16,429	62%	16.21
Health Care and Social Assistance	46,634	13%	22.14
Leisure and Hospitality	32,285	7%	10.44
Other Services	15,358	4%	15.67
Federal Government	7,401	(7%)	24.95
State Government	17,419	(15%)	22.47
Local Government	32,650	(3%)	18.52
Total	**349,204**	**(1.3%)**	**18.66**

[25] EMSI 2017.3 Class of Worker dataset. Retrieved from: http://www.economicmodeling.com

[26] EMSI 2017.3 Class of Worker dataset. Retrieved from: http://www.economicmodeling.com. Industry median wage was constructed by taking the weighted average of median wages for all occupations making up 0.1% or greater of the industry sector.

In addition to having the highest hourly wages (on average), the manufacturing sector provides the largest amount of jobs supported by exports. Traded industries, such as manufacturing, sell many of their products out of region and produce more regional economic impact from outside revenues than do non-traded industries. Non-traded, or local, industries include health care, food services, residential construction, and personal services. Non-traded industries are interrelated, may share workers, and are important for the well-being of local populations; nevertheless, they do not inject new money into the local economy to the same extent as traded industries. Table 4 highlights the total jobs supported by exports for the region by traded industry, and it shows a 27% growth in the total amount of jobs supported by exports from 2003-2014. Manufacturing provided over two-thirds of the jobs from exports between 2003 and 2014. Moreover, manufacturing jobs supported by exports grew by 20%, despite the industry experiencing job losses since the recession. The next three largest industries with jobs supported by exports (education, medicine, and tourism; information and technology; and engineering and heavy industries), provided just 24% or 6,474 of export-supported jobs in 2014.

Table 4: Total Jobs Supported by Exports in Region 2[27]

Industry	Number of Jobs			Cumulative Growth
	2003	2008	2014	
Total	21,310	25,038	27,077	27%
Manufacturing	15,231	17,339	18,216	20%
Educ., Meds., and Tourism	1,804	2,043	2,714	50%
Eng. & Heavy Machinery	1,118	1,705	1,687	51%
Information	1,448	1,711	2,073	43%
Finance	371	659	557	50%
Business	643	568	816	27%
Agriculture	636	858	889	40%
Mining, Oil, and Gas Ext.	59	154	124	110%

[27] Brookings Institute (2015). Export Monitor 2015 data. Retrieved from https://www.brookings.edu/interactives/export-monitor-2015/. For more information on the methodology, please visit, https://www.brookings.edu/wp-content/uploads/2015/05/Brookings-Export-Series-Methodology-NM-5715.pdf.

SECTION 2: REGIONAL ECONOMIC DRIVERS AND CLUSTERS

As described in the previous section, manufacturing remains a leading contributor to Region 2's economy, accounting for over $5 billion of the region's $27 billion in total gross regional product (GRP). Government services are next in line, making up nearly $4 billion of GRP. Health care, retail trade, wholesale trade and financial services all take up significant portions of total GRP as well. The median wage for a worker in Region 2 is $18.66 per hour, or $38.9k annually, assuming full-time employment (2087 hours annually). For the more rural counties of Region 2, the median wage is closer to $17 per hour. Of the top contributing industries, only two (on average) pay less than the median wage: retail trade and real estate and rental and leasing.

As with many regional economies, manufacturing is one of the main driving forces behind the economic engine. In Region 2, other important sectors include finance and insurance; professional, scientific, and technical services; real estate and rental and leasing; government; and construction. The other driver industries—those that have higher than average employment concentration (location quotient), job growth, and contribution to gross regional product (GRP)—include health care and social assistance as well as retail trade. As part of the government sector, education contributes approximately $1.8 billion to GRP, about half of which is from higher education institutions in the region.

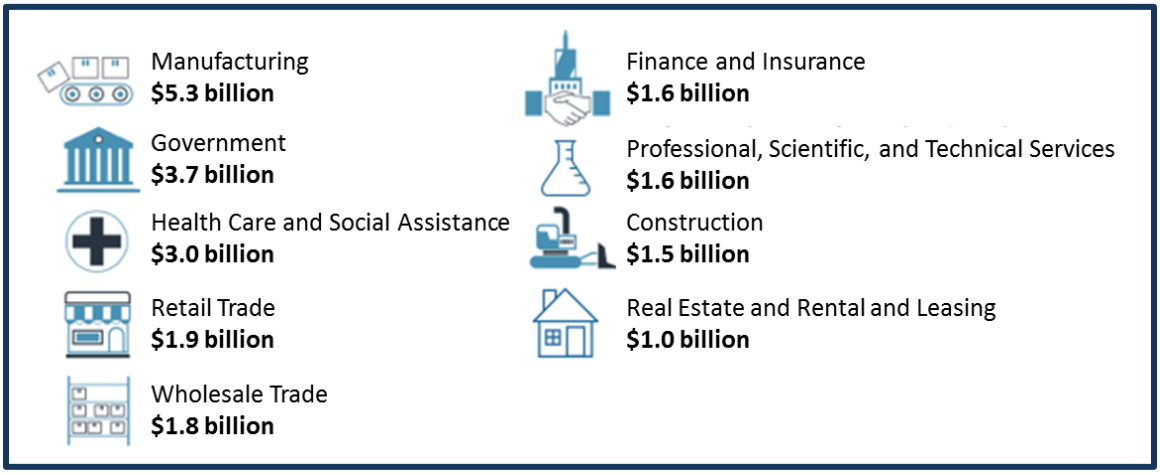

Figure 7: Top Contributors to Gross Regional Product (GRP)

The term "industry clusters" refers to a geographic concentration of businesses that share common markets, suppliers, technologies, and workforce needs. Businesses within a cluster benefit from their proximity to shared resources including a skilled workforce, specialized suppliers, infrastructure, and a localized base of sophisticated knowledge about their industry. Each cluster has a high level of economic integration and interdependency. Beginning with Harvard industry cluster definitions, Region 2 identified and tailored four existing and emerging industry clusters to the unique assets of the region using the following criteria:

- *Location Quotient (LQ)*: demonstrates the overall concentration of employment within a particular cluster, which serves as an indication of regional competitiveness. Those with proportionally higher employment concentrations in the region compared to the nation will have

LQs higher than 1.0. Clusters showing particular regional competitiveness will have LQs higher than 2.0.

- *Competitive Effect (Shift-Share)*: identifies clusters that have or will have job growth faster than the national average. Numbers higher than zero indicate that the cluster is not just following national trends, but has growth driven by regional assets as well. Higher than average job growth illustrates regional strength within the particular cluster and helps to identify possible emerging industries.
- *Gross Regional Product (GRP)*: illustrates a cluster's contribution to overall regional wealth. GRP can be an indication that the cluster is a regional economic driver.
- *Higher than Median Wage*: focusing on clusters that already have average median wages higher than the regional average ($38.9K) will ensure that GO Virginia funding is promoting the growth of higher than median wage jobs.

Using these criteria as well as input from regional stakeholders, Region 2 identified four clusters: manufacturing (particularly advanced manufacturing), life sciences and health care, food and beverage processing, and emerging technology and IT clusters. Each cluster represents opportunities for growth and diversification for the region's economy as well as opportunities for regional businesses to diversify their market base. Each make significant contributions to GRP, as demonstrated by the bubble size in Figure 7 and the GRP column in Table 5. Manufacturing, life sciences and health care, and the emerging technology and IT clusters each have higher employment concentrations than the national average. Manufacturing, life sciences and health care, and food and beverage processing clusters are also expected to grow faster than the national average in the next five years, as seen in the vertical axis measurement for competitive effect (see definition above).

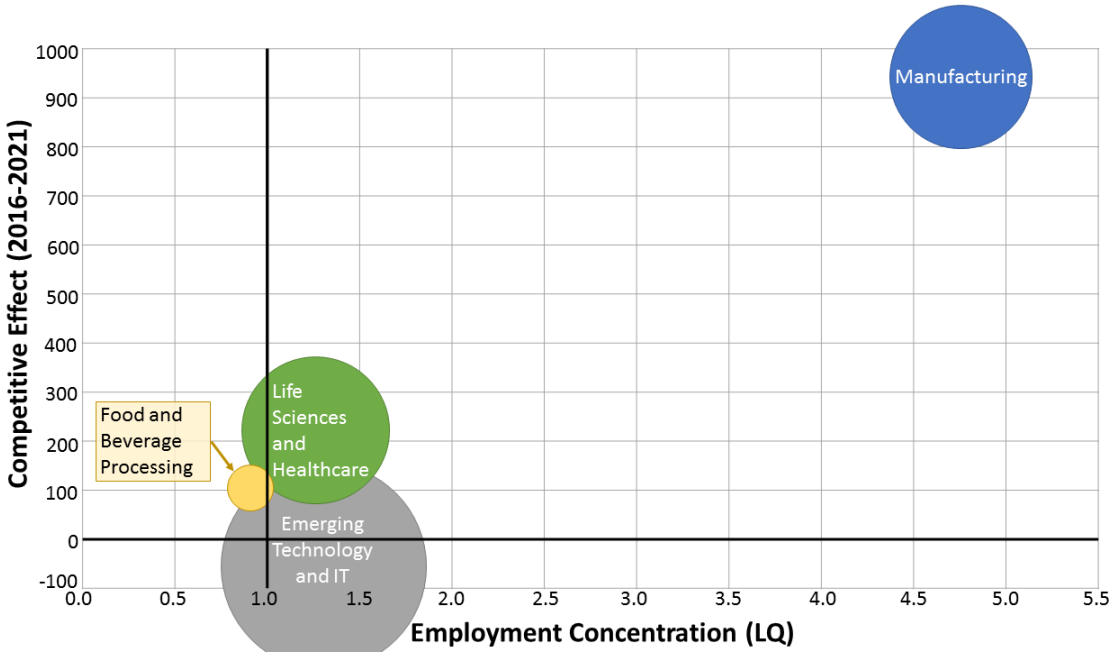

Figure 8. Region 2 Target Industry Clusters--GRP, LQ and Shift-Share[28]

[28] EMSI 2017.3; QCEW

Table 5 below summarizes projected employment growth for each cluster and its corresponding location quotient. The clusters selected are growing faster than the regional economy as a whole, with projected job growth rates averaging 6.9% from 2016 to 2021 (versus overall regional job growth of 5.3%). The jobs in these clusters pay, on average, nearly 50% more than other jobs in the region. While these clusters have only about 15% of all establishments in the region, they provide almost 40% of all jobs and account for 43% of the gross regional product (GRP).

Table 5. Region 2 Industry Cluster Performance Trends[29]

	2016 JOBS	PROJECTED JOB GROWTH (2016-2021)	2016 LQ	2016 GRP (MILLIONS)	2016 PAYROLLED BUSINESS LOCATIONS	2016 MEDIAN HOURLY WAGE
MANUFACTURING	16,950	7.2%	4.74	$2,643	131	$20
LIFE SCIENCES	33,753	10.3%	1.13	$2,714	1,123	$25
FOOD & BEVERAGE PROCESSING	5,225	6.6%	0.88	$864	205	$16
EMERGING TECH & IT	55,567	6.5%	1.22	$3,762	1,085	$20
TOTAL 4 CLUSTERS	111,495	7.5%	1.31	$9,983	2,544	$22
ALL INDUSTRIES	348,756	5.3%	--	$27,197	21,466	$19
4 CLUSTERS AS % OF TOTAL ECONOMY	32.0%	--	--	36.7%	11.9%	--

Except for the life sciences cluster, all identified clusters are projected to grow faster in Region 2 than in Virginia (Table 6). Compared to the U.S., all except the emerging technology and IT cluster will grow faster in Region 2. As seen in Table 6, median wages are lower in Region 2 when compared to Virginia and the U.S. They are notably lower in the emerging technology and IT cluster because the region's education institutions dominate this cluster. The U.S. and Virginia clusters have higher concentrations of private IT-related firms that pay higher wages.

Table 6. Comparative Industry Cluster Trends[30]

	PROJECTED JOB GROWTH (2016-2021)			2016 MEDIAN WAGES		
	REGION 2	VIRGINIA	U.S.	REGION 2	VIRGINIA	U.S.
MANUFACTURING	7.2%	7.0%	1.0%	$41,962	$48,903	$45,190
LIFE SCIENCES	10.3%	11.2%	9.9%	$52,984	$56,635	$56,528
FOOD AND BEVERAGE PROCESSING	6.6%	4.0%	4.1%	$33,343	$37,608	$34,052
EMERGING TECH & IT	6.5%	4.0%	7.0%	$42,675	$65,826	$56,511
TOTAL 4 CLUSTERS	7.9%	6.5%	7.4%	$45,568	$61,337	$54,329
ALL INDUSTRIES	5.3%	5.1%	6.2%	$37,003	$47,855	$43,493

[29] EMSI 2017.3; QCEW

[30] EMSI 2017.3 Class of Worker dataset, Retrieved from http://www.economicmodeling.com. Industry median wage was constructed by taking the weighted average of median wages for all occupations making up 0.1% or greater of the industry sector and then multiplying by 2087 work hours in the year. This calculation assumes full-time employment.

Table 7 illustrates that each cluster exports 50% or more of its products outside the region, indicating the potential for them to become significant traded industries. Furthermore, the table shows how much local demand is met by companies within the region and how much is met by imports. This comparison helps determine opportunities to expand local businesses' shares of local demand. For example, if only 10% of regional demand for a product is being met by regional companies, this table will quantify the value of the remaining 90% of demand that could be met by regional companies.

Table 7. Industry Cluster Sales and Demand, Region 2[31]

	TOTAL SALES (MILLIONS)	% IN-REGION SALES	% EXPORTED SALES	TOTAL DEMAND (MILLIONS)	% DEMAND MET IN-REGION	% DEMAND MET BY IMPORTS
MANUFACTURING	$8,739	5%	95%	$1,584	27%	73%
LIFE SCIENCES	$4,834	50%	50%	$3,757	64%	36%
FOOD & BEVERAGE PROCESSING	$2,657	16%	84%	$1,638	26%	74%
EMERGING TECH & IT	$5,511	48%	52%	$5,559	57%	43%

Based on jobs postings, annual openings and regional completions data as well as input from stakeholders, Region 2 conducted a workforce gap analysis. Workforce demands exist across different occupation types within these four clusters, depending on the level of education and skill sets. In general, demand for occupations includes:

- Entry-level Occupations: Certain entry-level occupations have increased demand for two major reasons. First, many of these occupations do not have high enough wages to secure and retain qualified talent. Second, companies express a lack of basic mathematical skill sets among high school graduates and a dearth of soft skills such as problem solving, initiative, dependability, and timeliness. Many applicants or beginning workers do not demonstrate the aptitude to learn quickly on the job.
- Middle-Skill Occupations: These jobs often require a unique skill set acquired through 1-2 year certification or associate degree programs, whether they are academic or workforce-based. Many of the occupations also involve professional accreditations, licensing and/or apprenticeship-style training. Technicians, machinists, Licensed Practical Nurses, computer support specialists, carpenters, HVAC workers, etc. are all considered "middle-skill" jobs. As many of the workers employed in these kinds of occupations are aging out of the workforce (i.e. baby boomers), demand for new workers grows. Meeting this demand is particularly challenging due to lack of interest among younger generations. First, they may not know about the opportunities available to them, such as the higher than median income wages for many of these jobs. Second, our society has developed a stigma regarding these types of occupations; people may view the jobs as manual labor or "grunt work". In addition, school counselors, peers, and families may reinforce the perception that students need to go to a four-year college to be successful, whereas many of these jobs do not require a four-year degree. Finally, many of

[31] EMSI 2017.3; QCEW

these jobs require similar skill sets to those described in the entry-level occupations description, and potential workers may find it challenging to acquire these skills.

- Mid-Level Managerial Positions and Higher: This region provides a number of jobs for recent bachelor or advanced degree graduates. The area also has higher than average numbers of graduates receiving bachelor, master, and doctorate degrees. Retaining these graduates is a challenge however. First, four-year higher education institutions and companies in the region do not adequately collaborate to build a pipeline of graduates into regional employment opportunities. Second, as graduates gain experience and search for promotion opportunities, they do not find as many of the mid-level jobs or salaries they desire. As a result, they may move elsewhere. Counter-intuitively, some companies in the region have also partly attributed departures or closings to difficulty finding qualified applicants for middle-management positions.[32]

The following is a description of the four priority industry clusters. We provide contextual data on the industry, occupation and skill needs in these clusters based on secondary data and stakeholder input.

Manufacturing Cluster

Historically and today, manufacturing has been one of the top industry drivers in Region 2. With a significantly higher employment concentration (LQ) and contribution to GRP, cluster strengths include:

- Automotive (including Truck) Manufacturing: Region 2 excels at developing automotive parts and specializing in heavy-duty truck production. Volvo Trucks USA produces all Volvo trucks sold in North America and is the largest automotive manufacturer in the region.
- Downstream Chemical Products: Region 2 has particular strengths in manufacturing personal care and cleaning products, pigments and coating, and explosives. Some of these products may support the automotive and mining industries. The expertise in this cluster can also contribute to biopharma and plastics industries,[33] which are two traded industry clusters in this region.
- Metalworking Technology: Plate work manufacturing—which can support automotive, construction, energy and other downstream industries—and the development of machine tools for manufacturers are two regional strengths, as indicated by the high location quotients and projected job growth exceeding the national average. Many of these manufacturers are small, with less than 50 employees.
- Paper and Packaging: Paper and packaging supports the transportation and distribution sector, and has potential to support the food and beverage processing cluster.
- Lighting and Electrical Equipment: Region 2 has a particular strength in lighting and electrical equipment, with a 7.73 LQ and a $417 million contribution to GRP. Companies contribute to automotive and energy through motor and generator manufacturing, construction through niche lighting fixtures, and even the technology sector through fiber optics.

These manufacturing industries are expected to grow 7.2% in the coming five years, which is a considerable increase compared to national growth of 1.0%. As technologies develop, many of these

[32] We use information from EMSI (2017.3), Bureau of Labor Statistics, the most recent workforce strategic plans, and local stakeholder interviews. More data on demand can be found in Appendix B.

[33] Harvard Business School (2014) U.S. Cluster Mapping. Retrieved from: http://www.clustermapping.us

industries will also need to adopt automation and advanced technologies to compete. For instance, the development of autonomous vehicle technologies and advanced CNC machining will challenge many companies to adapt both their production methods and products.

Table 8 provides a list of 15 prominent occupations in the manufacturing cluster. Occupations that provide higher than median wages for the region are in green. Occupational demand is contingent on potential interest to work in the cluster, on worker retirements, and on training and experience. Those occupations paying lower than median wage generally require a high school education level and some on-the-job training. While they are and will be in high demand, as illustrated by the large number of annual openings, the key challenge for employment here is increasing interest among potential workers and ensuring they have the soft skills (e.g. timeliness, dependability, and problem solving skills) to retain those jobs. Those occupations paying higher than median wage generally require some post-secondary education—ranging from professional certifications through bachelor degrees—and/or extensive on-the-job training. They are mostly middle-skill jobs and managerial positions. Companies in the region have indicated that it is challenging to fill both position types due to the lack of a sufficient career pipeline. Although community college and midlevel management training programs exist in the region, they are often not operating at full capacity or cannot meet all regional demand. In addition, many in Region 2 are not aware of these programs or the potential benefits they provide.

Table 8: Key Manufacturing Cluster Occupations[34]

SOC	*DESCRIPTION*	*Employed (2016)*
11-1021	General and Operations Managers	231
17-2112	Industrial Engineers	236
41-4012	Sales Representatives, Wholesale and Manufacturing	275
49-9041	Industrial Machinery Mechanics	368
49-9071	Maintenance and Repair Workers	303
51-1011	First-Line Supervisors of Production and Operating Workers	618
51-2022	Electrical and Electronic Equipment Assemblers	694
51-2092	Team Assemblers	2,527
51-4041	Machinists	465
51-4121	Welders, Cutters, Solderers, Brazers	397
51-9061	Inspectors, Testers, Sorters, Samplers, and Weighers	364
51-9196	Paper Goods Machine Setters, Operators, and Tenders	652
51-9198	Helpers--Production Workers	228
51-9199	Production Workers, All Other	270

[34] EMSI 2017.3; QCEW Employees

SOC	DESCRIPTION	Employed (2016)
53-7062	Laborers and Freight, Stock, and Material Movers, Hand	366
	TOTAL	7,995

* Occupations that provide higher than median wages for the region are in green.

Life Sciences and Health Care Cluster

Following national trends, Region 2's health care sector has grown significantly in the past decade and will grow approximately 10.3% by 2021. The cluster also has a slightly higher employment concentration (LQ) than the nation, both in health care provision and in life sciences. Carilion Clinic, Centra Health, Lewis-Gale and other health care entities and providers continue to experience growth in facilities, services, and employees. While health care is not a traded (or exports-producing) sector, it is an engine for higher wage job growth, talent attraction and retention, and supports other traded sectors, such as life sciences.

Llife sciences (defined as research, manufacturing, and distribution related to medical instruments, supplies, and pharmaceuticals) still constitutes an emerging cluster in this region. In recent years, the region has begun to develop the infrastructure to support this growing cluster. For instance, a partnership between Virginia Tech and Carilion Clinic has supported the creation of the Virginia Tech Carilion Research Institute and the Virginia Tech School of Medicine in Roanoke, VA. From this successful partnership, other initiatives have emerged such as a Health-IT Innovation Corridor and the business accelerator RAMP, which partially focuses on the fostering of life science startups. To support this effort and bolster the health care career pipeline, several higher education institutions have increased their support of life sciences and health care programming. Virginia Western Community College, for example, has constructed a wet lab to train lab technicians and others in the field.

A robust life sciences industry cluster can promote the growth of higher wage positions and become a strong economic driver through its exports. Because the life science cluster is still relatively nascent, the occupations listed in Table 9 (below) are mostly relevant to the health care industry. About half of the current employees in this group make higher than median wage. Other than the Licensed Practical/Vocational Nurses (LPNs/LVNs), these jobs require an associate's degree or above. Demand for Registered Nurses is particularly high. Regional hospitals and health care employers are currently collaborating with nonprofits and other training entities to create an adequate pipeline to fill this gap. Hindering this effort is the lack of basic STEM-skills, particularly mathematics, among potential workers (e.g. high school graduates) in the region. This skill gap will hamper the growth of a life science cluster as well. For every PhD researcher, the industry will also need multiple technicians and support staff capable of basic mathematics and lab testing.

For occupations requiring a bachelor's degree or higher, the challenge may be attracting or keeping employees in the region. Median salaries for these occupation types are 6% lower than the national median ($82,895 versus $87,983). While regional salaries may be lower, the worker's actual purchasing power may more than make up for this difference. According to BEA data on price parities for metropolitan areas, Region 2 price levels are approximately 10% lower than the nation.

Table 9: Key Life Science and Health Care Cluster Occupations

SOC	DESCRIPTION	LIFE SCIENCE CLUSTER				ALL INDUSTRY	
		EMPLOYED (2016)	% CHANGE (2011 - 2016)	EMPLOYED (2021)	% CHANGE (2016 - 2021)	MEDIAN HOURLY EARNINGS	AVG. ANNUAL OPENINGS (2016-2021)
11-9111	Medical and Health Services Managers	517	2%	570	10%	$45.39	72
29-1062	Family and General Practitioners	416	9%	429	3%	$92.10	24
29-1069	Physicians and Surgeons	675	3%	738	9%	$102.39	46
29-1141	Registered Nurses	5,629	0%	6,236	11%	$28.39	567
29-2034	Radiologic Technologists	516	0%	548	6%	$23.15	40
29-2053	Psychiatric Technicians	437	-27%	367	(16%)	$12.54	69
29-2061	Licensed Practical and Licensed Vocational Nurses	1,629	4%	1,740	7%	$19.07	195
31-1014	Nursing Assistants	4,033	4%	4,408	9%	$11.22	725
31-9091	Dental Assistants	590	4%	642	9%	$18.39	94
31-9092	Medical Assistants	975	7%	1,100	13%	$14.00	170
37-2012	Housekeeping Cleaners	553	4%	618	12%	$9.20	367
39-9021	Personal Care Aides	484	27%	596	23%	$8.74	796
43-4171	Receptionists and Information Clerks	1,065	10%	1,182	11%	$11.25	435
43-6013	Medical Secretaries	446	-6%	531	19%	$14.46	92
43-9061	Office Clerks, General	624	2%	677	9%	$13.51	1,306
	TOTAL	**18,588**	**2%**	**20,381**	**10%**	**$18.92**	**4,997**

* Occupations that provide higher than median wages for the region are in green.

Food and Beverage Processing Cluster

Another emerging industry cluster in Region 2 is food and beverage processing. Already, the region has a relatively strong food and beverage manufacturing industry group, with industries such as processed dairy products, snack foods, soft drinks and others having location quotients higher than 2.0. Commercial and retail food manufacturing is projected to grow in the coming five years. In addition, winery and brewery employment may grow as much as 18%. Many fermented beverage firms exist already in the region, and this subcluster is growing with the support of educational programming like Virginia Tech's Enology and Fermentation Sciences Department. With national concerns over food security, healthy eating, and local sustainability, this urban-rural mixed region is well positioned to align its agricultural supply chain, skilled workforce, manufacturing, and wholesale assets.

A December 2016 article in Forbes pointed to the extent of global and national industry growth, while highlighting that Silicon Valley invested over $1 billion in food startups and projects in 2016 alone.[35]

[35] Lampert, P. (Dec 2016). Ten Food Trends That Will Shape 2017. Forbes. Retrieved from: https://www.forbes.com/sites/phillempert/2016/12/14/the-supermarketgurus-2017-food-trend-forecast/#22f9bf1854b8

According to McKinsey & Company, from 2004-2013, global investments in the food-and-agribusiness sector increased threefold, to more than $100 billion in 2013. In Region 2, Frito Lay, Abbott Nutrition, Mennel Milling, Tetra U.S., Blue Ridge Beverage Company, Pepsi Bottling Group, and Red Sun Farms are just a few examples of businesses contributing to this cluster. The Roanoke MSA has successfully competed to be an east coast hub for several larger scale breweries including Ballast Point and Deschutes. Municipalities and regional economic development groups frequently cite the region's water and sewer infrastructure as a key asset. Water (quality, access, and cost) is among the leading site selection considerations for food and beverage processing.

Similar to the manufacturing cluster, the food and beverage processing cluster—both its agriculture and manufacturing components—may benefit from changing technology as well as consumer spending trends. Mechatronics, autonomous systems, and other technology continue to develop and have a growing presence among these industries. While most of the occupations listed in Table 10 do not officially require much higher than a high school education and some on-the-job training, many increasingly rely on an array of mechanical, computer, scientific, and business skill sets. Moreover, future job growth in this sector would likely include higher-wage occupations. Companies in this cluster represent small firms and start-ups as well as mid-size and larger-scale operations all of which must stay up-to-date on consumer spending, food trends, FDA and EPA regulations, and more. Those working in agriculture, for instance, often learn appropriate agricultural practices and integrate them more and more with technology used to monitor and produce agricultural goods. Small farmers, in particular, may benefit from "buy local" movements, but they must also take advantage of changing practices to sustain their businesses. Value-added agriculture and the transition to larger commercial agribusiness may be one opportunity for Region 2 to capitalize and align these assets. Thus, although there may always be a need for entry-level manufacturers and commercial drivers, the cluster will increasingly need talent skilled in the food sciences, mechatronics, and other technical skills, as well as those conscious of industry and regulatory trends. Consequently, overall median wage may increase.

Table 10: Key Food and Beverage Processing Cluster Occupations[36]

		FOOD AND BEVERAGE CLUSTER				ALL INDUSTRIES	
SOC	DESCRIPTION	EMPLOYED (2016)	% CHANGE (2011 - 2016)	EMPLOYED (2021)	% CHANGE (2016 - 2021)	MEDIAN HOURLY EARNINGS	AVG. ANNUAL OPENINGS (2016-2021)
11-9013	Farmers, Ranchers, and Other Agricultural Managers	623	-3%	610	(2%)	$12.08	69
41-4012	Sales Representatives, Wholesale and Manufacturing	269	7%	287	7%	$25.47	346

[36] EMSI 2017.3; QCEW, Non-QCEW Employees, and Sole Proprietors. We include non-QCEW and Self-Proprietors because many farmers are included in self-proprietors.

SOC	DESCRIPTION	FOOD AND BEVERAGE CLUSTER				ALL INDUSTRIES	
		EMPLOYED (2016)	% CHANGE (2011 - 2016)	EMPLOYED (2021)	% CHANGE (2016 - 2021)	MEDIAN HOURLY EARNINGS	AVG. ANNUAL OPENINGS (2016-2021)
43-5081	Stock Clerks and Order Fillers	152	10%	163	7%	$10.64	766
43-9061	Office Clerks, General	96	12%	99	3%	$13.53	1,310
45-2092	Farmworkers and Laborers, Crop, Nursery, and Greenhouse	515	12%	540	5%	$10.72	114
45-2093	Farmworkers, Farm, Ranch, and Aquacultural Animals	159	28%	173	9%	$11.93	41
51-1011	First-Line Supervisors of Production and Operating Workers	95	6%	101	7%	$28.17	217
51-3092	Food Batchmakers	417	12%	425	2%	$12.72	90
51-9111	Packaging and Filling Machine Operators and Tenders	180	-8%	197	9%	$13.38	83
53-3031	Driver/Sales Workers	138	4%	152	10%	$12.41	91
53-3032	Heavy and Tractor-Trailer Truck Drivers	239	9%	254	7%	$18.23	669
53-3033	Light Truck or Delivery Services Drivers	119	12%	126	6%	$11.70	305
53-7051	Industrial Truck and Tractor Operators	114	6%	123	7%	$15.71	180
53-7062	Laborers and Freight, Stock, and Material Movers, Hand	211	4%	225	7%	$11.68	857
53-7064	Packers and Packagers, Hand	106	3%	117	10%	$9.14	214
	TOTAL	**3,433**	**6%**	**3,592**	**5%**	**$14.47**	**5,353**

* Occupations that provide higher than median wages for the region are in green.

Emerging Technology and IT Cluster

This cluster includes existing and emerging industries that ultimately support the other prominent driver industries and clusters in the region through technology development. Sub-clusters include:

- Autonomous Systems: The autonomous systems market has been dominated by the Department of Defense (DoD), which budgeted $4.457 billion for autonomous systems development and research in 2017[37] alone. DoD spending is expected to increase in future years; however, the U.S.

[37] http://dronecenter.bard.edu/files/2016/02/DroneSpendingFy17_CSD_1-1.pdf

agricultural industry could be responsible for two-thirds of all private sector market purchases[38] within the next ten years. This would eventually lead to agricultural industries being the largest purchasers of autonomous systems devises. Farmers use autonomous systems to successfully identify crop diseases, monitor water usage, gauge weather patterns, and ultimately increase crop yields. Region 2 already has research, education, and manufacturing strengths in air, land, and sea. These assets include but are not limited to Virginia Tech's Transportation Institute research, Liberty University's Aviation and Unmanned Aerial Systems curriculum, community college drone curriculum, the Mid-Atlantic Aviation Partnership (an FAA-designated test site), the Association for Unmanned Vehicle Systems International (AUVSI) Valleys and Ridges chapter, and numerous researchers and companies pursuing the development and manufacturing of unmanned systems technology.

- Cyber security and Information Technology (IT): Cyber security and IT industries support practically all industries in the region from government and health care to manufacturing and financial industries. Many of the most recent, successful startups in Region 2 were innovative in their use and development of information technology. Meanwhile, the cyber security market has seen increasing demand that has progressed steadily along with technology. There is an ever-increasing global demand for IT skills such as coding, systems administration, malware prevention, network engineering, security analysis, and more. By 2020, the demand for cyber security will eclipse $120 billion.
- Knowledge Creation and R&D: The knowledge creation and R&D subcluster includes higher education institutions and research firms. Research and knowledge-production is vital to the development and evolution of other industries. In Region 2, most R&D activity is within higher education institutions, which represents a challenge, as much of the research has not translated to regional activities by private firms. Like most of Virginia, Region 2 has a high concentration of higher education institutions, although the scale, number, and variety of entities is perhaps unique. For example, Region 2 includes both the state's largest private university (Liberty University in Lynchburg) and the state's largest research university (Virginia Tech in Blacksburg). In Lynchburg alone, there are four colleges and universities. The highest number of jobs are teaching-related. The largest non-teaching occupations are technicians and engineers.

Technology and IT industries typically offer competitive wages, contributing handsomely to a region's GRP; however, this cluster typically requires a high level of skill, usually in a specific skill set, creating supply gaps in the workforce. Although graduates from the region's many higher education institutions can be a potential source of workforce supply, most with these skill sets leave the region after graduation. According to jobs postings data, in the average month over the last 12 months, the region filled 670 positions listed in Table 11 out of 969 unique job postings. This difference is an indication of unmet demand and greater competition among employers for talent.

Part of this talent attraction and retention challenge in Region 2 may be related to the lower salary trends. In 2016, the median compensation for tech cluster occupations is $57,543 (versus the national

[38] http://www.westernfarmpress.com/miscellaneous/agriculture-farm-two-thirds-uav-drone-market

median wage of $68,437).[39] An underlying cause of this lower salary trend may be the relatively high number of sector jobs in education institutions, which tend to pay lower wages than private firms.

Table 11: Key Emerging Technology and IT Cluster Occupations[40]

		EMERGING TECH AND IT CLUSTER				ALL INDUSTRIES	
SOC	DESCRIPTION	EMPLOYED (2016)	% CHANGE (2011 - 2016)	EMPLOYED (2021)	% CHANGE (2016 - 2021)	MEDIAN HOURLY EARNINGS	AVG. ANNUAL OPENINGS (2016-2021)
15-1121	Computer Systems Analysts	293	6%	342	17%	$32.47	64
15-1132	Software Developers, Applications	502	12%	583	16%	$40.43	80
15-1133	Software Developers, Systems Software	312	4%	350	12%	$42.94	49
15-1151	Computer User Support Specialists	994	19%	1,154	16%	$20.66	150
17-2051	Civil Engineers	346	-15%	362	4%	$34.92	57
17-2071	Electrical Engineers	267	-10%	279	4%	$45.60	59
19-1021	Biochemists and Biophysicists	15	-36%	11	-23%	$33.47	5
19-1042	Medical Scientists, Except Epidemiologists	32	-39%	24	-24%	$36.43	16
19-2031	Chemists	13	-35%	10	-21%	$40.25	18
19-4021	Biological Technicians	40	-31%	29	-29%	$17.76	22
25-1099	Postsecondary Teachers	6,159	-5%	6,153	0%	$27.50	609
25-2021	Elementary School Teachers,	2,379	-2%	2,389	0%	$23.11	234
25-2022	Middle School Teachers,	949	-2%	954	1%	$22.95	94
25-2031	Secondary School Teachers,	1,723	-2%	1,732	1%	$23.19	162
41-3099	Sales Representatives, Services, All Other	331	-1%	339	3%	$23.19	219
	TOTAL	14,354	-3%	14,712	2%	$30.30	1,837

* Occupations that provide higher than median wages for the region are in green.

[39] EMSI 2017.3 QCEW dataset

[40] EMSI 2017.3; QCEW Employees

SECTION 3: REGIONAL PRIORITIES

Region 2's three sub-regions have similar assets and concerns, as demonstrated by a review of existing strategic plans for each of the three areas as well as discussions with area representatives. The existing strategic plans reviewed for this document include Comprehensive Economic Development Strategies, Workforce Development Strategic Plans, and strategic plans of each of the three Economic Development Marketing Organization. During this review process, the GOVA Region 2 Council also met with representatives from each of the three area organizations to discuss key assets, activities and challenges. These organizations included:

- **New River Valley:** the New River Valley Regional Commission, the New River Mount Rogers Workforce Development Board, and the New River Valley Economic Development Alliance
- **Roanoke-Alleghany:** the Roanoke Valley-Alleghany Regional Commission, the Virginia's Blue Ridge Works! Workforce Development Board, and the Roanoke Regional Partnership
- **Lynchburg MSA:** Virginia's Lynchburg Region Local Government Council, the Lynchburg Region Workforce Development Board, and Lynchburg Regional Business Alliance

Through their strategic planning and daily activities, each of these organizations employ in-depth community engagement processes, which allows for a comprehensive perspective of each area's economy. Below is a list of key characteristics similar across Region 2 based on an analysis of these strategic plans.

Table 12. Region 2 Strengths, Opportunities, Challenges

Areas of Interest		Common Characteristics
Talent	Demographics	• CHALLENGES: Region 2 has an aging population with increasing loss of younger residents due to brain drain. Like many regions in the US, Region 2 also faces drug abuse challenges among citizens within its population.
	Education	• STRENGTHS: The community college system; many 4-year higher education institutions; strong K-12 system among many counties in the region • OPPORTUNITIES: Create stronger partnerships between businesses and schools; leverage the integrated community college system more • CHALLENGES: Lack of experiential learning opportunities; stigma against middle-skill (non-bachelor degree) jobs; workforce lacks soft skills
	Workforce	• STRENGTHS: Strong education system (K-postsecondary) • OPPORTUNITIES: Retain students and young professional by raising awareness of regional employment opportunities; grow public awareness of skilled trade occupations • CHALLENGES: Many low-wage jobs; brain drain; pipeline challenges; cost/time to upskill someone; limited retention of college graduates; lack of soft skills
Infrastructure	Infrastructure	• STRENGTHS: Water and sewer • OPPORTUNITIES: Redevelop and repurpose underutilized property; create more basic infrastructure including communications in rural parts of the region; expanding recreational, cultural and quality of life assets

Areas of Interest		Common Characteristics
		• CHALLENGES: Aging infrastructure and building stock; broadband access, rural-urban divide
	Transportation	• STRENGTHS: I-81 interstate system; regional airports; Amtrak; major railroads • OPPORTUNITIES: Improve regional air service; facilitate access to interstate system for attracting and growing businesses • CHALLENGES: Lack of public transportation especially in rural areas; regional airport challenges; congestion on I-81; no international terminal
Entrepreneurship	Business Environment	• STRENGTHS: Low cost of doing business; collaborative business community; good resources for businesses. • OPPORTUNITIES: Promote entrepreneurial growth and venture capital funding; improve business engagement with resource entities, ensure greater broadband connectivity; create financial incentives for hiring dislocated workers. • CHALLENGES: Weak entrepreneurial leadership; competition with online retailers; corporate restructuring resulting in regional downsizing or restructuring; lack of regional brand/image/identity
	Quality of Life and Culture	• STRENGTHS: Natural amenities and outdoor recreation; low cost of living; ability to retain family-oriented professionals; diversity in arts and culture; vibrant downtowns; low crime-rates • OPPORTUNITIES: Build public engagement; market to millennials; regionalize youth development programs; develop regional brand • CHALLENGES: Unaffordable and/or deteriorating housing; low citizen engagement; affordable housing; regional identity/brand; preservation of historic buildings and neighborhoods
	Institutional Collaboration	• STRENGTHS: Realignment of the workforce system • OPPORTUNITIES: Leverage research (including medical); develop shared legislative platform; more coordination and service delivery related to workforce; promote experiential learning; share data and market opportunities; build community leadership capacity • CHALLENGES: Lack of common vision among partners; lack of regional collaboration; no system of shared outcomes/metrics/collective impact

Moreover, these three sub-regions within Region 2 have several well-aligned target industry goals. The Region 2 Council considered these target industries in developing its four priority clusters. In the future, many of these industries will rely on their ability to grow and adapt to the changing economy with the help of new technologies. These industry similarities include:

- Manufacturing (both basic and advanced)
- Life sciences, biomedical, and health care
- Food and beverage processing
- Information technology (especially cybersecurity)
- Business and financial services

Other industries that at least two regions mentioned in their plans or during the Growth and Diversification planning process were transportation manufacturing and warehousing, autonomous systems (including aerial and terrain), and energy. While there are many industries that support the region's strong cultural environment and overall quality of life, the driver industries listed above provide a critical employment base.

While these three sub-regions exhibit numerous similarities, differences do arise particularly with respect to the more urban and rural parts of Region 2. For example, access to broadband and transportation infrastructure are much larger concerns for those in outlying rural counties. As small businesses in these counties consider growing their market base and exporting outside the region, they are hindered by this lack of IT and transportation access. Most rural counties in Region 2 are also more economically reliant on the manufacturing sector, as well as on the food and beverage processing cluster that includes agricultural production. Region 2's urban hubs, however, focus more on developing the life sciences, health care, and IT industries. This difference in industry reliance also contributes to diverse workforce needs from middle skilled jobs requiring industry certifications and associate degrees to jobs requiring higher level, research and development-oriented degrees. While the median hourly wage for all of Region 2 is $18.66 per hour, the region's more rural counties have median hourly wages closer to $17 per hour.

Nevertheless, these similarities also reveal focus areas that Region 2 might address with GO Virginia funding:

- Talent (Workforce) Development, Attraction, and Retention: One significant focus area for Region 2's GO Virginia funds addresses the need for talent attraction, retention, and development within the priority industry clusters, particularly as it pertains to higher than median-wage jobs. (Note: This plan uses the term "talent" in reference to workforce, partly since workforce is often associated with training programs and worker services whereas talent refers to a broader spectrum of approaches concerning attraction and retention of highly skilled [talented] people.)
- Sites and Buildings: Region 2's Council recognizes that one focus area in this region should include the development or re-development of real estate, particularly existing underutilized sites and buildings, appropriate for the needs of growing priority industry clusters.
- Entrepreneurship and Business Development: To address the need for entrepreneurial activity and business growth in the region, Region 2 identified a focus on promoting access to capital, mentorship, and training programs.
- Technology Development: To grow Region 2's priority industry clusters, the Council created a focus area specifically addressing the promotion and development of technology-based enterprises that drive overall industry growth.

The sections that follow provide an in-depth overview of each focus area, along with a discussion of regional assets, potential strategies, and possible criteria for projects related to this area.

Talent Development, Attraction, and Retention

Talent production and the attraction and retention of highly skilled workers is a critical challenge for all regions in Virginia. Members of Region 2's three sub-regions all share a desire with connecting skilled workers to high-paying jobs for the purpose of growing and retaining skilled talent. One major strength of Region 2 is that it is home to 23 institutions of higher learning, including colleges, universities, community colleges, and technical training centers (Figure 1). In fall 2016 alone, there were 75,524 individuals

enrolled in undergraduate programs in Region 2, which is roughly 10% of the population.[41] By comparison, 97,780 individuals were enrolled in *both* undergraduate and graduate programs at postsecondary institutions in the Richmond MSA or only 8% of the MSA's population.[42] Moreover, the Roanoke Regional Partnership estimates that the region has a higher concentration of undergraduates per capita than the Boston-Cambridge, San Francisco-Oakland, Raleigh-Durham-Chapel Hill, or Austin areas[43].

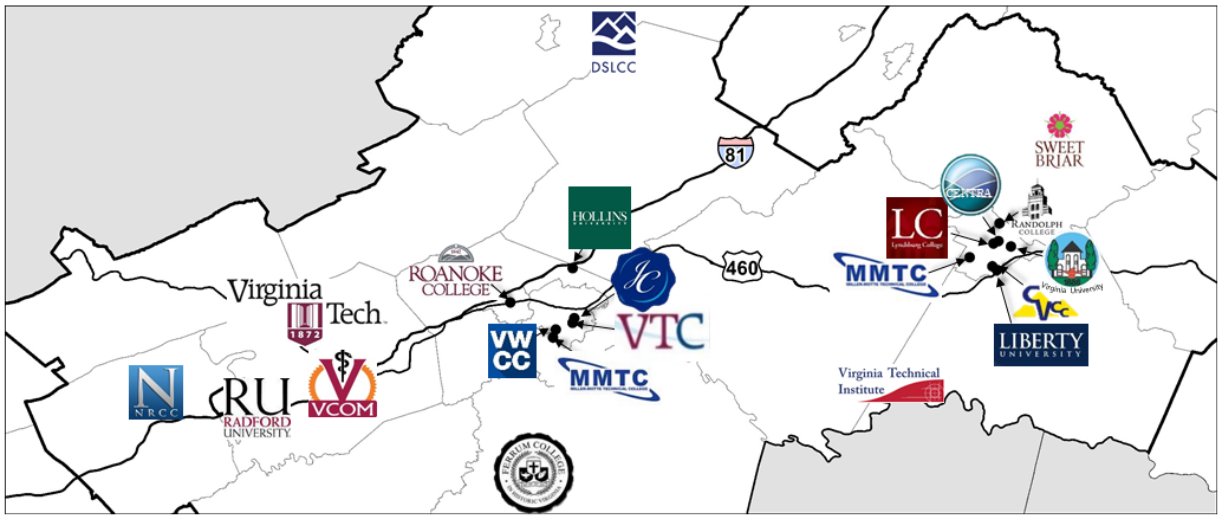

Figure 9: GO Virginia Region 2 Institutes of Higher Learning, Universities, Colleges, Community Colleges, and Training Centers

Indeed, the number of regional degree completions has increased steadily over the past 10 years, and the number of professional and graduate degree completions has increased by 250% (see Figure 1 on page 2). Total regional completions in 2015 almost topped 24,000.[44]

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[41] Compiled from various sources including: State Council For Higher Education for Virginia (2017) Fall Headcount Enrollment (1992 thru Current Year). Retrieved from http://research.schev.edu/enrollment/E2_Report.asp; Virginia Tech (2016). Factbook, Student Overview. Retrieved from https://vt.edu/about/factbook/student-overview.html; Radford University (2017). Who We Are. Retrieved from http://www.radford.edu/content/radfordcore/home/about.html; Liberty University (2016). Liberty New, Class of 2020 moves in, setting record for campus population and academic achievement. Retrieved from http://www.liberty.edu/news/index.cfm?PID=18495&MID=201965; Community College Review (2017). Virginia Community Colleges. Retrieved from https://www.communitycollegereview.com/virginia; College Tuition Compare (2017). Retrieve from http://www.collegetuitioncompare.com/edu/234137/virginia-university-of-lynchburg/enrollment/ and http://www.collegetuitioncompare.com/edu/232618/lynchburg-directory-hospital-school-of-nursing/

[42] Virginia Economic Development Partnership (VEDP; 2017). Community Profiles by MSA. Retrieved from http://profiles.yesvirginia.org/MapSearch?type=MSA

[43] Roanoke Regional Partnership. Retrieved from http://roanoke.org/advantages/higher-education/ Note: This estimate may be slightly different for the GO Virginia region as a whole.

[44] Dept of Education, NCES IPEDS, adjusted for non-resident programs

As measured by program completions, the region has increased its production of skilled workers; however, the overall number of jobs that require a certificate, two-year or four-year degree have not increased to the same extent. This suggests that graduates are leaving the region to pursue employment, or are underemployed. Underemployed workers includes those individuals who are highly skilled but working in low paying jobs, low skill jobs, or as part-time workers who would prefer to be full time. Data collected from regional employers and contained within regional workforce development plans suggests that companies are having difficulty filling positions with workers possessing the necessary and preferred skills. This misalignment between employers and employees is a major barrier for growing skilled talent in the region, and it can be described in terms of four major gaps:

- *Talent (skills) gap:* employers struggle to attract talent with the appropriate skills to succeed.
- *Interest gap:* there is a lack of interest in obtaining certifications and degrees required for in-demand technical occupations. Alternatively, those with the appropriate skills may not be interested in staying or coming to Region 2.
- *Affordability gap:* degree and certification programs are costly both in terms of tuition, and opportunity cost (lost wages in pursuit of a degree)
- *Coordination gap:* companies, education institutions, and workforce training entities do not necessary collaborate enough to seamlessly align career pipelines with regional job availability.

A review of nine economic development, planning and workforce plans for the three sub-regions in Region 2 describes several common goals to help address these gaps. Supporting and developing the continued growth of a qualified workforce through collaboration and partnership development is a common thread among the three regional planning commission's Comprehensive Economic Development Strategy (CEDS) plans. The New River Valley CEDS plan contains strategies for leveraging community colleges, one-stop centers, and experiential learning opportunities. The plan also calls for a better alignment of workforce needs and skills gaps with training opportunities. Roanoke Valley-Alleghany similarly focuses on promoting cooperation between higher education institutions and businesses, and highlights the need for stronger links between K-12 and higher education in the region. The Lynchburg region's plan also highlights partnerships between training institutions and regional employers.

Similarly, three regional workforce development boards (WDB) share common goals, including business engagement and sector partnerships, marketing and technology to improve awareness of both available jobs and available talent, and skill development for job seekers for in-demand occupations. The three regional economic development organizations (EDO) focus on attracting not just companies and jobs to the region, but highly skilled talent that would then assist with the marketing of the region as a premier destination to do business. Similar to the regional commissions and workforce boards, these regional EDOs also cite collaboration and marketing as potential means for bridging the gaps that exist between employers and job seekers.

During the planning process, Region 2 Council members and working group participants noted the presence of higher education in the region as an asset, particularly Virginia Tech, a major research university. Many people also cited the growth of other colleges and universities. While this represents a large potential talent pool, several individuals voiced concerns that the region is not doing enough to retain these graduates. Some stakeholders expressed concern that these institutions (and Virginia Tech in particular), are not doing enough to connect students and graduates to area businesses.

Based on these plans and discussions with key informants, important regional assets related to the attraction and retention of skilled talent to grow higher wage jobs include:

Table 13: Region 2 Assets, Strengths, and Challenges

Asset Type	Example Strengths	Challenges
Educational assets	K-12, community colleges, proprietary schools medical schools, universities, 4-year colleges, adult education (ACE program and similar)	Limited linkages between education institutions, limited awareness of offerings between sub-regions
Similar occupations across industry clusters	IT occupations, middle-skill occupations across GOVA target industry clusters. Programming for those cross-industry occupations.	Filling those programs with interested students, for example technician related programs
Workforce system	Three workforce development boards, robust community college system with access programs like ACCE at New River, CCAP at VA Western	Connectivity between the systems, employer/business awareness
National and international employers	Lab Corp, Carilion, BWX Technologies, Volvo, West Rock, Celanese, Rackspace, GE	Lack of awareness of employer needs and of workforce resources
Willingness to collaborate	Mentioned in each regional plan and highlighted during discussions with stakeholders during the Region 2 Planning period.	Limited means and methods of collaboration

In order to grow, attract, and retain top talent in Region 2, the region should develop strategies that address the four major gap areas: talent, interest, affordability, and coordination. These gaps can be addressed both individually and holistically. Using an iterative process, approximately 20 representatives from workforce, economic development, and regional planning groups helped identify the following potential strategies:

Table 14: Talent Strategies, Opportunities, and Metrics

Strategies	Opportunities	Metrics
Strengthen the pipeline from K-12 to higher education to career for each priority sector	Define clear career pathways for each of the four priority industry sectors and support programs that address critical pathway training opportunities (e.g. apprenticeships, STEM-focused CTE, or etc.)	• Number of career pathways (tailored to region) developed • Number of career counselors using career pathways to advise students

Strategies	Opportunities	Metrics
	Begin job training at K-12 level and enhance K-12 career exploration activities	• Percent of target population potentially reached in the GO Virginia region • Number of high school graduates pursuing occupations or higher education that may lead to occupations in target industries
	Bridge the interest gap through the creation of targeted awareness and recruitment campaigns in each priority industry sector	
Increase completions of degrees applicable to target industry sectors	Cross-market and cross-promote technical programs and certifications	• Increase in awareness of programs and resources by target populations in the GO Virginia region • Number enrolled in targeted program(s) • Number of inquiries from potential students in target footprint
	Provide financial assistance or incentives for students to enroll in certificate or degree programs that lead to careers in high-demand occupations	
Improve knowledge and promotion of complementary workforce and training services	Development and implementation of a collaborative region-wide impact-focused program model	• Number of workforce service participants in program • Number of new partnerships created • Number and diversity of participants in the workforce system
	Development and implementation of a virtual "one-stop shop" resource for employers, workers, students and their parents	
Enhance employer engagement activities that will encourage more aligned skill development, create opportunities for regional employment post-graduation, and promote the hiring of in-demand occupations	Develop and promote experiential learning opportunities	• Number of employers engaged • Number of student participants • Number of universities engaged • Number of new internships, apprenticeships, or experiential learning opportunities established
	Increase and promote internship opportunities	
	Identify innovative employer engagement activities that promote the presence of in-demand job openings	

Key Points: Talent Development and Retention

Why is this important?

- 23 institutions of higher learning, including colleges, universities, community colleges, and technical training centers
- Regional degree completions in 2015 almost topped 24,000

Problem:

- The overall number of jobs that require a certification, community college, or four-year degree have not increased to the same extent as completions
- Graduates are leaving the region to pursue employment, or are underemployed
- Four major gaps:
    - *Talent gap:* employers struggle to attract skilled talent
    - *Interest gap:* there is a lack of interest in obtaining certifications and degrees required for in-demand technical occupations
    - *Skills gap:* job applicants lack the required skills to succeed in available jobs
    - *Affordability gap:* degree and certification programs are costly both in terms of tuition, and opportunity cost (lost wages in pursuit of a degree)

Strategies

- Strengthen the pipeline from K-12 to higher education to career for each priority sector
- Increase completions of degrees applicable to priority industry sectors
- Improve knowledge and promotion of complementary workforce and training services
- Enhance employer engagement activities that will encourage more aligned skill development, create opportunities for regional employment post-graduation, and promote the hiring of in-demand occupations

Sites and Buildings

The task of developing appropriate real estate products, the places and spaces where different industries can thrive in a changing economy, has never been more complex and demanding. As currently understood, GO Virginia funds are not appropriate for direct site acquisition, but may be used for site preparation and development and to better position and animate sites and built assets to spur economic growth. In designing Go Virginia the state board has recognized there are opportunities to facilitate specific approaches to collaborative, regionally significant development through GO Virginia funds. Those opportunities may be shaped by the needs of priority industry clusters or groups of related firms identified through the Growth and Diversification planning process.

Region 2's three sub-regions all share a common issue with the availability of what economic developers describe as "product," market-ready sites and buildings. The limited number of large sites, graded pads, and "shovel-ready" development sites are a common concern. Increased attention is also being given to existing special assets like research or educational facilities, airports, or corporate anchors. All parts of the

region are talking about ways to leverage them. Business accelerators or specialized entrepreneurship centers, research parks or innovation districts, or other targeted development plans are being discussed for their stimulative effect on products coming to market and ultimately business location and expansion.[45]

Information

Readying a site or a building for market involves a host of considerations. Questions about physical features like lot size and topography, grading and readiness to build, as well as the quality of existing structures or the availability of shell buildings are common. Access to networked assets like power and communications infrastructure, transportation, and labor is important. Further, the proximity of institutions like educational and medical facilities, airports, or large corporate anchors is a concern. Sites of interest will look very different for different industries.

The state provides a very basic database of available properties called Virginia SCAN.[46] This provides limited physical information, most importantly size and acreage as well as proximity to highways. Within Region 2, most sites and buildings listed in the database are small. For example, 90% of sites are less than 22 acres, and 90% of buildings are less than 160,000 square feet. There are available sites and buildings in the Roanoke and Lynchburg regions that are less than 12 miles from an airport, while all the locations in the New River Valley are less than 35 miles from a major highway.

To create a richer picture, some areas have undertaken extensive efforts to assess and characterize sites and buildings. For example, the Roanoke Regional Partnership (RRP), on behalf of the Western Virginia Regional Industrial Facilities Authority (RIFA), completed an extensive study of 165,000 parcels, examining physical characteristics and proximity to utilities and infrastructure. Ten high priority sites emerged from that process and RIFA selected one location for development.[47]

Site evaluation criteria utilized by the RRP included:

- 100 acre minimum
- Limited number of landowners
- Avoiding floodplain locations
- Average slope <5% for a minimum 80 acre pad
- Maximizing buffer from residential areas
- Regular configuration (i.e. square or rectangular shape)
- High-visibility sites with highway access
- Utilities (e.g. power, water, sewer, fiber, natural gas) within 2 miles

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[45] Regional CEDS reports accessed August 9, 2017. http://nrvrc.org/wp-content/uploads/2017/07/CEDS2017Report.pdf
http://rvarc.org/wp-content/uploads/2017/07/2017-RVAR-CEDS-Annual-Report.pdf
http://www.localgovernmentcouncil.org/images/PDFs/16_11_DOC_ceds-and-implementation-plan_v.final.pdf
[46] Virginia SCAN database accessed August 9, 2017. http://virginiascan.yesvirginia.org/propertySearch/
[47] Announcement of Western Virginia RIFA, accessed August 9, 29017.
http://www.roanoke.com/business/news/roanoke-valley-governments-to-buy-acres-near-i--i/article_6efcc9cb-ae72-5008-a692-131c0cd2bb04.html

Other economic development organizations in Region 2 are preparing to launch similar site assessment initiatives, both to better position individual sites and to explore the feasibility of joint acquisition and development. The Commonwealth of Virginia has also launched a competitive site characterization and development grant program specifically supporting efforts to bring sites of 100 acres or greater on the market and introducing a tiered system of judging site readiness.

There has been a clear focus on bringing more information to bear on the site development process, especially identifying a supply of large industrial sites, characterizing their physical features, and their access to networked infrastructure or special assets. This speaks to the supply of sites or "products", although there is less information on the demand side. Economic development organizations can pursue multiple market opportunities based on site characteristics, but they face an information gap. "We don't know what we don't know," stated one participant in the working group developing this section of the plan. Most economic development organizations track some information about company prospects; however, consultants managing initial inquiries often provide limited information about their clients. Further, as many leads are generated centrally from the state, which does not collect and characterize such inquiries, there is no context in which to assess the leads that reach the regions.

This focus on sites also means in some instances that we may not know enough about existing office markets. This type of knowledge may be important in highly urbanized areas, or in targeting sectors where smaller high-growth firms may need a different footprint as they scale-up their activities. The focus on public acquisition and development also leaves open the possibility that actors in the private market may be overlooked, which is a subject of interest to some economic development organizations.

Collaboration

Collaboration among localities is clearly a key to large sites, given limited land availability in many jurisdictions, and the costs for acquisition and development. The state provides a legal framework for joint site development and revenue sharing through the Regional Industrial Facilities Act (RIFA).[48] Partners are asked to share costs up front with the promise of shared tax revenues at the end of the day. This model allows a relatively land-poor jurisdiction like Salem to share in the benefits of a large site in Roanoke County developed by the new Western Virginia Regional Industrial Facilities Authority.

It is important however to think about the long path of development and the many investments that partner jurisdictions may make along the way, such as utilities, site grading, shell buildings, and ultimately incentive packages. For example, years passed between the creation of Virginia's First Regional Industrial facility and securing its first tenant at the 1,000-acre New River Valley Commerce Park. In such a timeline markets can shift, leadership can change in partner governments, and the vision for a joint site must adjust. The RIFA may not provide sufficient incentive to partners to avoid a "free-rider" phenomenon over the life of such a project. Performance agreements for economic development projects exist to govern shared investments, but targeted funding available on the condition of joint investments by localities, might provide an incentive to make meaningful commitments.

[48] Regional Industrial Facilities Act, accessed August 9, 2017. http://law.lis.virginia.gov/authorities/virginia-regional-industrial-facilities-act/

Another form of collaboration takes place around special assets. Much attention is paid in economic development to anchor institutions; for instance, higher education institutions' ability to spin innovative new companies from research or teaching facilities. Similarly, certain functions of large corporations, federal facilities, or even airports, are often considered generative assets to leverage for development.

Ideas about what works to build on such assets focuses in many cases on how to facilitate and capture value from the unique points of connection and collision they represent. Bringing different economic actors together, almost always crossing jurisdictional or even state or national boundaries, can generate new ideas and opportunities. These ideas need the right kind of spaces like accelerators and incubators, research parks, or specialized development districts or corridors in the open market. They may require partnerships between localities and universities, or other "anchor" entities, to assist with development or facilitation.

The Virginia Tech Corporate Research Center, created in 1988, currently houses 180 technology companies with 3,000 employees on 230 acres adjacent to the Virginia Tech campus. Similar opportunities may exist for Liberty University, which just purchased the Center for Advanced Engineering and Research in Bedford's New London Park as a home to a new engineering campus. The City of Roanoke and partners from several anchor institutions are exploring an innovation corridor that, in part, would leverage innovations form the Virginia Tech Carilion School of Medicine and Research Institute. The uniqueness of each opportunity can make it hard to describe definitively the right kind of space. This creates an information challenge potentially more complex than that required to target industrial sites.

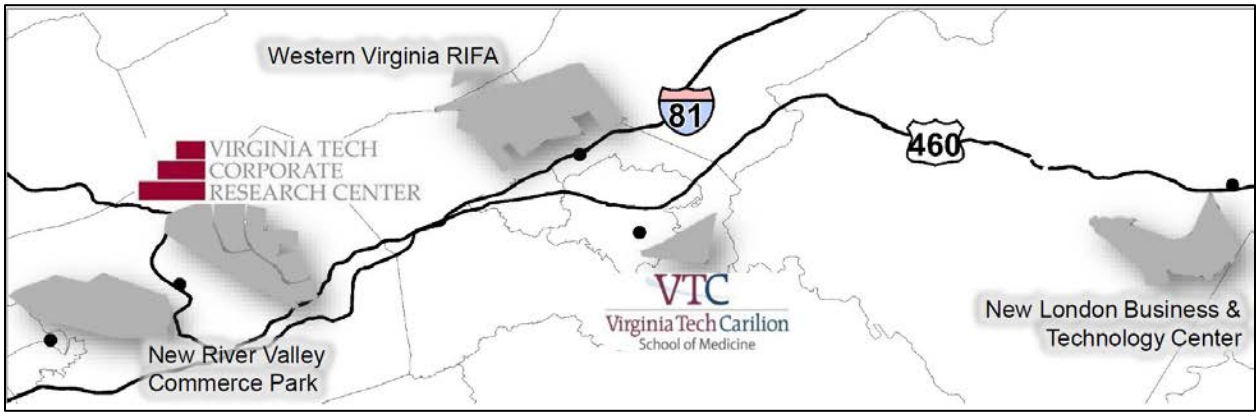


Figure 10: Select examples of sites and special assets

Strategies and Criteria

The goals of the GO Virginia program include growing higher than region median wage jobs, primarily from new investment, and facilitating collaboration across jurisdictions. Accordingly, one priority of Region 2, described in Table 14 below, is to support strategies that increase the number of collaboratively developed sites and buildings on the market, improving their market positioning, and meaningfully engaging sites and buildings leveraging special assets.

The reality of limited funding available through the GO Virginia program should encourage applicants to carefully consider other available sources they can utilize with respect to the topics discussed in this section. There is limited state support for information strategies, and many have worked largely through their own resources. There are substantial state and federal dollars available for infrastructure

investments and site development. These do not require, but would reward, collaborative strategies. They are however highly competitive, require substantial planning, and play out over extended timelines. Strategies for leveraging special assets may tap resources like those listed above; but generally, they begin with commitments at the local or regional level or in partnership with the anchors. Success metrics for projects could include bringing more information about both supply and demand to this market, delivering more data about site characteristics and industry needs to improve the success of development projects. Other measurements may include the number of sites appropriate for target clusters identified in this plan, market ready sites judged through the state assessment system, and dollars invested in collaborative projects.

Table 15. Sites and Buildings Development Strategies, Opportunities, and Metrics

Strategies	Opportunities	Metrics
Improve information about site and buildings characteristics and market demand for sites and buildings	Local government or regional economic development agency funding	• More information available on site and building characteristics available to the market • More information available to economic developers on industry demand from priority industry clusters defined by this plan • More sites and buildings on the market appropriate for priority industry clusters defined by this plan • More ready-to-market sites as defined by the state tiered readiness grades • More joint local investments or anchor institution investments in site/buildings development or re-development measured by dollars committed to projects
	VEDP sites characterization and development grants	
Incentivize collaboration at all stages of joint site/building development or re-development	Virginia Resources Authority funding	
	Virginia DHCD (e.g. Building Collaborative Communities, CDBG) grants	
	USDA Rural Development	
	US EDA Public works grants	
Develop and implement real estate strategies to leverage special assets	Local government or regional economic development agencies funding	
	Anchor institutions support	

Key Points: Sites and Buildings

Why is this important?

- Developing appropriate real estate products has become more complex and demanding

Problem

- Region 2 has a limited number of large sites, graded pads, and "shovel-ready" development sites
- Virginia SCAN system provides limited information on available sites
- Focus on public acquisition and development means actors in the private market may be overlooked

Strategies

- Improve information about site and buildings characteristics and market demand for sites and buildings
- Incentivize collaborative investment at all stages of joint site/building development
- Develop and implement real estate strategies to leverage special assets

Entrepreneurship and Business Development

Another common goal across Region 2's three sub-regions is the desire to support the development of young and growing firms. All three Comprehensive Economic Development Strategy (CEDS) plans that make up the region describe small and entrepreneurial business promotion as strategies. Several Economic Development Organizations (EDOs), Workforce Development Boards (WDBs), and other prominent organizations in the region also identify the acceleration of young and growing firms as an opportunity for regional growth. Indeed, the most recent federal data on regional startups shows that job creation by startups in the region is still lower that the state and nation despite growth since 2000. This region relies more on firms that are 11 years old and older for job creation compared to the state and nation. The overall density of startups (i.e. four startups for every 1,000 people) is also lower than the state and nation, indicating greater opportunity for startup growth and development.[49] If STEM employment is any indication, the number of high growth startups may also be lower than average. Successful high growth startups tends to employ higher percentages of STEM-related workers and provide significantly higher than median wage jobs. Currently, the proportion of STEM-related workers in Region 2 is 20% below the national average.[50]

[49] George Mason University (2017). GO Virginia Regional Data. http://cra.gmu.edu/go-virginia/
[50] EMSI (2017.3) Class of Worker dataset.

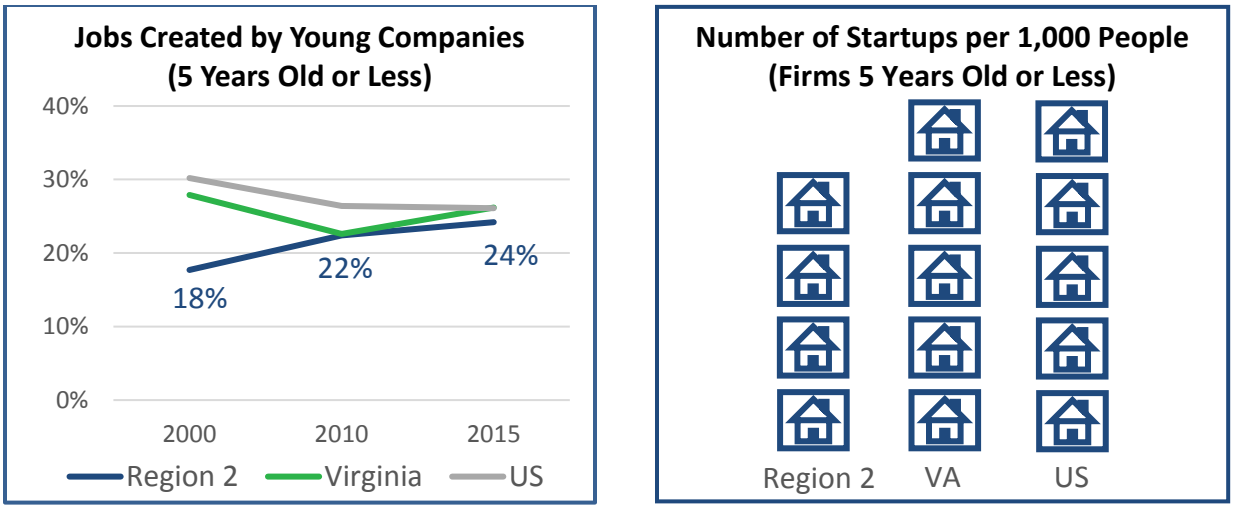


Figure 11: Region 2 Startup Presence and Employment[51]

Discussions among regional commissions, EDOs, WDBs, Chambers of Commerce and other business development interest groups highlight the need for greater access to capital. Compared to other regions, the amount of accessible capital is scarce in Region 2. This includes angel, venture capital, seed and pre-seed funding. Many entrepreneurs perceive investors as too risk averse. Meanwhile, potential investors question the quality and quantity of the region's investable opportunities. Although capital investors are present in the region, many look elsewhere because regional small businesses and entrepreneurs have not sufficiently built their management team, developed their products, and tested their business models. While increased capital would be an asset, the primary challenge may be deal-flow and an undersupply of vetted, high-growth potential ventures. Hence, an important component of connecting business with capital is developing and promoting training and mentorship programs. An increasingly common approach to effective capital deployment is high quality mentorship accompanied by education. Such initiatives tend to target firms with high growth potential across challenging stages of their life cycle.

Region 2 companies already have access to several angel and venture capital groups that make investments throughout Virginia. These funds do not require businesses to relocate to the home city of the fund. Below are lists and general locations of the more active capital investment and loan groups.

[51] George Mason University (2017). GO Virginia Regional Data. http://cra.gmu.edu/go-virginia/; U.S. Census (2014). Statistics on U.S. Businesses. https://www.census.gov/programs-surveys/susb.html

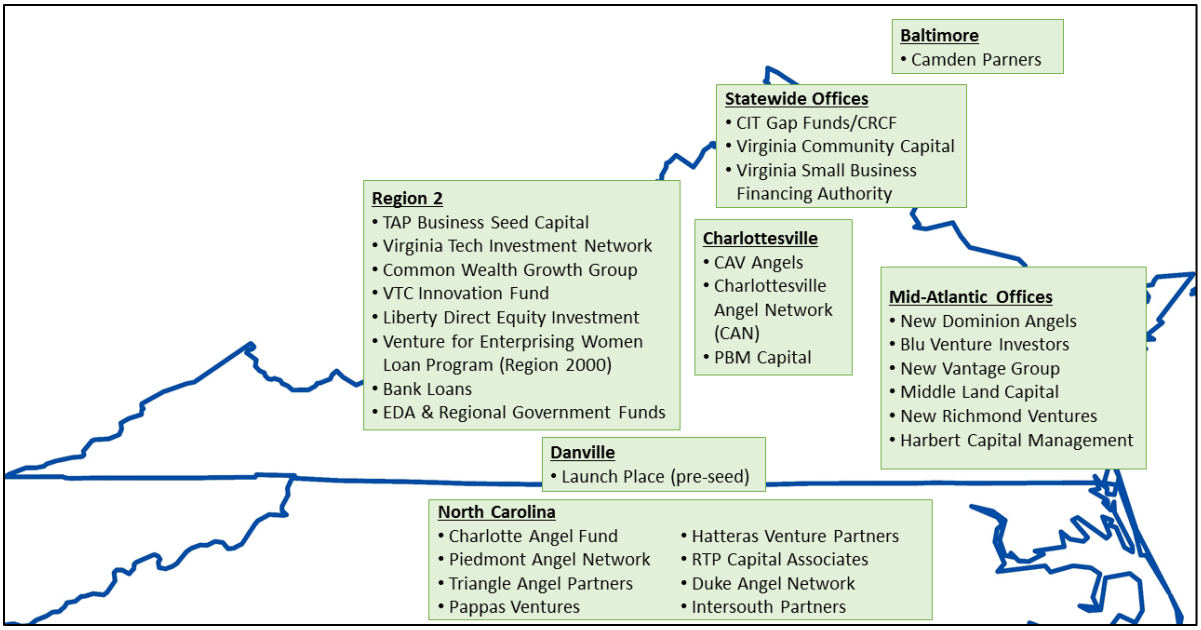


Figure 12: Sampling of Accessible Capital for Region 2 Companies

Several of these financers may not offer pre-seed for research and development, presenting a resource gap in the region. Although Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) grants through the federal government are one source of pre-seed funding, they are untapped by many in Region 2. For instance, Region 2 had over 360 SBIR/STTR grant awards between 2012 and 2016. Since larger entities can receive multiple awards, as few as 37 firms were actual grantees. The underlying challenge for many businesses in Region 2 is lack of awareness and understanding of how to access capital resources.

Region 2 is also home to many organizations and groups that offer informal and formal mentorship and training programs. Formal programs are those that establish more structured mentor-mentee assignments over a designated time. There are few of these formal programs in the region. Informal programs are those that set up an environment or event(s) where the mentor-mentee relationship may develop over time. They can be working spaces, meetups, one-off consulting opportunities, educational programming, or competitions where entrepreneurs and small business owners meet successful business owners and serial entrepreneurs. Training and mentorship assets include but are not limited to:

Table 16: Mentorship and Training Assets in Region 2

	Mentorship Assets
Formal Mentorship Programs	RAMP & Roanoke SCORE (Roanoke)
	Co. Starters $ Greater Lynchburg SCORE (Lynchburg)
	Roanoke-Blacksburg Tech Council (Region)
Informal Mentorship Opportunities	Local and Regional Chambers of Commerce (Region)
	Colab, Roanoke Public Library Consultations, Small Business Development Center, Star Tank, HIVE (Roanoke)
	Small Business Development Center of CVCC, Leadership Lynchburg, PopupAltavista, Opportunity Lynchburg, Lynchburg Business Development Center (Lynchburg)
	Studio 2.0, TechPad, VTKnowledgeWorks, Hacksburg, Beans & Rice (New River Valley)

Many of these programs started in the last decade as the region's entrepreneurial network has developed. However, stakeholders mention that while there are numerous 'spaces of collision' for entrepreneurs, translating these interactions into coordinated resources for emerging businesses remains a challenge. They noticed that several existing programs do not facilitate a pipeline toward significant capital investment. Moreover, resource providers may not coordinate their efforts or be aware of other resources, leaving entrepreneurs and business owners alone to navigate the system.

To achieve the goal of growing more startup and existing firms that create and sustain higher wage jobs, one priority of Region 2 is to support GOVA initiatives that increase the number of startups and small businesses accessing capital investments. Below are three strategies for increasing access to capital.

Table 17: Entrepreneurship and Business Development Strategies, Opportunities, and Metrics

Strategies	Opportunities	Metrics
Increase presence of and access to capital investors	Activities to encourage development of pre-seed and early-stage seed funding	• Number of active capital funds in region over time • Number & dollar amount of deals and grants in region over time • Number of firms (in priority industry clusters) receiving funding over time • Number of program participants over time • Number of program participants creating and sustaining startups, actively engaging with mentor, pursuing and/or receiving funding • Survival rates of served companies • Revenue and jobs of served companies • Survey/Interview data illustrating increased collaboration among regional groups
	Activities that connect regional companies to investors outside the region.	
	Activities that help formalize and professionally sustain regional network(s)	
	Activities that train entrepreneurs in acquiring government and private funding	
Expand and coordinate mentorship and training resources to increase the supply and flow of investible ventures	Activities to start/expand mentorship programs.	
	Activities to expand incubator/accelerator activities that make businesses capital ready.	
	Activities that would encourage resource collaboration among capital, mentoring and other business resource providers	
Improve awareness of existing capital, mentorship & training resources.	Activities to help measure, market, and illustrate the region's entrepreneurial resources and successes.	
	Activities that raise awareness and connect entrepreneurs and businesses to training, mentorship and funding resources.	

Key Points: Entrepreneurship and Business Development

Why is this important?

- Common goal across Region 2's three metropolitan areas: The desire to support the development of young and growing firms in the region

Problem

- Job creation by startups in the region is still lower that the state and nation despite growth since 2000
- The overall density of startups (i.e. four startups for every 1,000 people) is also lower than the state and nation, indicating greater opportunity for startup growth and development
- The region faces a capital supply and demand challenge in which capital and a pipeline of vetted, high-growth potential businesses are limited compared to other regions

Strategies

- Increase presence of and access to capital investors
- Expand and coordinate mentorship and training resources to increase the supply and flow of investible ventures
- Improve awareness of existing capital, mentorship & training resources

Technology Development

GO Virginia emphasizes a focus on existing or potential industry clusters that can support scalable, sustainable future growth. Across Region 2, Comprehensive Economic Development Strategy (CEDS) plans, target industries identified by regional Economic Development Organizations (EDOs), and strategic plans required by workforce development organizations share a number of common features and targets concerning key industry sectors. All three of the economic development organizations in the sub-regions (New River Valley; Roanoke-Alleghany; and Lynchburg/Lynchburg Region) have recently completed new target industry studies or plans. The Roanoke Regional Partnership lists nine targets on its website: transportation manufacturing; advanced manufacturing; life sciences; finance & insurance; printing & packaging; technology & innovation; food & beverage; outdoor industry; and foreign investment. The New River Valley Economic Development Alliance prioritizes four primary target industry clusters: advanced manufacturing; information technology; food and beverage processing; and unmanned systems and identifies several specific sub-sectors of interest for each of the four. The Lynchburg Regional Business Alliance identified five primary target sectors: food and beverage; steel and metals; nuclear technology; wireless infrastructure and communication; and financial and business support services. The Alliance also identified four additional long-term niche opportunities: nuclear medicine, alternative energy, cybersecurity, unmanned autonomous systems (UAS), and educational technology.

By looking more closely at total employment, growth projections, higher wage job possibilities, and out-of-region versus in-region purchase percentages, this plan for GO Virginia recommends narrowing the list to four priority clusters that serve as existing or potential industry "drivers":

- Manufacturing,

- Life Sciences (and health),
- Food and Beverage Processing, and
- Emerging Technologies and Information Technology (IT).

Planning documents across Region 2 consistently mention technology, information technology, or cybersecurity as important sectors for future growth. Industry sector data from Economic Modelling Specialists from Section 2 of this report projects job growth of 6.5% from 2016-2021, markedly greater than the state's projected growth of 4.0%. The average salary for Region 2 workers in this sector was $67,700 in 2016. The professional, scientific, and technical services sector (2 digit NAICS level) had a 19% increase in jobs in Region 2 over the last 10 years. As part of the GO Virginia planning process, stakeholders reiterated the need to prioritize attention on industries with higher-wage jobs, high growth potential, and that position the region to attract revenue from outside the state. Focusing on the region's technology sector and emerging industries aligns well with this priority.

Numerous informants urged the region to focus on technologies with potential for future growth, many of which cut across a number of traditional industry sectors. Unmanned Autonomous Systems (UAS) is a common and widely mentioned example in the region given a number of existing assets, some of which are mentioned below. Energy and renewable energy technology is another example discussed by stakeholders and Council. Stakeholders recommended a continual exploration of the technology horizon for opportunities (what new technologies and systems are on the horizon and cut across multiple industries). Technologies related to systems and Internet of Things (IoT) cut across a number of industries, and there may be regional entrepreneurial opportunities related to helping companies better employ technology. There are a number of existing assets in the Region 2 that support innovation and technology for high-potential industry clusters:

Table 18. Target Cluster Assets

Sector	Sub-areas of note	Selected Assets in region
Manufacturing	Transportation; electrical equipment; metals and materials	High schools and CTE programs (including new investments and programming in Botetourt County Technical Education Center, Staunton River High School, and Giles County Technology Center); the Franklin Center for Advanced Learning and Enterprise; community colleges including the Advanced Technology in Mechatronics at Virginia Western Community College and the Advanced Manufacturing & Packaging Technology Program at Dabney S. Lancaster Community College; the Virginia Tech Center for High Performance Manufacturing; GenEdge; Liberty University's Center for Advanced Engineering and Research; Virginia Tech College of Engineering; existing employers such as Volvo, Tecton, AREVA, BWX Technologies; etc.
Life Sciences and Health Care	Biotechnology; Health Care; Hospitals; Pharmaceuticals	Virginia Tech Carilion Research Institute; RAMP Accelerator; Jefferson College of Health Sciences; Radford University; Edward Via Virginia College of Osteopathic Medicine; Fralin Life Science Institute; Virginia Tech Corporate Research Center; Liberty University; community colleges; high schools and CTE programming; Roanoke Valley Governor's School; employers

Sector	Sub-areas of note	Selected Assets in region
		such as Carilion Clinic, Centra Health, Plastics One, Novozymes, Intrexon, Luna Innovations, and more.
Food and Beverage Processing	Beverage Manufacturing; Packaging	Virginia Tech Food Sciences; community colleges; high schools and CTE programs; employers such as Ballast Point, Aardagh, Phoenix Packaging; Tetra; Wholesome Harvest Baking, Homestead Creamery, Westover Dairy, Central Virginia Foods, Frito-Lay and more.
Technology and Information Technology	Unmanned Autonomous Systems	Alleghany Highlands "Drone Zone" and Flying Circus FPV Festival; Liberty University School of Aeronautics; AUVSI chapter; Mid-Atlantic Aviation Partnership; Virginia Tech Transportation Institute; Community Colleges; Industry such as Aeroprobe, Moog, TORC Robotics, VPT, and AFT.
	IT (including digital media, etc.)	Roanoke-Blacksburg Tech Council; RAMP Accelerator; Virginia Tech Corporate Research Center; Radford University (including National Center of Academic Excellence in Cyber Defense Education designation and M.S. program in Data and Information Management); Liberty University; community colleges; Virginia Tech cybersecurity and IT research entities and educational programming; broadband access and speeds in key nodes; employers such as Rackspace, GE Digital, Cox Communications, and more.

Regional stakeholder input affirmed a desire for the region to identify and focus on high potential emerging industries and to better support and leverage our higher education institutions as engines for technology and entrepreneurial development. There is a critical need to improve connectivity and leverage university research assets and activities in support of emerging regional industries and start-ups. The region should also better capitalize on opportunities for the region's universities to help attract and partner with larger companies. Universities can continue to enhance research assets and secure greater research funding that aligns with regional cluster activity.

Once again, Council members and working group participants emphasized the region's higher education institutions as assets, but also called attention to areas of underperformance and disconnectedness. As the region's major research university, Virginia Tech is both an exemplar and also a weak link. Region 2 lags behind peer regions in university research commercialization. A comparison of the ratio of university research to venture capital investment showed the region scoring in the bottom third among peers (National Science Foundation, National Venture Capital Association). While the region has some access to angel and early stage funds it lacks a resource dedicated to seeking out promising technologies, "de-risking" them and putting them on a path to market. Some stakeholders suggested a need for the region's colleges and universities to collaborate more closely around economic development and regional innovation. The growth of institutions such as Radford University, Jefferson College of Health Sciences, and Liberty University may represent more entrepreneurial and innovation possibilities and could serve to learn more from each other, streamline approaches, and identify shared aims for regional innovation. Virginia Tech, and other institutions, may need incentives or outside impetus to spur regionally-focused commercialization and entrepreneurial activities.

The table below includes regional strategies, examples of funding opportunities, and possible success measures for projects through GO Virginia related to promoting innovation and technology for critical and high-potential clusters:

Table 19. Technology Development Strategies, Opportunities, and Metrics

Strategies	Opportunities	Metrics
Increase investments and support for emerging and critical industries and innovative technologies	Activities to encourage development of pre-seed and early-stage seed funding	Number & dollar amount of deals and grants in region over time o Jobs created >20% above regional annual wage average o Number of knowledge based economy jobs created o Number of new jobs attributed to incubators and accelerators o Number of new jobs attributed to ideas translated from universities, research institutes, labs, etc. Company funding and exits o Number and amount of new Angel and VC funding to regional firms o Number successful exits (> $5M- i.e. new regional wealth creation) o Number of firms (in priority industry clusters) receiving funding over time Number of new company startups emanating from: o Incubators and accelerators o Attributed to ideas translated from universities, research institutes, labs, etc. o Attributed to licensed technology from universities, research institutes, labs, etc. • Number of education and training program participants over time
	Activities that connect regional companies to investors outside the region.	
	Activities that enhance support services and technical assistance capabilities for small-to midsized companies in important and emerging industries.	
	Activities to support the growth and viability of companies exploring "game-changing" technologies in such areas as Unmanned Autonomous Systems, additive manufacturing, and similar.	
	Activities that support entrepreneurs in acquiring government and private funding	
Expand and enhance technology transfer and research commercialization to spur regional company growth and venture creation.	Activities to better connect regional companies (including small to medium sized enterprises) with universities and research centers.	
	Activities that help formalize and sustain regional research networks and consortiums.	
	Activities to expand incubator/accelerator activities that provide mentorship and resources for new ventures engaged in commercialization.	
	Activities that would incentivize universities and researchers to increase regionally-focused start-ups and commercialization opportunities.	
Support and enhance regional talent attraction efforts.	Activities to help measure, market, and illustrate the region's assets, stories, and quality of life.	
	Activities that target, recruit, and market to workers and highly skilled individuals outside Virginia.	
Grow the number of individuals entering and	Activities that market higher wage job opportunities and training and education programs to younger people (K—12 level).	

Strategies	Opportunities	Metrics
completing training and educational programs for higher-wage in-demand occupations.	Activities that help raise awareness and appeal of industries and occupations such as advanced manufacturing.	• Survival rates of targeted/served companies • Revenue and jobs of targeted/served companies • Survey/Interview data illustrating increased collaboration among regional cluster-serving entities, assets, and companies.
	Activities to offer more varied, innovative, and accessible training and educational opportunities for higher-wage in-demand occupations (web-based, distance learning, intensive boot-camp learning, pre-apprenticeships, etc.)	

Key Points: Technology Development

Why is this important?

- Planning documents across Region 2 consistently mention technology, information technology, or cybersecurity as important sectors for future growth
- Projected job growth of 6.5% from 2016-2021, markedly greater than the state's projected growth of 4.0%
- Average salary for Region 2 workers in this sector was $67,700 in 2016

Strategies

- Increase investments and support for emerging and critical industries and innovative technologies
- Expand and enhance technology transfer and research commercialization to spur regional company growth and venture creation
- Support and enhance regional talent attraction efforts
- Grow the number of individuals entering and completing training and educational programs for higher-wage in-demand occupations

SECTION 4: ASSESSMENT CRITERIA

This plan should guide the Region 2 Council in assessing projects to support and guide applicants in designing and submitting fundable projects.

This section provides a process for project screening, beginning with a first-stage, baseline, screening. If any of the prohibited screening elements are present, then the project is not eligible for further review. These screening criteria are readily discernible from an initial review and subject to less discretionary judgment. By articulating a clear set of initial screening criteria that rules out projects that are non-reviewable, both applicants and the Council will benefit from timely reviews or discussions of projects that simply should not be funded due to eligibility or related concerns.

First stage screening assessment

(If any of these are present, then the project is not reviewable):

	YES*	NO
Is there a single applicant?	_____	_____
Is the funding for land acquisition?	_____	_____
Is funding for construction of transportation projects?	_____	_____
Is funding for trade missions?	_____	_____
Is funding for quality of life projects**?	_____	_____
Is funding for museums or entertainment venues?	_____	_____
Is the application impacting only a single locality?	_____	_____

*If any yes's are marked, then the project is not reviewable by the Council and should be referred back to the applicants.

**Quality of life projects are defined as those projects that are worthwhile, such as addressing a social need like childcare or population health, but not DIRECTLY and SUBSTANTIVELY addressing the GO Virginia aims of producing more high paying jobs in the region.

There may be other baseline, or threshold, criteria identified by the Council and staff. The check-list above represents a starting point and can be further refined with time and experiences of actual project review. Moreover, the state GO Virginia Board or Virginia Department of Housing and Community Development may provide additional or alternative guidance. This section is not intended to supersede state guidance but offers a starting point based on existing known considerations.

The second stage is an assessment of projects that meet the threshold criteria or first-stage screening. The process involves a weighted review grid, and each criteria involves discernment on the part of the Council and staff in terms of assessing the extent to which proposed projects meet the weighted criteria. The draft initial assessment grid is on the next page.

Second stage screening

Criteria	Weight	Score	Notes
Is the project likely to spur the growth of higher-paying (above median-wage) jobs and/or increased revenue in the region?	25		
Does the project directly address or respond to one of the identified strategies in the Economic Growth and Diversification Plan related to advancing technology and high-growth clusters; growing skilled talent; supporting entrepreneurship; and collaborative development of sites and buildings?	25		
Does the project support priority sectors or clusters in the Growth and Diversification plan – that are ultimately likely to generate revenues from outside the region?	20		
Does the project show evidence of cross-regional partnerships (including private or corporate partnerships) and hold promise to offer broad community benefit across multiple localities?	10		
Does the project include substantive applicant matching contribution?	10		
Is the project innovative and forward-looking? (Does it represent an attempt to "move the needle" or advance an emerging opportunity as opposed to simply supporting "business as usual" programming?*****)	10		
Does the project hold promise to promote sustainable, long-term economic growth in the region?******	5		
TOTAL			

Is funding recommended? YES or NO

Funding amount recommended: _____

COMMENTS: _____

_____

_____

*****This criteria is subjective but reflects a desire not to fund projects that would have happened without GO Virginia (eg. "business as usual"). It also reflects the Council's interest in actively encouraging projects that are forward-looking and may represent a creative and innovative approach and provide support to nurture fledgling high-potential industries and innovations whose creation or growth may spur additional future growth and align with the region's innovation assets (eg. "move the needle").

******Again, this criteria is subjective but pertains to the Council's desire to generally not prioritize support for one-off projects or initiatives (a one-time job fair is an example here). It also relates to Council's preference to encourage projects that clearly relate to targeted sector and clusters in a way that strengthens and supports on-going growth, jumpstarts a period of increased growth, and/or creates a program or resource that will yield continuing benefits over time.

SECTION 5: IMPLEMENTATION AND SUSTAINABILITY

This plan represents a baseline analysis of GO Virginia Region 2, including its existing economic structure, recent and emerging trends, and strategic opportunities. Moving from plan to implementation is a notoriously difficult challenge. Region 2 has a number of factors that should serve to ease this difficulty.

First, the Region 2 planning process itself represents an opportunity for smoother implementation. The Region 2 Council, in conjunction with the support organization, established a working group-structure that could become an ongoing model. Four working groups provided input and guidance to the formation of strategies in four key areas of focus:

- Grow, attract, and retain skilled talent at all levels
- Collaborate in development of sites and buildings
- Enhance access to capital and business mentorship & training
- Promote innovation and technology for priority and high-potential industry clusters

A council member chaired each working group, and the Council support organization provided staffing. Working groups included members from across the region representing a diverse mix of people in terms of organizations, sectors, geographies, expertise, and interests. Working group membership was open to all, however, attendance at the work sessions varied. Ultimately, this resulted in groups averaging 6-12 persons in attendance at any one session. Keeping the groups small allowed for a depth of discussion not always available during regular Council sessions, and the differing geographic, institutional, and sector mixture of membership enriched the quality and nature of discussions as well. Consequently, the work groups will be a key element of plan implementation, and ultimately sustainability.

Second, an accelerated planning process is challenging and risks producing a weakened plan, particularly if data-collection, analysis, or public engagement is too limited. These risks are minimal in Region 2. This is partly due to the pre-existence of recently completed high-quality plans and studies in each of our three sub-regions: New River Valley, Roanoke-Alleghany, and Lynchburg. Each of these three regions had an active EDO, regional commission, and WDB, which resulted in nine substantive plans and reports.

Third, the support organization conducted the planning process and will provide seamless and ongoing technical assistance and data support, which should help streamline implementation and allow for a consistency of approach and ongoing updates and supplements to data as needed.

Implementing the Plan and Advancing GO Virginia Goals

Council members, working group chairs, and support staff continually reiterated to focus on strategies and activities that would support the creation of higher wage jobs and generate new revenues from out-of-state sources. Each of the four working groups identified strategies within their area of focus to advance this aim:

- Grow skilled talent
    - Core strategies include:
        - Strengthen the pipeline from K-12 to higher education to career for each target sector
        - Increase completions of degrees applicable to target industry sectors

        - Improve knowledge and promotion of complementary workforce and training services
        - Enhance employer engagement activities that will encourage more aligned skill development, create opportunities for regional employment post-graduation, and promote the hiring of in-demand occupations
    - In this focus area, the **key implementation charge** is to:
        - Support strategies to grow, attract, and retain skilled talent by enhancing regional coordination and increasing the talent pipeline for critical higher wage occupations.
    - In addition to the broader criteria, applicants may be asked to:
        - Explain how their project supports one or more core strategies in this focus area
        - Align their activities with three or more of the success metrics listed in the focus area description; and
        - Describe how their project will address one or more of the gaps identified in the talent development and retention section (talent, interest, affordability, coordination).
- Collaborate in development of sites and buildings
    - Core strategies include:
        - Improve information about site and buildings characteristics and market demand for sites and buildings
        - Incentivize collaboration at all stages of joint site/building development
        - Develop and implement real estate strategies to leverage special assets
    - In this focus area, the **key implementation charge** is to:
        - Support strategies that increase the number of collaboratively developed prospect-ready sites and buildings on the market, improving their market positioning, and meaningfully engaging sites and buildings by leveraging special assets.
    - In addition to the broader criteria, applicants may be asked to explain how their project supports one or more core strategies in this focus area and align their activities with three or more of the success metrics listed in the focus area description.
- Enhance access to capital and business mentorship
    - Core strategies include:
        - Increase the presence of and access to capital investors
        - Expand and coordinate mentorship and training resources
        - Improve awareness of existing capital, mentorship & training resources
    - In this focus area, the **key implementation charge** is to:
        - support the development of young and growing firms in the region
    - In addition to the broader criteria, applicants may be asked to explain how their project supports one or more core strategies in this focus area, align their activities with three or more of the success metrics listed in the focus area description, and describe how their project will:
        - Increase the number of deals in the region,
        - Create and sustain companies in the region, and

        - Promote startups or expanding businesses that support higher than median wage jobs.
- Promote innovation and technology for targeted and high-potential industry clusters
    - Core strategies include:
        - Increase investments and support for emerging and critical industries and innovative technologies
        - Expand and enhance technology transfer and research commercialization to spur regional company growth and venture creation.
        - Support and enhance regional talent attraction efforts.
        - Grow the number of individuals entering and completing training and educational programs for higher-wage in-demand occupations.
    - In this focus area, the key implementation charge is to:
        - Support strategies that strengthen emerging industries and better leverage higher education institutions as engines for technology and entrepreneur development.
    - In addition to the broader criteria, applicants may be asked to explain how their project supports one or more core strategies in this focus area, align their activities with three or more of the success metrics listed in the focus area description, and describe how their project will:
        - Increase the number of higher wage jobs in the region,
        - Create and sustain companies in the region, and
        - Promote startups or expanding businesses that support higher than median wage jobs.

In the broadest terms, these four focus areas and corresponding strategies remain fairly broad and could encompass a plethora of possible projects. For each focus area, therefore, this plan offers examples of possible projects and recommended criteria. The planning process also brought forth a desire by the Council, and a sentiment among stakeholders, for selectivity. One stakeholder described this as supporting "move the needle" projects that do not just add funding to business as usual activities, but rather prioritize a vigilant focus on projects that stimulate growth, serve a catalyzing effect, and hold promise to make substantive economic impact for the region. Sometimes this may require a longer term vision in terms of timeframe.

Given funding limitations as well as the size and varied geography of the region, this plan supports that desire for a vigilant selectivity and strong preference for "move the needle" projects. These need not all be large-scale. Sometimes a small amount of investment can jumpstart a powerful pilot initiative, lay the early groundwork for additional funding at a later stage, or significantly expand the boundaries of an already successful program.

Beyond the desire for selectivity and impact, there is a continued concern for recognition of the varied nature of the region. Region 2 includes three metropolitan areas, each with a mixture of rural and urban characteristics. Some localities are more rural in nature and may lack some of the infrastructure, assets, and benefits associated with the more urban locations in the region. For example, Craig County is in the Roanoke-Alleghany MSA but may be among our most rural counties, with a sparse population and little in-county entrepreneurial activity outside of the agriculture and outdoors sectors. Alleghany County is

also quite rural but does have larger towns, a community college, and a significant manufacturing presence.

The Region 2 Council and staff will conduct an annual review of this plan and perform updates as agreed upon by the Council. The review will incorporate a discussion and consideration of overall GO Virginia Performance Metrics provided by the Virginia Department of Housing and Community Development. The review will include both project impacts, pipeline indicators and outcome measures to the extent that data is available.

In Region 2, applicants are expected to provide meaningful project match and the presence of match is a weighted element for project assessment. By prioritizing substantive applicant match, the Council seeks to enhance impact, leverage available funding, and ensure broad-based support for implementation.

Beyond project-specific match, the Council is still exploring overall program match with potential investors/donors. These conversations are ongoing and funds would most likely help to strengthen strategic reserves.

In terms of overall sustainability of the Region 2 Council, there are serious reservations as to whether the Council is sustainable without dedicated state funding support at some level. That said, Council is seeking to reduce operational costs and enhance administrative efficiencies. This is evidenced in a number of ways – such as the streamlining of support and consulting functions in one entity and the preservation of significant funds for strategic reserve.

There are a number of challenges to sustainability. Funds for regional and local economic development are a limited pool and regional economic development organizations are also in the midst of their own fundraising campaigns. Soliciting GO Virginia funds threatens to divert funds from EDOs, and those funds are critical to regional industry attraction and targeting activities.

Proposed GO Virginia Region 2 Peer Regions

In considering long-term growth and impact, Region 2 has developed a set of eight possible peer regions. The process began with the identification of 28 possible metropolitan regions (MSAs) with comparable higher education institutions to account for research, human capital and possible spinout tech companies. Factors that were taken into consideration for each of the 28 MSAs were:

- Population Density and Growth
- Urban to Rural Ratio (Designate Places with 50,000 or more residents)
- Comparable industry sectors
- Per Capita Income
- Median Household Income
- Gross Regional Product per Capita

Composition of population in terms of age and education attainment (within 1-5% difference compared to Region 2 among different categories e.g. those with Bachelors)

These factors led to the selection of eight proposed peer regions. The areas are comparable to Region 2 but also may have particular strengths in certain industries or activities from which this region could

learn. For instance, some peer regions seem to be making great strides in advanced manufacturing, life sciences, and/or entrepreneurship.

Table 20. Possible GOVA Region 2 Peer Regions

METROPOLITAN AREA	POPULATION (2014)	POP GROWTH (2004-2014)	POPULATION PER SQ. MILE	PER CAPITA INCOME (2015)	MEDIAN HOUSEHOLD INCOME (2014)	GRP PER CAPITA (2015)	CITY-RURAL RATIO
REGION 2	761,789	12%	128	$39,071	$47,706	$35,602	0.42
BIRMINGHAM, AL	1,143,772	6%	217	$44,568	$47,046	$50,257	0.35
CHAMPAIGN-URBANA, IL	238,680	11%	124	$42,863	$48,063	$40,833	0.55
CHATTANOOGA, TN-GA	488,129	11%	228	$41,225	$46,600	$44,398	0.47
COLUMBIA, SC	800,752	17%	216	$40,420	$50,091	$42,692	0.20
GREENEVILLE, SC	862,463	48%	432	$39,213	$44,783	$39,777	0.08
LAFAYETTE, IN	211,515	17%	165	$35,120	$46,109	$41,770	0.50
LANSING, MI	470,458	3%	277	$37,863	$49,697	$39,797	0.53
STATE COLLEGE, PA	158,742	13%	143	$41,344	$51,367	$46,276	0.36

CLOSING

This Growth and Diversification Plan offers a case for action grounded in a thoroughly researched and deliberated understanding of the economy and labor markets in Region 2. The document brings four target clusters into focus: advanced manufacturing, life sciences and health care, food and beverage processing, and emerging technology and IT. The plan further provides strategies and metrics for meeting the needs these clusters have in areas such as skilled talent development and retention, collaborative development of sites and buildings, entrepreneurship and business development, and technology development.

Following transmittal of the plan to the state GO Virginia board for review, the Region 2 Council will begin a process of developing a solicitation for projects and initiatives that may be funded by the state in response to this plan. This should take place over the fall, with additional funding opportunities in which the regional Council plays a consulting role beginning early next calendar year.

APPENDIX A: INDUSTRY CLUSTER DEFINITIONS

Below is the list of industries comprising Region 2's four industry clusters. Region 2 began with the Harvard industry cluster definitions explored in the McKinsey Group data provided through GO Virginia and DHCD, as well as other sources (e.g. clustermapping.com and Economic Modeling Specialists Inc.). With input from stakeholders and a local understanding of the data, the region tailored specific clusters according to regional strengths. All data presented here is from the Economic Modeling Specialists Incorporated (EMSI), a proprietary economic and workforce development software. We provide the most recently available dataset from 2017Q3.

Manufacturing Cluster

NAICS	Description	2016 Jobs	2021 Jobs	2016 - 2021 % Change	2016 LQ	Competitive Effect	2016 GRP (millions)	Avg. Earnings Per Job
MANUFACTURING CLUSTER		**16,707**	**17,903**	**7%**	**4.74**	**980**	**$2,643**	**$83,836**
AUTOMOTIVE		5,522	5,693	3%	4.93	48	$678	$69,373
331511	Iron Foundries	332	155	(53%)	3.92	(138)	$32	$76,354
336120	Heavy Duty Truck Manufacturing	2,929	3,029	3%	46.06	49	$395	$70,939
336211	Motor Vehicle Body Manufacturing	242	254	5%	1.86	2	$16	$55,312
336310	Motor Vehicle Gasoline Engine and Engine Parts Manufacturing	148	177	20%	1.01	25	$30	$111,934
336350	Motor Vehicle Transmission and Power Train Parts Manufacturing	1,139	1,293	14%	6.26	88	$127	$62,347
336360	Motor Vehicle Seating and Interior Trim Manufacturing	129	172	33%	0.79	28	$8	$30,416
336390	Other Motor Vehicle Parts Manufacturing	602	613	2%	1.72	(6)	$71	$74,782
DOWNSTREAM CHEMICAL PRODUCTS		2,081	2,126	2%	3.88	7	$514	$82,738
325130	Synthetic Dye and Pigment Manufacturing	78	81	4%	2.53	4	$15	$84,693
325510	Paint and Coating Manufacturing	111	98	(12%)	1.10	(15)	$22	$77,017
325611	Soap and Other Detergent Manufacturing	30	43	43%	0.42	10	$10	$54,729
325612	Polish and Other Sanitation Good Manufacturing	113	116	3%	1.86	(0)	$44	$62,744
325620	Toilet Preparation Manufacturing	617	613	(1%)	4.56	(25)	$196	$57,093
325920	Explosives Manufacturing	948	1,016	7%	58.69	46	$196	$103,007
325992	Photographic Film, Paper, Plate, and Chemical Manufacturing	85	116	36%	2.95	43	$11	$65,808
325998	All Other Miscellaneous Chemical Product and Preparation Manufacturing	97	45	(54%)	1.06	(56)	$20	$99,467
METALWORKING TECHNOLOGY		3,233	4,200	30%	3.97	864	$407	$96,329
327910	Abrasive Product Manufacturing	25	14	(44%)	1.05	(11)	$4.5	$49,855
332313	Plate Work Manufacturing	2,437	3,318	36%	23.28	777	$339	$107,404
332721	Precision Turned Product Manufacturing	40	54	35%	0.42	12	$4	$43,879
332812	Metal Coating, Engraving (except Jewelry and Silverware), and Allied Services to Manufacturers	47	63	34%	0.34	13	$2	$31,597
332813	Electroplating, Plating, Polishing, Anodizing, and Coloring	178	215	21%	1.25	42	$16	$59,221

333514	Special Die and Tool, Die Set, Jig, and Fixture Manufacturing	209	228	9%	1.37	28	$11	$47,528
333515	Cutting Tool and Machine Tool Accessory Manufacturing	21	20	(5%)	0.33	(1)	$3	$95,853
333517	Machine Tool Manufacturing	277	286	3%	2.88	3	$28	$82,383
NAICS	Description	2016 Jobs	2021 Jobs	2016 - 2021 % Change	2016 LQ	Competitive Effect	2016 GRP (millions)	Avg. Earnings Per Job
PAPER AND PACKAGING		2,743	2,908	6%	3.66	224	$642	$90,676
322121	Paper (except Newsprint) Mills	152	199	31%	1.15	66	$25	$69,416
322130	Paperboard Mills	1,787	1,823	2%	25.75	46	$536	$100,810
322211	Corrugated and Solid Fiber Box Manufacturing	306	371	21%	1.46	74	$26	$68,838
322212	Folding Paperboard Box Manufacturing	42	54	29%	0.64	9	$4	$69,381
322219	Other Paperboard Container Manufacturing	117	153	31%	2.05	33	$8	$56,448
322220	Paper Bag and Coated and Treated Paper Manufacturing	149	140	(6%)	1.11	(4)	$15	$61,573
322230	Stationery Product Manufacturing	156	127	(19%)	3.68	(6)	$26.5	$107,812
322299	All Other Converted Paper Product Manufacturing	33	41	24%	0.87	5	$2.5	$41,778
LIGHTING AND ELECTRICAL EQUIPMENT		3,371	3,230	(4%)	7.73	(161)	$417	$88,605
335121	Residential Electric Lighting Fixture Manufacturing	123	176	43%	4.83	47	$11	$56,281
335122	Commercial, Industrial, and Institutional Electric Lighting Fixture Manufacturing	426	435	2%	7.76	(7)	$44	$64,155
335311	Power, Distribution, and Specialty Transformer Manufacturing	467	476	2%	7.87	(9)	$68	$99,335
335312	Motor and Generator Manufacturing	1,410	1,271	(10%)	16.35	(103)	$168	$87,323
335314	Relay and Industrial Control Manufacturing	757	660	(13%)	6.93	(106)	$97	$107,531
335921	Fiber Optic Cable Manufacturing	175	194	11%	7.48	11	$26	$72,678
335931	Current-Carrying Wiring Device Manufacturing	13	19	46%	0.17	6	$1	$63,875

Life Sciences and Health Care Cluster

NAICS	Description	2016 Jobs	2021 Jobs	2016 - 2021 % Change	2016 LQ	Competitive Effect	2016 GRP (millions)	Avg. Earnings Per Job
LIFE SCIENCES AND HEALTH CARE CLUSTER		33,753	37,219	10%	1.13	214	$2,712	$67,907
BIOPHARMACEUTICALS AND MEDICAL DEVICES (EXCEPT R&D)		866	823	-5%	1.02	-73	$206	$76,548
325412	Pharmaceutical Preparation Manufacturing	391	324	(17%)	0.82	(64)	$94	$79,503
325414	Biological Product (except Diagnostic) Manufacturing	166	136	(18%)	2.26	(52)	$73	$86,407
339113	Surgical Appliance and Supplies Manufacturing	277	319	15%	1.17	31	$37	$68,516
339115	Ophthalmic Goods Manufacturing	32	44	38%	0.51	11	$2	$58,663
HEALTH CARE PROVIDERS		32,887	36,396	11%	1.13	287	$2,506	$67,679
339116	Dental Laboratories	73	73	0%	0.69	1	$4	$42,767

621111	Offices of Physicians (except Mental Health Specialists)	5,691	6,119	8%	0.97	(233)	$657	$102,606
621112	Offices of Physicians, Mental Health Specialists	74	97	31%	0.59	12	$15	$69,588
621210	Offices of Dentists	1,773	1,914	8%	0.82	(47)	$131	$65,973
621310	Offices of Chiropractors	285	305	7%	0.92	(8)	$18	$40,863
621320	Offices of Optometrists	304	337	11%	0.98	(18)	$15	$43,551
621330	Offices of Mental Health Practitioners (except Physicians)	278	317	14%	1.46	(16)	$22	$39,826
621340	Offices of Physical, Occupational and Speech Therapists, and Audiologists	771	912	18%	0.91	(74)	$47	$50,095
621391	Offices of Podiatrists	70	94	34%	0.84	16	$5	$53,099
621399	Offices of All Other Miscellaneous Health Practitioners	190	278	46%	0.78	19	$25	$43,185
621420	Outpatient Mental Health and Substance Abuse Centers	831	1,110	34%	1.59	131	$44	$47,610
621492	Kidney Dialysis Centers	265	311	17%	0.92	(15)	$15	$48,018
621493	Freestanding Ambulatory Surgical and Emergency Centers	358	494	38%	1.09	35	$26	$66,755
621498	All Other Outpatient Care Centers	125	189	51%	0.36	28	$10	$66,030
621511	Medical Laboratories	455	469	3%	1.00	(73)	$26	$49,678
621512	Diagnostic Imaging Centers	112	148	32%	0.67	20	$11	$87,693
622110	General Medical and Surgical Hospitals	13,392	14,496	8%	1.24	406	$1,070	$74,062
623110	Nursing Care Facilities (Skilled Nursing Facilities)	4,852	5,215	7%	1.25	124	$216	$38,421
623311	Continuing Care Retirement Communities	2,098	2,663	27%	1.88	42	$81	$33,782
902622	Hospitals (State Government)	889	855	(4%)	1.05	(62)	$68	$72,004

Food and Beverage Processing Cluster

NAICS	Description	2016 Jobs	2021 Jobs	2016 - 2021 % Change	2016 LQ	Competitive Effect	2016 GRP (millions)	Avg. Earnings Per Job
FOOD AND BEVERAGE PROCESSING CLUSTER		**5,225**	**5,569**	**7%**	**0.88**	**101**	**$853**	**$50,354**
AGRICULTURAL INPUTS AND SERVICES		1,138	1,226	8%	0.36	41	$331	$30,180
111000	Crop Production	255	241	(5%)	0.19	(13)	$50	$31,374
112000	Animal Production and Aquaculture	389	410	5%	0.64	8	$263	$35,247
115115	Farm Labor Contractors and Crew Leaders	225	252	12%	0.30	4	$5	$19,915
115210	Support Activities for Animal Production	115	152	32%	1.64	27	$7	$37,267
311611	Animal (except Poultry) Slaughtering	72	93	29%	0.23	20	$4	$33,837
424520	Livestock Merchant Wholesalers	81	77	(5%)	1.92	(7)	$3	$17,374
FOOD PROCESSING, MANUFACTURING AND DISTRIBUTION		4,087	4,343	6%	1.46	60	$522	$55,972
311119	Other Animal Food Manufacturing	298	275	(8%)	3.79	(33)	$36	$59,763
311211	Flour Milling	34	44	29%	1.05	8	$5	$63,382
311511	Fluid Milk Manufacturing	77	94	22%	0.60	16	$13	$92,178

311514	Dry, Condensed, and Evaporated Dairy Product Manufacturing	452	358	(21%)	11.81	(134)	$68	$72,423
311811	Retail Bakeries	121	136	12%	0.63	4	$7	$23,157
311812	Commercial Bakeries	681	800	17%	2.18	113	$49	$47,297
311919	Other Snack Food Manufacturing	424	424	0%	4.49	(20)	$105	$60,941
312111	Soft Drink Manufacturing	387	457	18%	2.09	77	$41	$63,480
312120	Breweries	55	65	18%	0.42	(1)	$26	$75,138
312130	Wineries	165	194	18%	1.17	7	$11	$26,800
424410	General Line Grocery Merchant Wholesalers	466	491	5%	0.85	12	$60	$58,242
424450	Confectionery Merchant Wholesalers	300	387	29%	2.34	62	$28	$41,026
424490	Other Grocery and Related Products Merchant Wholesalers	181	179	(1%)	0.35	(7)	$24	$56,837
424810	Beer and Ale Merchant Wholesalers	444	440	(1%)	1.72	(43)	$51	$56,613

Emerging Technology and IT Cluster

NAICS	Description	2016 Jobs	2021 Jobs	2016 - 2021 % Change	2016 LQ	Competitive Effect	2016 GRP (millions)	Avg. Earnings Per Job
EMERGING TECH AND IT CLUSTER		**56,362**	**60,246**	**7%**	**1.22**	**(20)**	**$3,802**	**$54,590**
AUTONOMOUS SYSTEMS		360	437	21%	0.30	77	$42	$63,730
334290	Other Communications Equipment Manufacturing	72	95	32%	1.70	25	$5	$41,043
334510	Electromedical and Electrotherapeutic Apparatus Manufacturing	<10	<10	N/a	0.03	0	$1	N/a
334511	Search, Detection, Navigation, Guidance, Aeronautical, and Nautical System and Instrument Manufacturing	33	51	55%	0.12	21	$7	$124,866
336412	Aircraft Engine and Engine Parts Manufacturing	71	104	46%	0.38	35	$12	$92,989
423410	Photographic Equipment and Supplies Merchant Wholesalers	<10	<10	N/a	0.10	(0)	$0.4	N/a
423860	Transportation Equipment and Supplies (except Motor Vehicle) Merchant Wholesalers	<10	<10	N/a	0.04	(2)	$1	N/a
488190	Other Support Activities for Air Transportation	72	75	4%	0.29	(2)	$5	$44,826
541370	Surveying and Mapping (except Geophysical) Services	90	86	(4%)	0.82	(3)	$7	$50,373
541922	Commercial Photography	<10	<10	N/a	0.16	(0)	$3	N/a
611512	Flight Training	<10	13	N/a	0.21	4	$1	N/a
IT & CYBERSECURITY		10,149	10,877	7%	0.77	-379	$1,404	$82,890
237130	Power and Communication Line and Related Structures Construction	889	1,181	33%	2.10	45	$102	$77,860
334118	Computer Terminal and Other Computer Peripheral Equipment Manufacturing	123	139	13%	1.27	31	$10	$55,321
334220	Radio and Television Broadcasting and Wireless Communications Equipment Manufacturing	23	13	(43%)	0.19	(6)	$6	$70,162
425110	Business to Business Electronic Markets	118	152	29%	1.47	37	$21	$62,427

511210	Software Publishers	71	68	(4%)	0.09	(15)	$20	$117,437
517110	Wired Telecommunications Carriers	855	611	(29%)	0.61	(189)	$308	$93,331
517210	Wireless Telecommunications Carriers (except Satellite)	153	166	8%	0.51	11	$43	$53,618
517911	Telecommunications Resellers	123	116	(6%)	1.00	5	$15	$75,748
517919	All Other Telecommunications	14	21	50%	0.22	5	$3	$93,052
518210	Data Processing, Hosting, and Related Services	297	284	(4%)	0.42	(36)	$43	$92,799
519130	Internet Publishing and Broadcasting and Web Search Portals	21	27	29%	0.05	1	$7	$64,411
519190	All Other Information Services	19	22	16%	0.46	(0)	$3	$82,221
541330	Engineering Services	2,980	3,082	3%	1.34	(112)	$370	$107,790
541511	Custom Computer Programming Services	702	781	11%	0.35	(29)	$80	$80,139
541512	Computer Systems Design Services	1,079	1,286	19%	0.49	20	$124	$89,851
541513	Computer Facilities Management Services	1,907	2,050	7%	12.28	(143)	$111	$44,750
541519	Other Computer Related Services	46	51	11%	0.17	2	$8	$68,562
541690	Other Scientific and Technical Consulting Services	256	313	22%	0.55	13	$42	$116,618
541990	All Other Professional, Scientific, and Technical Services	228	291	28%	0.70	8	$66	$53,700
561210	Facilities Support Services	19	20	5%	0.06	(2)	$4	$60,558
561621	Security Systems Services (except Locksmiths)	109	88	(19%)	0.38	(31)	$10	$63,212
624230	Emergency and Other Relief Services	34	30	(12%)	0.55	(5)	$2	$64,983
811212	Computer and Office Machine Repair and Maintenance	62	75	21%	0.62	12	$4	$41,266
811213	Communication Equipment Repair and Maintenance	19	20	5%	0.55	1	$2	$45,398
KNOWLEDGE CREATION AND R&D		45,853	48,922	7%	1.45	281	$2,356	$48,254
541380	Testing Laboratories	184	191	4%	0.47	(4)	$15	$70,587
541711	Research and Development in Biotechnology	58	42	(28%)	0.15	(23)	$11	$154,963
541712	Research and Development in the Physical, Engineering, and Life Sciences (except Biotechnology)	351	274	(22%)	0.33	(98)	$42	$104,018
541720	Research and Development in the Social Sciences and Humanities	72	105	46%	0.50	33	$7	$77,530
611210	Junior Colleges	363	391	8%	2.26	36	$12	$29,638
611310	Colleges, Universities, and Professional Schools	13,889	17,232	24%	3.04	1,947	$494	$31,943
813920	Professional Organizations	43	53	23%	0.22	7	$2	$33,425
902612	Colleges, Universities, and Professional Schools (State Government)	12,090	11,850	(2%)	1.98	(931)	$801	$63,288
903611	Elementary and Secondary Schools (Local Government)	18,734	18,704	(0%)	1.11	(694)	$968	$49,372
903612	Colleges, Universities, and Professional Schools (Local Government)	18	32	78%	0.01	13	$1	$35,517
903619	All Other Schools and Educational Support Services (Local Government)	51	48	(6%)	0.47	(6)	$2	$38,032

APPENDIX B: ADDITIONAL WORKFORCE DEMAND DATA

Workforce demand is dependent on many variables including retirement trends, rate of industry growth, changing occupation needs, the strength of the career pipeline (i.e. number of students moving toward different career types), and the degree of skill specialization for each occupation. This section provides some description and indicators used to determine workforce demand. Indicators include

- *Jobs Postings*: Jobs postings data provides number of "unique" jobs postings, or number of jobs that companies have advertised for in an average month. The number of regional jobs postings in an average month compared to national or state numbers can indicate high demand for a particular occupation. Similarly, the number of total job postings for an occupation compared to the number of hires may show that companies are having to work harder to find qualified talent. However, not all positions are publicly-posted, or they are posted using more local communication channels.
- *Annual Openings*: Average annual openings over a period of time illustrate how many job openings due to retirements and industry growth may be expected in an average year. This indication provides some insight into how many new workers may be required in the region. This number is an estimate based on national and regional industry trends.
- *Regional Completions*: Number of graduates in the region who are academically qualified to fill a position. This data is mostly from the National Center for Education Statistics and does not necessarily include workforce program completions and professional credentials.

Note that most workforce demand indicators are not 100% reliable. Indeed, they are best used as initial indicators of demand that researchers verify and contextualize with local stakeholders. Occupation descriptions in the main text provide this analysis.

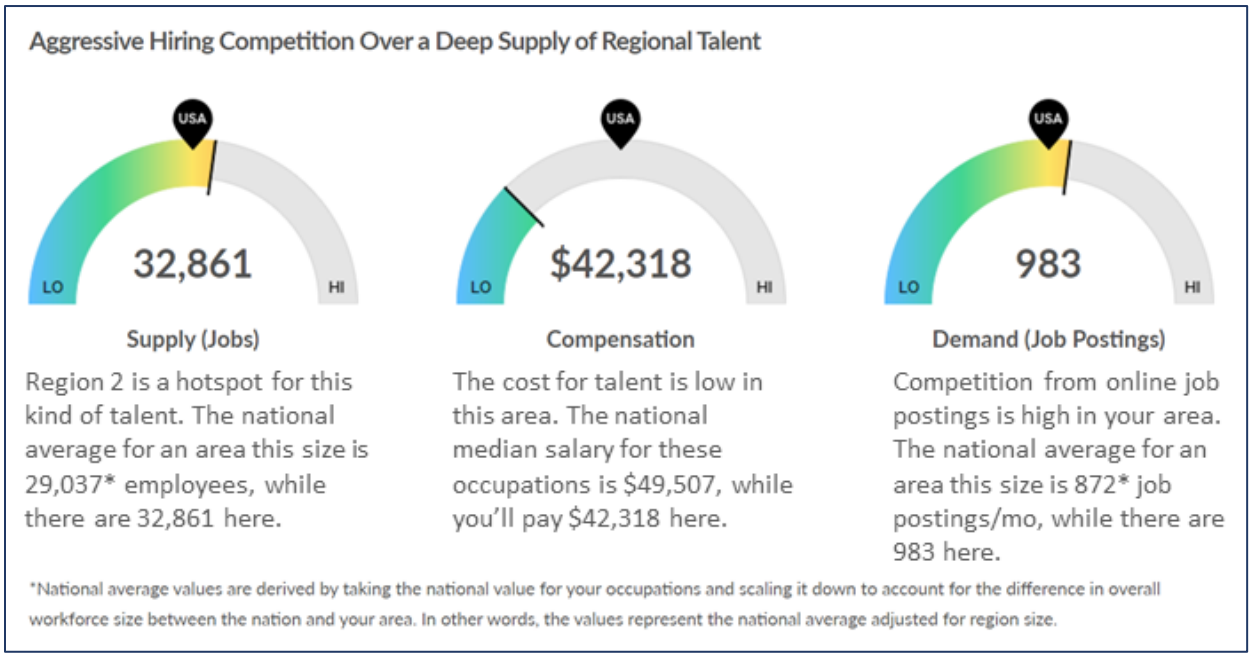
Based on this data as well as input from stakeholders, Region 2 discovered talent demands exist across different occupations types, depending on the level of education and skill sets:

- Entry-level Occupations: Entry-level occupations have increase demand for two major reasons. First, many of these occupations do not have high enough wages to secure and retain qualified talent. Second, companies express a lack of basic mathematical skill sets among high school graduates and a dearth of soft skills such as problem solving, initiative, dependability, and timeliness. Many applicants or beginning workers do not demonstrate the aptitude to learn quickly on the job.
- Middle-Skill Occupations: These jobs often require a unique skill set acquired through 1-2 year certification programs, whether they are academic or workforce-based. Many of the occupations also involve professional accreditations and apprenticeship-style training. Technicians, machinists, Licensed Practical Nurses, computer support specialists, construction workers, etc. are all considered "middle-skill" jobs. As many of the workers employed in these kinds of occupations are aging out of the workforce (i.e. baby boomers), demand for new workers grows. Meeting this demand is a particular challenge due to lack of interest among younger generations. First, they may not know about the opportunities available to them, such as the higher than median income wages for many of these jobs. Second, our society has developed a stigma regarding these types of occupations; they are seen a manual labor and

grunt work. Our education system and families tell students to go to a four-year college to be successful, and these occupations do not fall into that vision.

- **Mid-Level Managerial Positions and Higher:** This region may provide jobs for bachelor degrees or higher that are appropriate for those who have recently graduated. Fortuitously, this region also has higher than average numbers of graduates received bachelor's, master's and doctorates. Retaining these graduates is a challenge however. First, four-year higher education institutions and companies in the region do not adequately collaborate to build a pipeline of graduates into regional employment opportunities. Second, as graduates gain experience and search for promotion opportunities, they do not find the mid-level careers or mid-level salaries they desire. As a result, they move elsewhere. Ironically, many companies in the region also leave because they express they cannot find qualified applicants for middle-management positions.

Manufacturing Cluster



Description	2016 Jobs	2016 Median Hourly Earnings	Annual Openings (2016-2021)	Regional Completions (2015)	Typical Entry Level Education	Typical On-the-Job Training
General and Operations Managers	3,511	$42.09	330	3,564	Bachelor's degree	None
Industrial Engineers	681	$35.46	53	293	Bachelor's degree	None
Sales Representatives, Wholesale and Manufacturing,	2,875	$25.51	331	15	HS diploma or EQV	Moderate-term OJT

Industrial Machinery Mechanics	1,276	$20.70	145	0	HS diploma or EQV	Long-term OJT
Maintenance and Repair Workers, General	3,961	$16.30	433	0	HS diploma or EQV	Long-term OJT
First-Line Supervisors of Production and Operating Workers	1,902	$28.26	211	0	HS diploma or EQV	None
Electrical and Electronic Equipment Assemblers	1,075	$17.04	130	53	HS diploma or EQV	Moderate-term OJT
Team Assemblers	5,347	$14.54	701	0	HS diploma or EQV	Moderate-term OJT
Machinists	1,485	$21.91	177	0	HS diploma or EQV	Long-term OJT
Welders, Cutters, Solderers, and Brazers	1,402	$19.41	195	65	HS diploma or EQV	Moderate-term OJT
Inspectors, Testers, Sorters, Samplers, and Weighers	1,296	$17.53	175	0	HS diploma or EQV	Moderate-term OJT
Paper Goods Machine Setters, Operators, and Tenders	697	$19.01	85	0	HS diploma or EQV	Moderate-term OJT
Helpers--Production Workers	904	$12.71	152	0	No formal educational credential	Short-term OJT
Production Workers, All Other	955	$11.88	122	0	HS diploma or EQV	Moderate-term OJT
Laborers and Freight, Stock, and Material Movers, Hand	5,494	$11.63	835	0	No formal educational credential	Short-term OJT

*Occupations highlights in green show characteristics of demand as indicated by jobs postings, annual openings versus completions, and local stakeholder data.

As stated previously, some of the regional completions data does not capture many of the workforce and professional certifications that employers desire today. In the manufacturing cluster, these credentials vary. For in-demand occupations in particular, these credentials may include:

- Industry Machinery Mechanics and Maintenance and Repair Workers: Moderate to Long-term OJT, Apprenticeship, NCCER IM Mechanic Level 1-4 & NIMS Machining Level 1 (not available in region); Industrial Maintenance Technician Certifications: CMRT, Siemens Mechatronics Level 1, OSHA 10 General Industry, MT1, CRC Accreditation, Advanced Manufacturing Technology Certificate (DLCC)
- Welders, Cutters, Solderers, and Brazers: Moderate OJT, AWS Welding Accreditation, NCCER Welding Levels 1-3 Accreditation
- Machinists: Long-term OJT, CNC training with emphasis on CAD/CAM, NIMS Machining Level 1, MT1, Siemens Mechatronics Level 1

In addition to these middle skill credentials, companies in the region have expressed a need for soft skills in their workforce such as critical thinking, problem solving, timeliness, and dependability. These traits are

necessary for all positions. Many manufacturers have found that they can usually train many positions on the job as long as applicants have these skill sets. Unfortunately, they have found that many do not have these skills, resulting in high employee turnover.

Health Care and Life Sciences Cluster

Description	2016 Jobs	2016 Median Hourly Earnings	Annual Openings (2016-2021)	Regional Completions (2015)	Typical Entry Level Education	Typical On-The-Job Training
Medical and Health Services Managers	785	$45.39	73	236	Bachelor's degree	None
Family and General Practitioners	466	$92.10	20	441	Doctoral or professional degree	Internship or residency
Physicians and Surgeons, All Other	881	$102.39	44	544	Doctoral or professional degree	Internship or residency
Registered Nurses	7,308	$28.39	563	1,197	Bachelor's degree	None
Radiologic Technologists	547	$23.15	36	133	Associate's degree	None
Psychiatric Technicians	645	$12.54	50	62	Postsecondary nondegree award	Short-term OJT
Licensed Practical and Licensed Vocational Nurses	2,505	$19.07	193	137	Postsecondary nondegree award	None
Nursing Assistants	5,264	$11.22	733	62	Postsecondary nondegree award	None
Dental Assistants	675	$18.39	93	62	Postsecondary nondegree award	None
Medical Assistants	1,195	$14.00	176	511	Postsecondary nondegree award	None

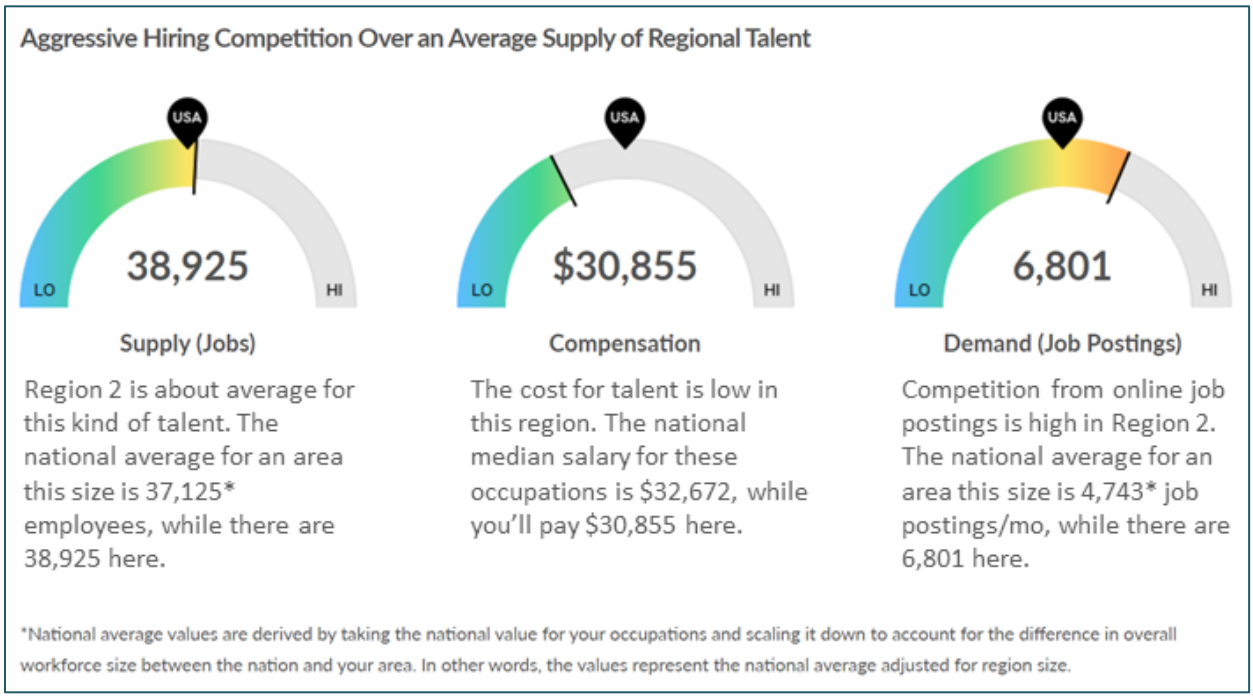
Maids and Housekeeping Cleaners	2,394	$9.20	365	0	No formal educational credential	Short-term OJT
Personal Care Aides	4,411	$8.74	801	314	No formal educational credential	Short-term OJT
Receptionists and Information Clerks	3,015	$11.25	432	0	HS diploma or EQV	Short-term OJT
Medical Secretaries	640	$14.46	100	105	HS diploma or EQV	Moderate-term OJT
Office Clerks, General	10,203	$13.51	1,294	0	HS diploma or EQV	Short-term OJT

*Occupations highlights in green show characteristics of demand as indicated by jobs postings, annual openings versus completions, and local stakeholder data.

Completions data for health care is more reliable than manufacturing because training of these occupations has historically been integrated with education services. Some of the key in-demand occupations in health care include:

- Registered Nurses: Generally requires an Associate's or Bachelor's degree. Applicants take a test to receive the RN License. Licensed Practical and Vocational Nurses hold many positions in this region that would normally be Registered Nurses due to lack of RN supply. Low pass rates for the RN exam and RNs leaving the region may be two contributing factors for the lack of supply.
- Licensed Practical and Vocational Nurses: LPNs/LVNs usually require a 1-2 year certificate and NCLEX-PN accreditation. As illustrated by the annual openings versus completions data in table above, there is not a sufficient supply of workers in the talent pipeline.
- Nursing Assistants: Nursing Assistants often require some post-secondary coursework accompanied by on-the-job training. Unfortunately, the hourly wage is so low for this occupation that there is little incentive for workers. Students studying to be RNs, LPNS, or LVNs may support these positions.
- Personal Care Aides: Many U.S. seniors today prefer to stay in their homes as long as possible, avoiding senior residential facilities. As the senior population grows, the demand for personal care aides will also increase. The challenge in this case is the increase demand for these positions combined with low hourly wages (which are sometimes necessary when considering senior's fixed incomes). This challenge may be outside the GOVA scope of service.

Food and Beverage Processing Cluster



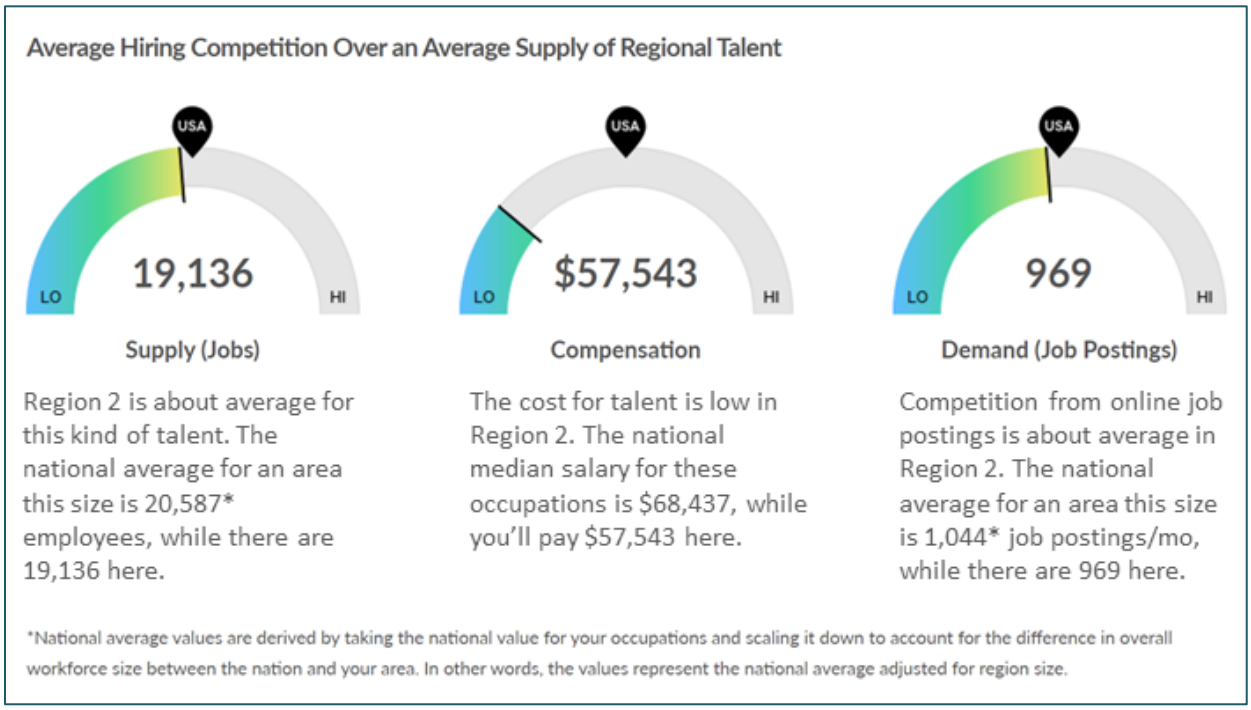
Description	2016 Jobs	Median Hourly Earnings	Annual Openings (2016-2021)	Regional Completions (2015)	Typical Entry Level Education	Typical On-The-Job Training
Farmers, Ranchers, and Other Agricultural Managers	68	$29.22	6	273	HS diploma or EQV	None
Sales Representatives, Wholesale and Manufacturing	2,875	$25.51	331	15	HS diploma or EQV	Moderate-term OJT
Stock Clerks and Order Fillers	5,496	$10.63	763	0	No formal educational credential	Short-term OJT
Office Clerks, General	10,203	$13.51	1,294	0	HS diploma or EQV	Short-term OJT
Farmworkers and Laborers, Crop, Nursery, and Greenhouse	564	$10.87	99	0	No formal educational credential	Short-term OJT
Farmworkers, Farm, Ranch, and Aquacultural Animals	204	$11.98	37	0	No formal educational credential	Short-term OJT
First-Line Supervisors of Production and Operating Workers	1,902	$28.26	211	0	HS diploma or EQV	None
Food Batchmakers	547	$12.72	84	0	HS diploma or EQV	Moderate-term OJT
Packaging and Filling Machine Operators and Tenders	599	$13.38	81	0	HS diploma or EQV	Moderate-term OJT
Driver/Sales Workers	728	$12.39	88	0	HS diploma or EQV	Short-term OJT

Heavy and Tractor-Trailer Truck Drivers	5,061	$18.30	609	0	Postsecondary nondegree award	Short-term OJT
Light Truck or Delivery Services Drivers	2,477	$11.67	294	0	HS diploma or EQV	Short-term OJT
Industrial Truck and Tractor Operators	1,429	$15.70	168	0	No formal educational credential	Short-term OJT
Laborers and Freight, Stock, and Material Movers, Hand	5,494	$11.63	835	0	No formal educational credential	Short-term OJT
Packers and Packagers, Hand	1,278	$9.12	210	0	No formal educational credential	Short-term OJT

*Occupations highlights in green show characteristics of demand as indicated by jobs postings, annual openings versus completions, and local stakeholder data.

As stated previously, some of the regional completions data does not capture many of the workforce and professional certifications that employers desire today. In the Food and Beverage Processing cluster, these credentials vary. Manufacturing companies that rely on transportation and distribution have expressed that they find a limited supply of drivers with Commercial Driver's Licenses (CDLs). Community Colleges, in partnership with other private entities, continuously offer trainings for these licenses. The challenge may be informing potential workers of these courses, facilitating their access to these courses, and increasing interest in these positions, some of which pay higher than median wage.

Emerging Technology and IT Cluster



Description	2016 Jobs	Median Hourly Earnings	Annual Openings (2016-2021)	Regional Completions (2015)	Typical Entry Level Education	Typical On-The-Job Training
Computer Systems Analysts	719	$32.43	65	358	Bachelor's	None
Software Developers, Applications	909	$40.70	80	215	Bachelor's	None
Software Developers, Systems Software	570	$43.17	46	258	Bachelor's	None
Computer User Support Specialists	1,525	$20.58	149	126	Some college	None
Civil Engineers	547	$35.25	48	284	Bachelor's	None
Electrical Engineers	760	$45.69	54	241	Bachelor's	None
Biochemists and Biophysicists	42	$33.47	4	155	Doctoral or professional	None
Medical Scientists, Except Epidemiologists	162	$36.36	14	214	Doctoral or professional	None
Chemists	160	$40.25	15	116	Bachelor's	None
Biological Technicians	172	$17.76	20	0	Bachelor's	None
Postsecondary Teachers	6,317	$27.52	534	2,615	Doctoral or professional	None
Elementary School Teachers, Except Special Education	2,646	$23.22	217	551	Bachelor's	Internship or residency
Middle School Teachers, Except Special and Career/Technical Education	1,046	$23.09	86	292	Bachelor's	Internship or residency
Secondary School Teachers, Except Special and Career/Technical Education	1,929	$23.22	152	383	Bachelor's	Internship or residency
Sales Representatives, Services	1,632	$23.32	213	15	HS diploma	Moderate OJT

*Occupations highlights in green show characteristics of demand as indicated by jobs postings, annual openings versus completions, and local stakeholder data.

IT occupations cross most industry sector boundaries, and thus are expected to increase in demand in the coming years. Demand for Computer User Support Specialists may grow in particular. Computer User Support Specialists exist across all industries. They are the resident IT people in most offices. These workers may have some post-secondary education, an Associate's or Bachelor's degree depending on the position and wage. In this region, some certificates offered are the Cisco CCNA Networking Career Studies Certificate and the Cyber Security Career Studies Certificate.

Shared knowledge (hard) skills for IT support workers include computers & electronics, engineering & technology, customer & personal services, and mathematics. Soft skills include critical thinking, coordination, monitoring, judgement & decision making, system analysis, problem sensitivity, and inductive & deductive reasoning.

Meanwhile, those in the higher education and research & development arm of this cluster often need a bachelor's degree or higher.

APPENDIX C: REGION 2 MEMBERSHIP

Council Members (as of August 17, 2017)

Marla Akridge, Alleghany Highlands EDC
Dr. Eddie Amos, Meridium from GE Digital
Dr. Nathaniel Bishop, Jefferson College
Ab Boxley, Boxley Materials Company
Dr. John Capps, Central Virginia Community College
Kenneth Craig, Liberty University
Patrick Collignon, Volvo Trucks
Beverly Dalton, English Construction
Sandy Davis, BCR Property Management
Dr. John Dooley, Virginia Tech Foundation
Michael Fleming, TORC Robotics
Watt Foster, Foster Fuels
William Fralin, Medical Facilities of America
Dr. Michael Friedlander, VT Carilion Research Institiute
Don Halliwill, Carilion Clinic
Mike Hamlar, Hamlar-Curtis Funeral Home
Dr. Brian Hemphill, Radford University
Dr. Victor Iannello, Radiant Physics, Radiant Ventures
Terry Jamerson, Roanoke Times
Doug Juanarena, retired serial entrepreneur
Floyd Merryman, Sonny Merryman Inc.
Debbie Petrine, Commonwealth Care of Roanoke, Virginia Tech Board of Visitors
John Putney, Town of Bedford Industrial Development Authority
Dr. Ray Smoot, Union Bank
E.W. Tibbs, Centra Health
Shannon Valentine, Commonwealth Transportation Board
John Williamson, Botetourt Co. Board of Supervisors

Working Group Members

Collaborative Sites and Buildings

- John Putney, Town of Bedford Industrial Development Authority (chair)
- Traci Bildo Bedford County
- Kevin Byrd, NRVRC
- Brian Cossman, Hurt & Proffitt
- Beth Doughty, Roanoke Regional Partnership
- John Doyle, Lynchburg Regional Business Alliance
- Deborah Flippo, Draper Aden Assoc.
- Rebekah Gunn, Roanoke Regional Chamber of Commerce

- Kathy Hodges, Franklin Center for Advanced Learning
- Jane Johnson, City of Salem
- Jon Lanford, County of Alleghany
- Rob Ledger, City of Roanoke
- Jill Loope, Roanoke County
- Joe Meredith, VTCRC
- Dan Motley, Norfolk Southern
- Peer Segelke, Lawrence Companies
- Tom Sibold, City of Covington
- John Smolak, Appalachian Power
- Danny Wilson, VA First Regional Industrial Facility Authority

Entrepreneurship and Business Development

- Dr. Victor Iannello, Radiant Physics, Radiant Ventures (chair)
- Gary Christie, Lynchburg Region
- Sam English, CIE Partners
- Greg Feldmann, Skyline Capital
- Don Halliwill, Carilion Clinic
- Victor Ianello, Radiant Physics, Radiant Ventures
- Fourd Kemper, Woods Rogers PLC
- Mary Miller, RAMP
- Rebekah Gunn, Roanoke Regional Chamber of Commerce
- Annette Patterson, The Advancement Foundation
- James Ramey, Middleland Capital
- Lisa Schoppmeyer, The Alleghany Foundation
- Samantha Steidle, Virginia Western CC
- Bryan Thompson, Highlands Community Bank
- Sheri Winesett, Botetourt County Chamber of Commerce

Talent and Workforce Development

- Dr. John Capps, Central Virginia Community College (chair)
- Ed Armentrout, Retired - Non-profits org.
- Ben Bowman, Lynchburg Region
- Scott Brabrand, Lynchburg City Schools
- Angela Falconetti, formerly Virginia Western Community College
- Lon Forehand, Business & Education Writer
- Jake Gilmer, Western Virginia Workforce Development Board
- Marty Holliday, New River/Mt. Rogers WDB
- Susan Martin, Bedford Area Chamber of Commerce
- Nancy Moga, Callaghan Elementary
- Leo Mulcahy, Retired
- Debbie Petrine, Commonwealth Care of Roanoke, Virginia Tech Board of Visitors

- Dr. John Rainone, Dabney S. Lancaster CC
- Doug Schuch, Bedford Public Schools
- Scott Stanley, Fostek Corporation
- Wayne Strickland, Roanoke Valley-Alleghany Regional Commission
- Leslie (Tyke) Tenney, Virginia Technical Institute

Technology Development

- Doug Juanarena, retired serial entrepreneur (chair)
- Marla Akridge, Alleghany Highlands EDC
- Bob Bailey, CAER
- Jay Brenchick, Roanoke County Economic Development
- Richard Diddams, CCCxA
- Rebekah Gunn, Roanoke Regional Chamber of Commerce
- Dr. Brian Hemphill, Radford University
- John Hull, Roanoke Regional Partnership
- Megan Lucas, Lynchburg Regional Business Alliance
- Nick Moga, Alleghany Highlands Economic Development
- Marc Nelson, City of Roanoke Economic Development
- Dennis Reece, Citizens Telephone Coop
- Lisa Schoppmeyer, The Alleghany Foundation
- Bob Stolle, Virginia Center for Innovative Technology
- Shannon Valentine, Commonwealth Transportation Board