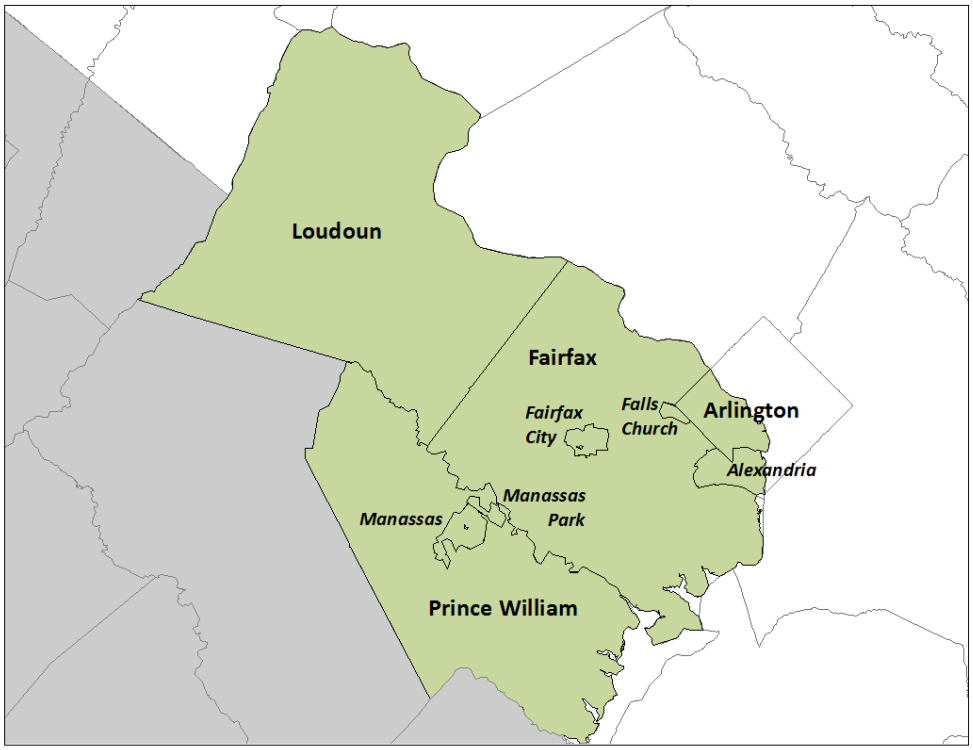


Economic Growth and Diversification Plan 2021 Update

Prepared for:

GO Northern Virginia Regional Council (Region 7)

Prepared by:

The George Mason University Center for Regional Analysis

Contents

Plan-In-Brief

The following is the 2021 update to the Economic Growth and Diversification Plan (EGDP) adopted by the Region 7 (Northern Virginia) Council under the Virginia Growth and Opportunity Initiative, initially adopted in 2017 and previously updated in 2019. The Virginia Initiative for Growth and Opportunity in Each Region (GO Virginia) is a public-private approach to boosting economically sustainable growth in the Commonwealth. This initiative promotes collaborative, regional initiatives to expand economic opportunity; grow and diversify the economy; and increase career readiness in high-wage industries. The Initiative is specifically geared to incentivize inter-jurisdiction cooperation among the jurisdictions included in Region 7 (Arlington County, Fairfax County, Loudoun County, Prince William County, and the independent cities of Alexandria, Fairfax City, Falls Church, Manassas, and Manassas Park). The implementation of the EGDP is guided by the Region 7 Council made up of business and community leaders, education institutions, economic and workforce development professionals, and elected officials.

This plan update was prepared by the Center for Regional Analysis (CRA) at George Mason University with input and guidance from the Region 7 Council. The plan document includes updates to data, highlights key economic challenges facing the region, reiterates the priority goals established by the Council, and the introduction of an importance expansion in strategies to achieve the plan's workforce development goals. These modifications reflect knowledge and experience gained since the implementation of the original EGDP (The original EGDP can be found at www.GOnorthernVA.com), in addition to research undertaken in connection with recent projects funded by GO-Virginia Region **7.**[1]

Key Characteristics of the Northern Virginia Economy

- The Northern Virginia regional economy drives much of the state's economy representing more than 40 percent of all Commonwealth economic output in 2020.
- The region is home to more than 2.54 million residents, which represents about 30 percent of the state's population.
- The region's population increased by 295,000 residents between 2010 and 2020, an annual growth rate of 1.2 percent, though the pace of growth has slowed considerably since 2017. Loudoun County led the way with a net increase of 108,000 residents and an annual growth rate of 3.0 percent.
- Northern Virginia is the wealthiest region in the state with per capita annual income at $82,964—a figure 39 percent higher than the state and 47 percent higher than the nation.
- The region's key economic development assets include:

[1] Two recent grants provided important insights into Region 7 high-tech labor markets and regional entrepreneurship. Economic Resilience and Recovery Grant, Region 7: Pivoting Technology Companies for the Post-COVID 19 Economy (20-GOVA-ERR-07C). Enhanced Capacity Building Grant Region 7: Creating a Roadmap for Reskilling Displaced Leisure, Hospitality and Gig Workers for Technology Employment in a Post COVID-19 Economy.

- Highly educated workforce with 56.0 percent of the working age population possessing at least a bachelor's degree, compared with the national average of 32.2 percent and the statewide average of 39.6 percent.
- Major federal government agencies that provide more than 88,000 direct jobs.
- $48.8 billion in federal procurement spending in Region 7 for FY2020, split evenly between Department of Defense and other agency spending.
- Key federal research centers such as Defense Advanced Research Projects Agency, Office of Naval Research, Air Force Office of Scientific Research, and the National Science Foundation, plus nine Federally Funded Research and Development Centers.
- Campuses of three Research 1 Universities (GMU, VT, UVA).
- Entrepreneurship development initiatives being pursued by the R1 universities as well as other educational institutions in the region including Northern Virginia Community College and Marymount University.
- Emerging bio-medical research centers, such as the Inova Center for Personalized Medicine and Janelia Research Campus.
-
- Recent success in attracting large commercial businesses companies that utilize technology and high value added employees as enablement of their business activities.
- Largest number of computer security analysts in the nation, representing a key skilled labor force advantage.
- An existing base of resources to build a resilient and persistent commercially--oriented technology product business start-up ecosystem that attracts venture capital and supports long term growth resulting in large and sustainable businesses staying in Region 7.

- Region 7 has significant economic challenges:
  - A persistent over-reliance on federal spending that caused the region to experience slower economic growth during recent times of uncertainty regarding the federal budget.
  - An over reliance on consulting business models, rather than product or technology enabled services that allow businesses to leverage technology and labor to create higher profit margins and growth, which can lead to the federal government seeking technology innovation from other regions more focused on product-led commercial products.
  - A shortfall of compelling high growth technology product companies when compared to other regions, causing Region 7's share of national venture capital to fall precipitously over the past 20 years, affecting wage growth, and causing business exits to lag behind regions that have established themselves as hotbeds of technology company formation, growth, and market exit (IPOs, M&A).
  - The region's population growth rate has outpaced its employment growth rate since 2008; exacerbated by Region 7's strong bias towards consulting and labor led business models, where growth in profitability is tied to profit margins on labor, and further exacerbated by the COVID-19 pandemic.

- Even with relatively high per capita income, Region 7 has a very high cost of living, with an average housing price of $601,000 as of April 2021. This has contributed to domestic net out-migration of the Northern Virginia population for each of the past six years.
- A fragile funding ecosystem. Although investment of risk-equity (venture capital, angel capital and private equity) in Region 7 businesses is at historical highs; (more than $8 billion in the Greater Washington region since January 2000), much of this money is not regionally based, is aggregated in funds provided by wealthy individuals, sourced from nontraditional sources of startup capital (e.g., hedge funds and private equity) or being deployed by emerging fund managers with limited track records and incomplete fundraising plans. In totality these characteristics make Region 7's risk capital market very sensitive to negative macro-economic trends.
- A lack of clarity around the true nature of its technology business community. Region 7 has traditionally viewed itself as having one technology community. It in fact has at least three: government services (e.g., Booz Allen or General Dynamics) that deliver technology along through consulting services, commercial businesses that deliver technology as a product of labor (e.g., Clarabridge or Cvent) and commercial businesses that use technology as a part of their overall service business (e.g., Amazon, CapitalOne of Inova). These overlapping but distinct technology industries have different talent and capital requirements and compete for economic development resources and policy foci making it difficult for any "one size fits all" solution, as well as confusing resource allocation decisions.
- In comparison with other technology-driven regions of the United States (Silicon Valley, Austin, or other), Region 7's largest consumer of technology have a lower level of interconnection with entrepreneurial and emerging businesses developing commercial technology products.[2] This means that in many cases where Region 7 commercial technology business achieve sufficient growth, they are acquired or look to partner with the large commercial technology businesses outside of Virginia, which increases the fragility of Region 7's ability to support continual commercial innovation as innovators look elsewhere for a business exit or their next career move.
- The COVID pandemic has weakened many of the existing networks that entrepreneurs and business owners have used to find business partnerships, talent, and capital. A shift away from face-to-face networking and co-working communities may be a persistent phenomenon. Recent trends in start-up funding levels in Region 7 suggest a high rate of business formation, However, anecdotal observations suggest these businesses are forming from existing networks of individuals already connected in some way and utilizing virtual connections to add talent and collectively operate. This further adds to the fragility of Region 7's hold on talented business founders and employees who want to pursue commercially focused product businesses – they can benefit from the virtual

[2] Compared to the relationships a company like Google has with other participants in the Silicon Valley technology eco-system.

proximity to larger companies in more commercially focused regions, and ultimately, their connection to Region 7 is weakened.

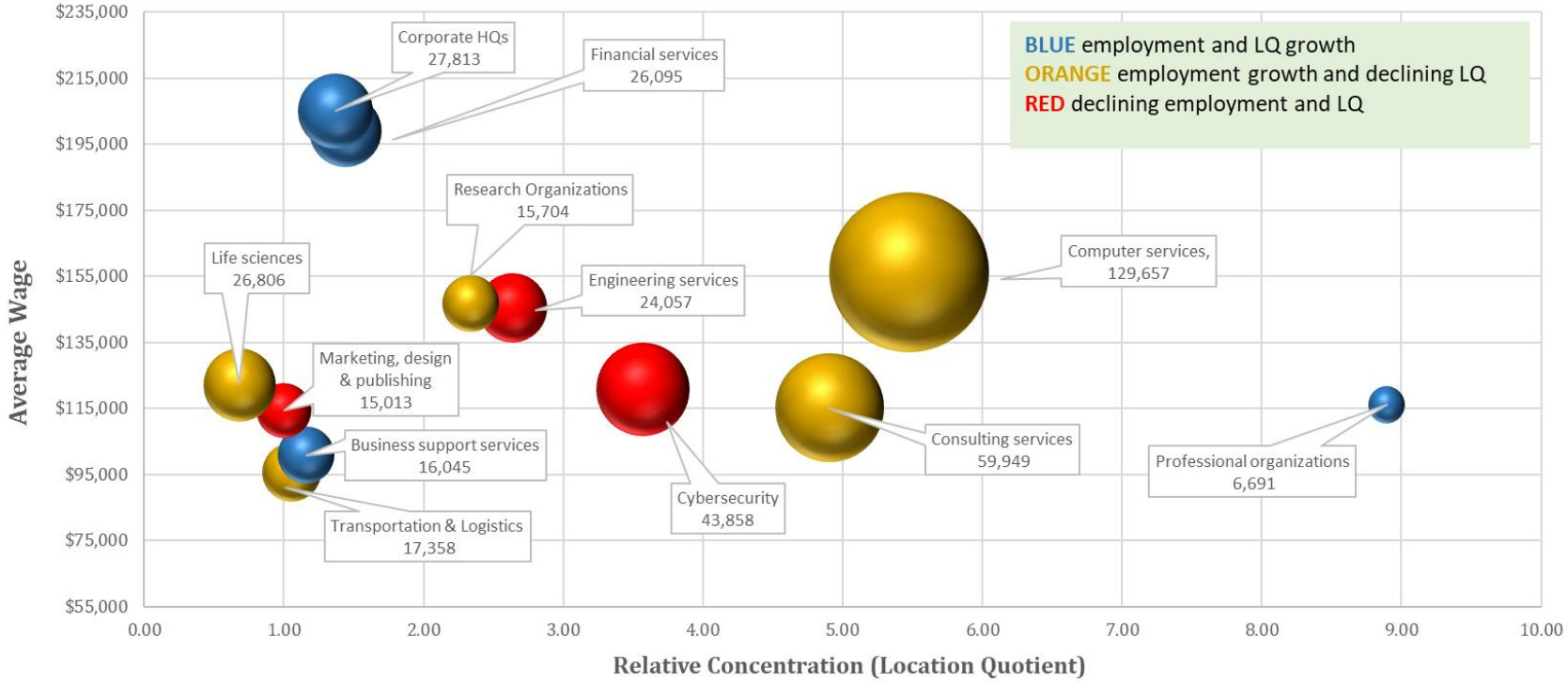
Economic and Workforce Analysis

The economic and workforce analysis component of the planning process developed data focused on three dimensions: industrial clusters that represent qualified industries (high wage, traded sectors, growth opportunities); occupations critical to the growth of targeted clusters; and the skills sets required for these occupations. Based on data analysis and consultation with the Region 7 Council, the research team examined several industry clusters regarding wages, number of jobs, job growth trends, and competitive position based on national location quotients.[3] The figure below summarizes these data and shows that several of the most valuable and important industry clusters in Northern Virginia are not growing at a competitive rate.

- The region's three largest clusters—computer services, consulting services, and cybersecurity—are all heavily influenced by government contracting and have rebounded due to an uptick in federal contractor spending in the past four years.
- Four clusters—financial services, corporate HQs, professional organizations, and business support services—experienced growth in both employment and competitive positioning from 2015 to 2020.
- A key commonality among targeted clusters is the need for significant numbers of capable technology workers. Computer-related occupations represent a substantial share of total jobs in several of the Region's top clusters and has risen over the past two years:
    - 58.6 percent of all jobs in the computer services cluster,
    - 15.8 percent of research organization jobs,
    - 14.4 percent of jobs at corporate headquarters,
    - 10.7 percent of engineering services employment, and
    - 11.9 percent of all consulting jobs.
- Information Security Analysts and Computer and Information Research Scientists remain heavily concentrated in Region 7 with location quotients of 8.6 and 7.4, respectively, when using national data as a baseline.
- The region faces a severe shortage of qualified technology workers. According to data from EMSI, there were more than 10,000 openings in 2020 in computer-related occupations in the region. Many employers across each of the region's technology communities report having difficulty finding workers who possess both the necessary skills required for many of these jobs. Because of the distinctly different growth requirements of the Region's technology communities, a one size fits all approach to talent creation and job connection is unlikely to succeed. The table below offers data on key computer-related occupations in Northern Virginia.

[3] We encourage readers to recognize that the industry cluster analysis is based on labor market data that are categorized in ways that do not reflect some characteristics of the technology community.

Region 7 Industry Clusters, 2015-2020



Source: EMSI, Cluster definitions from U.S. Cluster Mapping Project

Computer Occupations in Region 7, 2015-2020

Position Title	2020 Jobs	2020 LQ	Median Earnings 2020	Job CAGR 2015-2020	Projected Job CAGR 2015-2020	2020 Position Openings
Software Developers/QA Analysts & Testers	50,329	3.83	$119,632	5.8%	1.8%	4,281
Computer Systems Analysts	12,406	2.40	$116,953	-4.4%	1.0%	995
Information Security Analysts	10,872	8.52	$120,789	7.0%	2.6%	1,063
Network and Computer Systems Admins	10,699	3.48	$97,039	-0.6%	0.4%	711
Computer User Support Specialists	9,817	1.68	$64,532	1.6%	1.6%	886
Computer Occupations, All Other	8,745	2.53	$121,861	1.8%	0.6%	689
Computer Network Architects	5,127	3.59	$142,642	-1.6%	0.4%	327
Database Administrators and Architects	4,336	3.63	$119,872	8.2%	0.8%	328
Computer Network Support Specialists	3,996	2.39	$78,585	0.4%	0.6%	303
Computer Programmers	3,634	2.30	$108,862	-3.8%	-0.6%	240
Web Developers & Digital Interface Designers	3,029	2.14	$90,021	9.0%	1.2%	255
Computer & Information Research Scientists	2,108	7.35	$153,091	11.6%	0.8%	180

Source: EMSI

- The Northern Virginia Technology Council has identified five hard-to-fill competency areas: big data and analytics, cyber security and privacy, data center and cloud infrastructure, network systems, and programming and software development. The NVTC Cstudy also noted that soft skills (e.g., written and verbal communication, problem solving and critical thinking, and relationship management) are vital considerations. This was also widely reported in the interviews undertaken in connection with recent research on technology talent sponsored by the Region 7 Council.

- Many Northern Virginia government service technology jobs require U.S. citizenship, security clearances, and 4-year degrees to meet federal specifications. As this remains a dominant employer of technology workers in Region 7, this focus on degree attainment and ability to obtain security clearance requirements is a significant constraint on employment growth and absorption of less traditional candidates.

- Other employers also generally put a premium on degree completion from a four-year undergraduate program. Overall, therefore, increasing the number of degree completers is a necessary step in addressing the region's shortage of technology workers in this sector.

- Technology sectors not driven by government contracting are increasingly showing a willingness to hire candidates from nontraditional backgrounds; however, there are challenges in evaluating talent in the absence of the "credentialization" of completion of a degree program at an accredited college or university. Businesses willing to hire non-traditionally credentialed talent will benefit from the identification, promotion, and promulgation of *industry-recognized* nontraditional worker credentials. While the region will continue to attract talent, the growing importance of industry-recognized skills presents opportunities for ***native Northern Virginia workers*** through short courses, boot camps, internships, and similar new and existing programs. These also include programs targeted to exiting military personnel.

Priority Goals

Based on the information briefly described above, input from regional stakeholders, and a highly collaborative and deliberative process, the Region 7 Council identified seven strategic priority industry clusters for the Economic Growth and Diversification Plan. Each of these clusters is represented in each of the three technology communities described above

The Key Industry Clusters that will serve as a focus of the Region 7 Economic Growth and Diversification Plan implementation include:

- Computer software (including data sciences, artificial intelligence, and autonomy)
- Cybersecurity (including services and products)
- Consulting Services
- Financial Services
- Engineering Services
- Life Sciences
- Research Organizations
- Emerging technologies (nano technology, material sciences, and quantum computing)
- Healthcare (including healthcare services, medical devices, genomics, proteomics, and other life sciences)

Among these industries, Region 7 will show particular interest in projects focused on:

- Cross-sectoral innovation that creates unique products, or integrates participants within or across existing technology business clusters
- Emerging technology innovations (product and processes)
- Advanced computer software supporting automation and artificial intelligence
- Talent preparation and matching with employer demands, particularly in technology employment.
- Support for established small and medium sized technology-based commercial businesses with high growth potential.
- Enhancing the quality of support for entrepreneurial education and networking to promote the formation of new technology based commercial businesses with high growth potential.
- Leveraging federal and state research and commercialization funding to create and expand commercially-focused product businesses with special interest in activities related to:
    - Autonomous transportation
    - Nano-scale technologies
    - Advanced materials

Maintaining and enhancing Region 7's competitive position for attracting growth and investment in these key regional sectors will require collaborative action and innovative approaches to meeting long run challenges and responding to labor market and business operating disruptions related to the COVID-19 pandemic. The persistent challenges of skilled labor availability, taking advantage of existing regional competitive assets, and supporting creative solutions to address market weaknesses drives the selection of priority goals and project selection for the Region 7 Council including:

1. Strengthening Northern Virginia's technology workforce through talent development and workforce attraction,
2. Accelerating the development of high growth potential technology product companies,
3. Enhancing the regional innovation eco-system through industry change and management enhancement, technology transfer and intellectual property commercialization, and enhancing funding opportunities in the entrepreneurial sector,
4. Address issues throughout the Region 7 economy and across all priority goals to expand high value opportunities that enhance economic equity and opportunity.
5. Identify and, where possible, attract project proposals that address key challenges in the Region 7 economic development and innovation eco-systems, including industries that support targeted sectors.

These consensus goals will inform the regional council's decision-making process, but the council will also consider any high impact project that contributes to the overarching GO Virginia goal of achieving private-sector driven job growth in high-wage sectors through interjurisdictional cooperation. Given the changing dynamics of work location (work from home), especially if hybrid work plans dominate workplace agreements, the council will welcome project proposals that consider workforce issues in neighboring GO-Virginia regions that contribute economic benefits to the Region 7 economy.

The descriptions below identify the types of strategies the regional council will consider, prospective performance measures, and potential partners and sources of match funding. The Region 7 Council identified a strong preference for high-impact projects, meaning that there will likely be few total projects, but that each successful applicant will receive substantial support. However, the plan does allow for meaningful smaller projects that may represent pilot efforts for innovative programs that can be tested with less initial funding and supported more fully after proof-of-concept. Therefore, we have provided a scale to indicate the expected budget required to complete each strategy.

- **$**=Projects requiring less than $100,000 of GO Virginia funding
- **$$**=Projects requiring between $100,000 and $500,000 of GO Virginia funding
- **$$$**=Projects requiring more than $500,000 of GO Virginia funding

It will be the responsibility of the proposers to describe the specific project elements and how their proposed initiatives will benefit multiple jurisdictions in Northern Virginia, or multiple jurisdictions throughout the Commonwealth. They will also be required to identify and describe how they will track outcome and output measures, and gain commitments from key partners. In some instances, the proposed projects will involve scaling up current, ongoing initiatives so that they can sustainably serve more participants or more jurisdictions over time. In these instances, proposals will benefit by being able to demonstrate and quantify the impacts of their existing efforts.

The projects that are ultimately funded will be determined by the quality of the proposals and the extent to which they align with the regional priorities. The next section lays out the Council's goals and will guide project funding decisions.

SPECIAL FUNDING OPPORTUNITIES: The Region 7 Council will undertake a review of ARPA (American Rescue Plan) programs for potential sources of matching funds supporting project applications and

strategic initiatives across G&D Plan goals. While these funds are temporary, many of the programs supported by ARPA can last through 2027, which makes this a viable source of funding to support GO-Virginia projects and initiatives.

SPECIAL PROGRAM EMPHASIS: The Region 7 Council will engage in planning and activities designed to particularly encourage project proposals that include or emphasize programs that will enhance equity of opportunity for historically underrepresented communities.

Goal #1: Strengthen Northern Virginia's Technology Workforce

The region will produce technology workers, both in terms of quality and quantity, needed to grow and enhance the competitiveness of regional technology firms.

Challenge: The number of workers entering technology-related occupations is insufficient to meet regional demand.

- Efforts should include preparing workers who are just entering the labor force and those switching careers—to choose technology-related careers. This will include programs addressing hard skills and soft skills appropriate for the region's targeted industries.
- Look to leverage existing non-degree training and certification programs, expanding apprenticeship and internship opportunities, and programs supporting exiting military, where possible.
- Include incumbent worker training opportunities that are relevant, accessible, and affordable.
- Support program efforts to retain workers in the region choosing remote work.

Work with commercial real estate community to ensure that blend of available workspaces matches to the requirements of both local employers and regional talent.

- Work with the Economic Development Alliance to coordinate and support potential projects aimed at attracting new workers to the region to help meet industry labor needs.

Strategies and Expected Outcomes

Strategy 1.1: Strengthen and expand non-degree programs (e.g., certifications and credentials) that allow workers to enter and advance in technology careers.

- *Performance measures:* Certifications and credentials granted
- Funding required: $-$$$

Strategy 1.2: Establish and expand internships, apprenticeships and other work-based learning opportunities that prepare workers and provide them with experience in technology careers.

- *Performance measures:* Program placements, completions, placements in permanent full-time positions
- Funding required: $-$$$

Strategy 1.3: Strengthen and expand programs that prepare veterans and other underserved community candidates with soft and hard skill development and related certifications necessary to enter technology careers.

- *Performance measures:* Program placements, completions, placements in permanent full-time positions
- Funding required: $-$$

Strategy 1.4: Identify and develop programs recognizing career pathways that can guide current and future technology workers through an articulated series of educational programs (including credit and non-credit programs from both public and private training providers) that will allow them to advance their careers from entry-level to middle-skill positions and on through to more leadership positions. Supported programs in this strategy will have clearly distinct offerings from currently available programming.

- *Performance measures:* Program participants, cluster employment, cluster average wages.
- Funding required: $-$$

Strategy 1.5: Strengthen and expand technology-oriented incumbent worker training programs that keep the workforce of small- and medium-sized firms (SMEs) current and competitive.

- *Performance measures:* Number of SMEs participating in incumbent worker training programs, jobs created/retained due to training
- Funding required: $$

Strategy 1.6: Organize regional cluster networks to promote collaborative workforce development and training solutions.

- *Performance measures:* Participating companies, cluster employment
- Funding required: $

Strategy 1.7: Support ideation sessions and invite innovative proposals targeting regional issues impacting workforce retention to lower the incidence of skilled workers leaving Northern Virginia.

- *Performance measures:* Development of worker retention programs in collaboration with appropriate regional entities.
- Funding required: $-$$

Strategy 1.8: Identify and support programming for workforce attraction in collaboration with the Economic Development Alliance.

- *Performance measures:* Development/completion of workforce attraction program implementation with subsequent measures of program success to be determined in collaboration with the EDA.
- Funding required: $-$$

Strategy 1.9: Develop a regional data system to continuously track and monitor the availability of technology workers with the region's education and training pipelines.

- *Performance measures:* Students and workers in education and training pipeline, number of technology workers.
- Funding required: $$

Strategy 1.10: Work with the Economic Development Alliance, regional landlords and developers to assist in the modification and repurposing of existing facilities to match emerging industry needs and post-pandemic labor market characteristics.

- *Performance measures:* Net real estate absorption and new business attraction from out of region.
- Funding required: $

Potential partners:

- Public school systems, particularly Career and Technical Education Programs
- Regional Workforce Boards
- Colleges and universities (e.g., George Mason University, Northern Virginia Community College, Virginia Tech, Marymount, UVA, etc.)
- Industry groups (e.g., Northern Virginia Technology Council)
- Private and non-profit training providers
- Economic Development Alliance
- Virginia Economic Development Partnership
- Potential partners will be both regional and cross-regional entities, especially where project can leverage existing regional and state-level collaborations

Potential sources of matching funds:

- Workforce Innovation and Opportunity Act funding
- Local jurisdictions
- Regional foundations
- Private sector companies
- Industry groups and associations
- ARPA programs

Goal #2: Accelerate the Development of High Growth Technology Product Sector

Challenge: The existing ecosystem to support the support growth of technology product focused businesses is fragile, fragmented, and invisible to many potential participants.

To achieve an economic growth and wage growth rate that is closer to peer technology regions, and to serve its largest local customer, it is essential that Region 7 ensure that product-based technology businesses, and the entrepreneurs that start them, have ready access to the resources, facilities, and expertise necessary to grow their business and expand their commercial customer base. Region 7's ability to generate high paying employment will be directly affected by its success in establishing and

growing business enterprises that utilize technology, while maintaining its existing success in government services, consulting services, and other sectors.

Traditionally, regional economic development plans have focused on two primary areas for increasing technology business employment: encourage the formation of small technology businesses (aka, startups) and seek to develop funding sources to finance the growth of such companies. While these dual foci are important, they are not specific enough by themselves to foster successful growth of Region 7. The GO-Virginia Region 7 council will provide support for existing local economic development programming focused on:

- Fostering the growth and development of businesses that are *specifically* engaged with creating or using technology as a product.
- Differentiating between businesses that are merely small, and those that are at an initial stage of development into a rapidly scaling (jobs, revenue, tax base) business.
- Appreciating that technology is broader than software and computer hardware and includes other high growth areas such as human health, material sciences, climate change remediation and energy.
- Creating sustainability in the form of permanent support structures, networks and funding sources that can survive and overcome macroeconomic shocks.
- Creating a diverse and talented workforce that is suited for leading and working in rapidly growing and evolving technology product businesses.
- Addressing issues that directly impact talent attraction and retention in Region 7.
- Increase and expand interconnection between Region 7's largest commercial users of technology, and the support structures, networks, and funding sources that drive the expansion of growing technology product businesses.
- Address inherent inequities in the availability of resources between experienced entrepreneurs and those who are less experienced or do not have access to resources due to social or economic factors.

Strategies and Expected Outcomes

Strategy 2.1: Build greater awareness, across all demographic and economic groups, of existing and emerging business support programs and resources available to promote the expansion of technology product businesses.

- *Performance measures:* Increased participation in existing or new programs targeted to Growth Companies in priority clusters
- Funding required: $-$$

Strategy 2.2: Support programs designed to assist small and medium-sized technology product based businesses to enter new markets, both domestically and internationally, and to respond to market challenges and opportunities created by the pandemic.

- *Performance measures:* Companies served, new sales by small- and medium-sized establishments (SMEs) in target clusters
- Funding required: $-$$

Strategy 2.3: Develop economic gardening programs that provide growth-minded small businesses (in the priority clusters) with customized competitive market and business intelligence on markets, customers, competitors, business processes, and innovation.

- *Performance measures:* Change in number of jobs and sales in participating firms
- Funding required: $$

Strategy 2.4: Encourage the permanent connection of regional sources of risk capital (angel, venture capital and private equity) to Region 7.

- *Performance measures:* Increase in investment funding for growth companies from regional sources.
- Funding required: $$-$$$

Strategy 2.5: Support new initiatives to provide resources for product technology entrepreneurs and leadership, including business mentorship, networking, resource sharing and other support activities. Initiatives pursued by Region 7 universities, not for profits and local economic development entities will be given priority consideration. This includes working with Virginia Tech and George Mason University in supporting relevant business and workforce development programming at new regional technology campuses.

- *Performance measures:* Increase the number/size of growth companies offering technology products.
  Funding required: $$-$$$

Strategy 2.6: Support programs that train employees and leaders of businesses focused on consulting to reorient their businesses as product companies.

- *Performance measures:* Increase the number/size of growth companies offering technology products.
- Funding required: $$-$$$

Strategy 2.8: Support programs that create greater interconnection between the larger businesses in Region 7 that purchase technology products and the region's smaller but growing technology based businesses. Encourage corporate investment, pooling of business opportunities, sharing of talent requirements and other activities to encourage regional collaboration across and within the priority economic clusters identified in this plan.

- *Performance measures:* Increase the revenue of growth companies offering technology products; increase the number of mergers and acquisitions between businesses operating in Region 7 and Northern Virginia.
- Funding required: $$-$$$

Strategy 2.7: Conduct regional road mapping and resource surveys to provide a census of the businesses and resources constituting the region's technology product business ecosystem, and publicly share results.

- *Performance measures:* Increase the number/size of growth companies offering technology products.
- Funding required: $-$$

Strategy 2.8: Encourage the coordination of programing and efforts undertaken by Region 7 with a broader group of regions around the Commonwealth.

- *Performance measures:* Number of GO-Virginia regions participating in projects and activities formulated by Region 7.
- Funding required: $-$$$

Strategy 2.9: Specifically include targeted small and medium sized enterprises in job fairs resulting from GO-Virginia funded talent pipeline projects.

- *Performance measures:* Companies participating in job fairs, candidate placement.
- Funding required: -$

Strategy 2.10: Work with the NOVA Economic Development Alliance on connecting small businesses to regional talent attraction initiatives. Consider grant funding programs that provide resources for small business to compete for out of area talent.

- *Performance measures:* Number of hires among small companies.
- Funding required: $

Strategy 2.11: Work with Economic Development Alliance and other regional entities on providing small business with resources to effectively manage the emerging, and likely persistent shift towards, a distributed workforce.

- *Performance measures:* Number of hires and employee retention among small firms.
- Funding required: $

Potential partners:

- Technology campuses at VT and GMU
- Business support providers (e.g., Mason Enterprise Center, Genedge Alliance, Tandem Product Academy)
- Industry groups (e.g., Northern Virginia Technology Council)
- Economic Development Organizations, Economic Development Alliance
- Chambers of Commerce
- Area incubators and accelerators
- Universities (e.g., George Mason University, Marymount University)

- Relevant state organizations (e.g., Virginia Economic Development Partnership, Center for Innovative Technology)

Potential sources of matching funds:

- Local jurisdictions
- Industry groups and associations
- Private sector companies
- ARPA funded entities

Goal #3: Expand the Commercial-Focused Technology Sector

Challenge: Proximity to the federal government and federal R&D funding creates an over reliance on consulting business models, but also provides a large amount of innovation funding that is underutilized in Region 7 when compared to other technology regions.

Northern Virginia's innovation ecosystem is quite different from other technology intensive economic regions in that Region 7 entrepreneurial enterprises often grow without venture capital because they are highly involved in and often dependent on government contracting and services revenues. This creates many situations where a consulting business develops technology that could be offered as a commercial product if the consulting business had the knowhow to do so. Additionally, these types of activities often result in intellectual property that is owned by the federal government but could be licensed for commercial use.

Additionally, Region 7 receives a large portion of federal funding of basic research and development. Much of this goes into the region's wealth of research assets ranging from post-secondary research institutions, bio-medical research campuses, and vital federal research agencies. The region is also unique in that it is home to nine of the nation's 43 Federally Funded Research and Development Centers (FFRDCs).

The region will have institutional, developmental, and financial resources to foster enhanced business development and growth opportunities in commercial markets. This will include product development, effective intellectual property transfer mechanisms, and product commercialization. Achieving the goals enumerated here will also be supported by the creation, dissemination, and adoption of innovative practices in business and government; the development of a workforce skilled in change management to effectively compete under rapidly changing market conditions; and an understanding of how networking will be successfully undertaken in an era characterized by hybrid and remote workers. This Goal is closely related to Goal #2 but includes opportunities for strategies and projects beyond emerging enterprises.

Strategies and Expected Outcomes

Strategy 3.1: Support programs that connect technology entrepreneurs with holders of intellectual property in clusters identified by Region 7 as high priority, and aid in the initial steps of commercialization, including prototyping, market analysis, go-to-market planning, and business formation.

- *Performance measures:* Participating companies, sales from commercialized technologies, jobs created/retained
- Funding required: $$-$$$

Strategy 3.2: Create an innovation voucher program that would provide small, established technology companies with discreet amounts of funding to access not-for-profit expertise from universities, national laboratories, and/or nonprofit research centers. These grants would enable companies to prepare assessments of research needs, analyze technology transfer options, or identify technology solutions.

- *Performance measures:* Vouchers granted, sales resulting from new technologies, jobs created/retained
- Funding required: $-$$

Strategy 3.3: Support programs that connect experienced technology entrepreneurs with scientists and researchers to develop commercialization pathways and new business formation.

- *Performance measures:* New business formation and commercial revenue.
- Funding required: $-$$

Strategy 3.4: Support programs that encourage the commercialization of technologies derived from federal research and development programs focused on small business, including the Small Business Innovative Research and Small Business Technology Transfer Research programs.

- *Performance measures:* Participating companies, grants obtained, sales from commercial technologies, job growth, risk capital funding success.
- Funding required: $-$$

Potential partners:

- Business support providers (e.g., Mason Enterprise Center, Genedge Alliance)
- Industry groups (e.g., Northern Virginia Technology Council)
- Private sector companies
- Area incubators and accelerators
- Locally-based Federally Funded Research and Development Centers (e.g., Rand Corporation, MITRE)
- Government operated federal labs.
- Research universities (e.g., George Mason University, Virginia Tech, George Washington University, University of Virginia)

- Bio-medical research campuses (e.g., Inova Center for Personalized Health, Janelia Research Campus)
- Federal research agencies (e.g., DARPA, NSF, USPTO)

Potential sources of matching funds:

- Local jurisdictions
- Industry groups and associations
- Commercial partners

Implementing the Plan

The Region 7 Council will undertake several activities to advance it efforts and achieve its goals. These activities will include:

- Ongoing outreach
- Continuation of marketing program
- Identify and implement proposal attraction initiative
- Encouraging partnerships
- Increasing administrative efficiencies
- Laying the groundwork for financial sustainability
- Setting procedures for effective evaluation
- Promoting successful investments
- Routinely revisiting and adapting the plan.

Introduction

The Virginia Initiative for Growth and Opportunity in Each Region (GO Virginia) is a public-private consortium dedicated to promoting economically sustainable growth in the Commonwealth.[4] This initiative promotes collaborative, regional initiatives to expand economic opportunity, grow and diversify the economy, and increase career readiness in high-wage industries. GO Virginia represents a unique initiative that targets state funding to leverage cross-jurisdictional and interregional cooperation on locally and regionally developed programs, while simultaneously recognizing the unique economic characteristics of Virginia regions.

GO Virginia's efforts are directed by the Virginia Growth and Opportunity Board, which includes many of the Commonwealth's top government and business leaders. The Board, with the support of the Virginia Department of Housing and Community Development (DCHD), developed the framework for regional councils to guide the planning and manage the recruitment and vetting of programs to be supported by GO Virginia funds. Each of the nine regional councils around Virginia includes business and community leaders, education institutions, economic and workforce development professionals, and elected officials who are guiding the development of Economic Growth and Diversification Plans that lay out how regional and interregional GO Virginia initiatives and projects will be implemented.

The Northern Virginia (Region 7) GO Virginia region includes Arlington County, Fairfax County, Loudoun County, Prince William County, and the independent cities of Alexandria, Fairfax City, Falls Church, Manassas, and Manassas Park (Figure 1). Northern Virginia is unique within the Commonwealth because it is part of a much larger, multistate region. The region accounts for about 40 percent of the Washington–Arlington–Alexandria, DC–VA–MD–WV Metropolitan Statistical Area population. As a result, interstate collaboration, often facilitated through organizations like the Metropolitan Washington Council of Governments (MWCOG), is required to address many of the region's pressing challenges in areas such as transportation, but also in areas such as workforce, housing, and land use.

Region 7 encompasses two workforce boards—The Alexandria/Arlington Regional Workforce Council that serves Arlington County and the City of Alexandria, and the Northern Virginia Workforce Development Board that serves the region's seven other jurisdictions. Northern Virginia Community College (NVCC)—the largest public educational institution in the Commonwealth of Virginia and the nation's second largest community college—serves the entire region. NVCC has over 75,000 students and six campuses[5] throughout Northern Virginia. The region is served by a single planning and development commission—The Northern Virginia Regional Commission. Each of the jurisdictions has its own economic development organization or office, and there are numerous chambers of commerce and organizations like the Northern Virginia Technology Council represent the region's extensive technology community.

[4] More information on the GO Virginia initiative can be found at www.govirginia.org

[5] Alexandria, Annandale, Loudoun, Manassas, Woodbridge, and the Medical Education Center in Springfield.

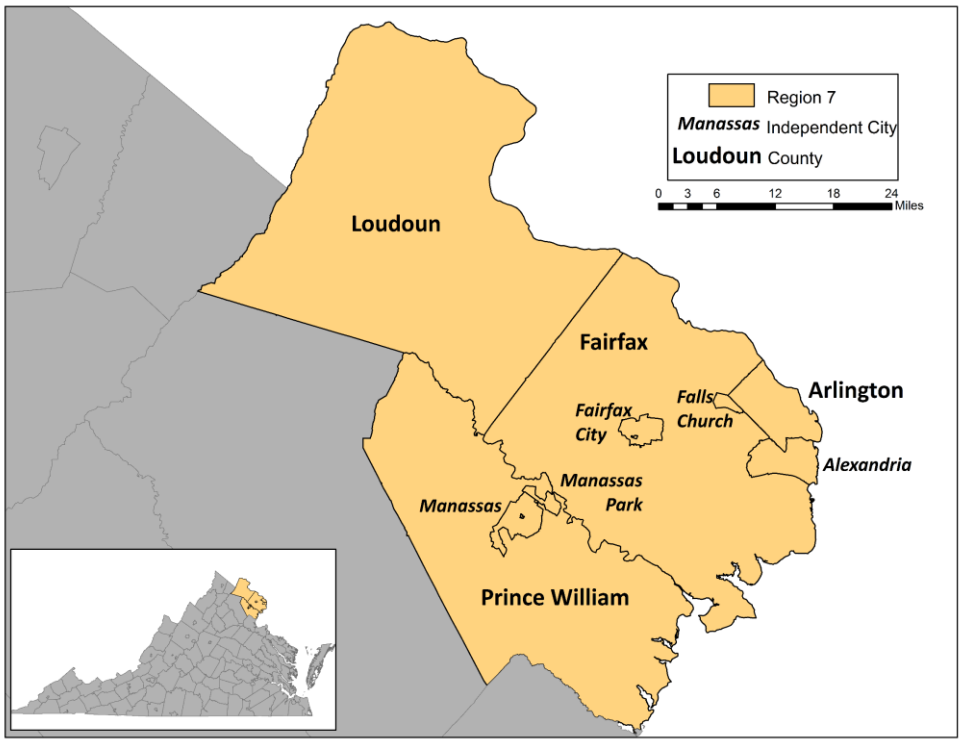
The Northern Virginia region plays an important role in supporting the work of the US federal government, and this shared dependence on the federal government leads to many shared economic challenges and opportunities. The federal government's role has been a source of opportunity and growth and our region has benefitted tremendously from this relationship, particularly during periods of macro-economic shock (e.g., post 9/11 or the 2008 mortgage market collapse). However, this close relationship has also inhibited the development of entrepreneurial businesses that are not involved in government contracting. This has occurred in two ways. The first is that the proximity to such a large customer has encouraged local entrepreneurs and businesses to bend their business models to suit the government – which results in large numbers of businesses that can manage the complexity of the Federal Acquisition Rules and operate in a labor-first business model. The second is that this overreliance on a labor-first business model creates businesses that deliver technology as the outcome of a consulting service, and not as a commercial product to be sold elsewhere.

While some services, such as those related to highly-resilient cyber security have spread to commercial applications and is boosting business growth and employment in this sector of the Region 7 economy, the lack of "product" firms creates a competitive imbalance that helps to explain why the region lags other parts of the United States and the world with technology and innovation resources. A comparison with Silicon Valley, Austin, New York, Tel Aviv, and Shenzhen show that many of the primary requirements for a rapidly-growing technology-led economy are present in Region 7. On average, product based firms attract more interest from early stage investors, which has spillover effects on the region's ability to grow and retain innovative small- and medium-sized enterprises. Commercial companies, compared to federal contractors, have the ability to better absorb non-traditional job candidates (those without 4-year degrees), which impacts Region 7's ability to attract talent to the region and at the same time limits job opportunities for underserved cohorts of Region 7 residents.

The GO Virginia program provides an opportunity for the region to address these challenges. The region's nine jurisdictions all share many common concerns about training the workers to support the region's critical technology industry. They also are all looking for ways to create a more dynamic regional economy that not only maintains its existing strengths, but also develops new strengths that are less reliant on federal contracting. The concerns are not entirely unique to Northern Virginia. For instance, regions such as the Hampton Roads and Fredericksburg area are also heavily influenced by federal and defense spending. The GO Virginia program provides an opportunity to work with those regions on efforts to train exiting military for in-demand cybersecurity jobs or help small and medium-sized enterprises grow and diversify their markets.

Given the scale of GO Virginia funding, the GO Northern Virginia Regional Council will focus its funding on projects that will help the region address three goals. First and foremost, the region will seek to strengthen the region's technology workforce. Second, it will look for opportunities to accelerate the development and expansion of technology product-focused "growth" companies. Finally, it will support innovative programs with the goal of expanding growth of commercial market focused technology companies, which includes work with newly formed firms and existing small- and medium-sized government contractors. The Region 7 Council, however, recognizes and will support any high impact

Figure 1: Map of GO Northern Virginia region (Region 7)



projects that contribute to the overarching GO Virginia goal of achieving private-sector driven job growth in high-wage sectors through interjurisdictional cooperation.

This plan—developed by the Center for Regional Analysis (CRA) at George Mason University, with the assistance of Amplifier Advisors, on behalf of the GO Northern Virginia Regional Council—describes the key economic challenges facing the region and articulates the region's priority goals that will guide efforts to alter the region's economic trajectory. This report is the culmination of a highly intense, but collaborative effort between the Council, CRA, and wide range of community stakeholders to draft Northern Virginia's Economic Growth and Diversification Plan for review and approval by the GO Virginia board. The restrictions imposed by the on-going COVID-19 impacted some elements of information gathering and consultation with regional stakeholders during this plan update. However, the updated plan reflects the lessons learned in implementing previous Growth and Development Plans and is representative of the strategies identified by regional economic development entities and business leaders.

The report begins by reviewing the broad economic and demographic trends shaping the Northern Virginia economy. It then provides a detailed analysis of the industry clusters that drive the region's economy and explores those clusters' key workforce needs—particularly as they relate to computer and technology workers. It then articulates the region's priority goals and identifies potential strategies for achieving these goals and the performance measures for determining their success. It concludes by describing some steps that the region will take to implement the plan. Two appendices identify the composition of the GO Northern Virginia Regional Council and provide a detailed description of the process used to develop the Northern Virginia's Economic Growth and Diversification Plan.

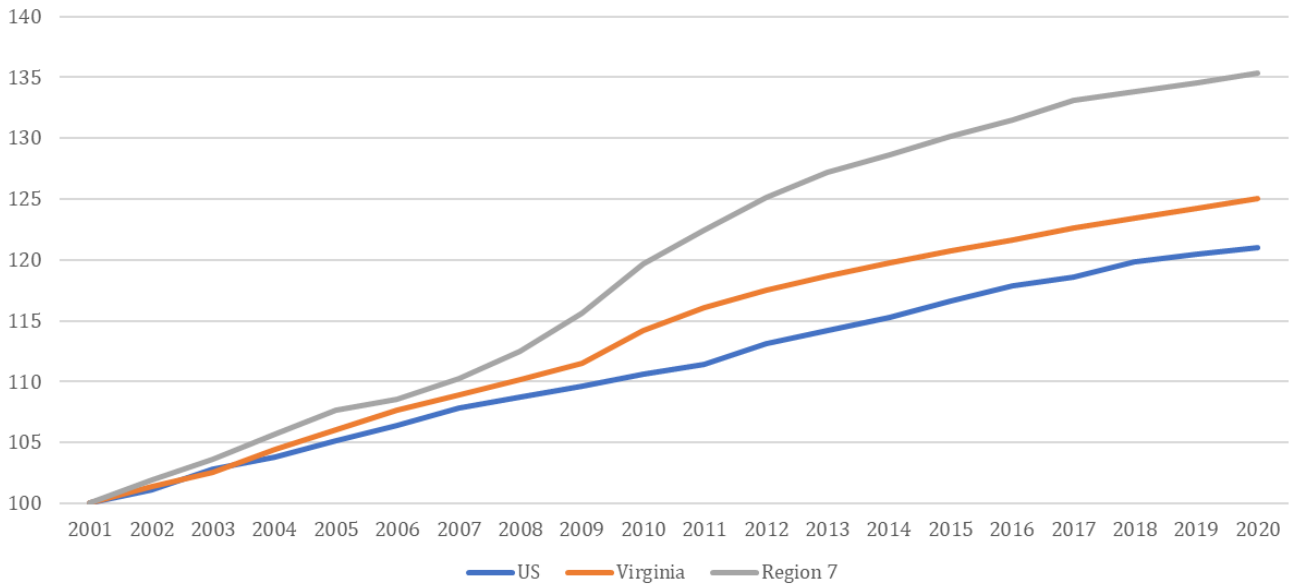
About the region

Northern Virginia is one of the Commonwealth's economic engines

The Northern Virginia regional economy drives much of the state's economy. In 2020, Northern Virginia's Gross Regional Product (GRP) was $229.3 billion, representing more than 40 percent of Virginia's overall economic output.[6] This is more than 57 percent greater than Virginia's next largest region (Hampton Roads). Region 7 is home to 2.54 million residents, or 30 percent of the Commonwealth's total population. Figure 2 shows that Northern Virginia's population growth has consistently exceeded that of either the Commonwealth or the nation over the past two decades; its population increased by 663,500 residents from 2001 to 2020, an increase of 35 percent. Between 2001 and 2010 the annual population growth rate in the region was 2.0 percent, but this slowed to 0.7 percent from 2010 through 2020.

Despite this slowing population growth, Northern Virginia is the state's fastest growing region and continues to grow faster than either the state (1.02 percent annually) or nation (0.84 percent annually). Within the region, Fairfax County is the region's largest jurisdiction, its 1.15 million residents account for approximately 45 percent of the region's total population. Loudoun County has been the fastest growing jurisdiction in the region, accounting for 35 percent of the population increase since 2001.

Figure 2: Index of Population Growth (2001 Population = 100)



Source: EMSI; U. S. Census Bureau, Population Estimates Program

[6] Estimated by Economic Modeling Specialists, Inc. (EMSI)

In addition to being the Commonwealth's largest region, Region 7 is also its wealthiest. In 2019, the region's per capita annual income was $82,964—a figure 39 percent higher than the state and 47 percent higher than the nation. As further evidence of the region's importance to Virginia, consider that without Northern Virginia, the state's per capita income drops nearly $10,000 from $52,052 to $42,641. Not surprisingly, multiple regional jurisdictions were among the nation's wealthiest. For instance, the per capita incomes in Arlington ($99,407) and Alexandria ($91,990) ranked 22nd and 32nd, respectively, out of more than 3,000 jurisdictions. Similarly, Fairfax County/Fairfax City/Falls Church ($86,141) ranked 42nd and Loudoun County ($80,914) ranked 64th.

Several other measures reflect the region's economic strength. For instance, in 2019 Region 7 had a poverty rate (5.9 percent) that was well below the state rate (9.9 percent). Prior to the onset of the COVID-19 pandemic, the region's unemployment rate stood at 2.2 percent, compared with 2.7 percent statewide and 3.2 percent nationally. The economic damage from the pandemic drove Region 7's unemployment rate up to 5.8 percent for 2020, which was still lower than the state average of 6.2 percent and the national rate of 8.1 percent.

Most individuals who live in Northern Virginia both live and work within its boundaries. Approximately seven of ten[7] Northern Virginia residents live and work in the region. Those that live in the region and are employed outside are mostly working in Washington DC (15.1 percent). About seven percent of residents commute elsewhere in Virginia for work, while just over six percent of Northern Virginia residents work in Maryland (largely in Montgomery and Prince George's counties).

Commuting patterns tend to move from west to east across the region. In Arlington and Alexandria, 32.6 percent of the residents work in the District of Columbia, compared to 15.3 percent in Fairfax County, Fairfax City, and Falls Church, and 6.9 percent in Loudoun and Prince William Counties. Approximately 22 percent of Fairfax County workers are drawn from Loudoun and Prince William counties. Just over half (55 percent) of those employed in Loudoun and Prince William Counties commute from outside those counties – primarily from Stafford County in Region 6 and Fauquier County in Region 9.

The region's commute times are among the longest in the nation. Average travel time from place of residence to employment is about 33.4 minutes,[8] ranging from 29.1 minutes in Falls Church to 40.0 minutes in Prince William County. By comparison, the Virginia State average commute time is about five minutes less at 28.7 and nationally commute times are about six minutes less at 27.6 minutes.

The region's high median income level and low poverty rate is enviable, yet also reflects the high cost of living in Northern Virginia. The high cost of living, and particularly high cost of housing, and longer commutes are especially challenging for the region's lower wage workers. These factors are also a challenge in attracting and retaining workers, who might find greater opportunities elsewhere.

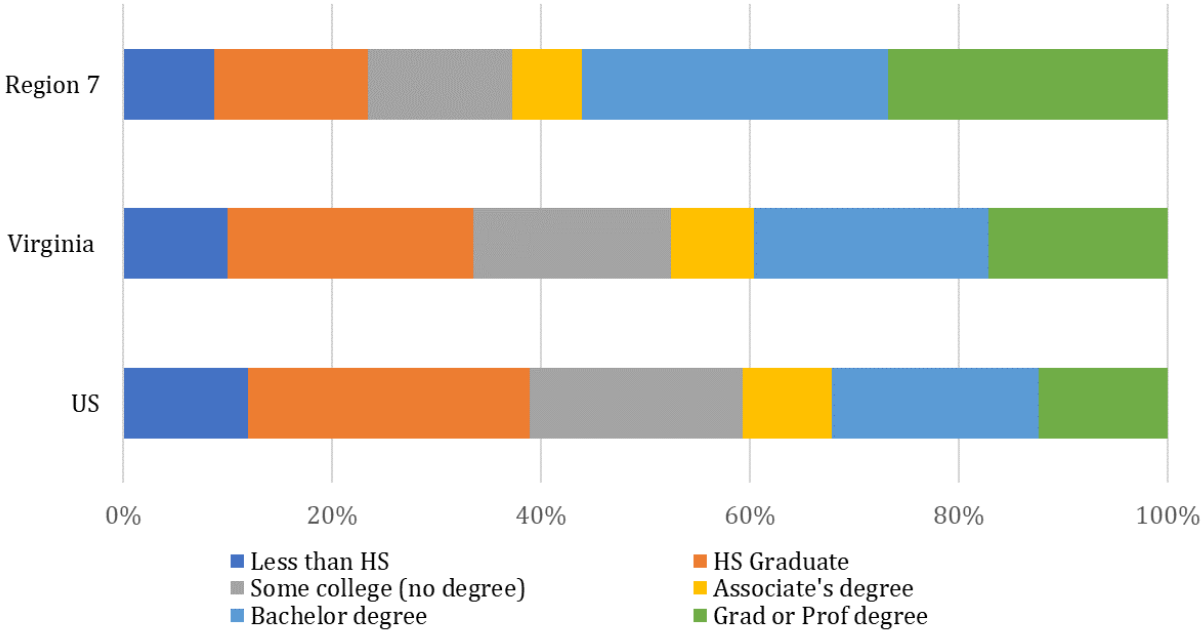
[7] Commuting patterns based on 2018 US Census Bureau, OnTheMap data

[8] US Census Bureau American Community Survey, 2015-2019 Five-Year Averages.

The region has assets to leverage in support of the region's economic development

The region's highly educated workforce contributes to its economic strength. Figure 3 shows that 56.0 percent of the region's working age population has a bachelor's degree or higher. This is a far higher level than the state (39.6 percent) and the US total (32.2 percent). The educational attainment levels within individual jurisdictions highlight the region's workforce advantage, as five of the region's jurisdictions are among the 10 most educated counties or independent cities in the nation, led by Falls Church (77.5 percent), Arlington (74.9 percent), Alexandria (65.9 percent), Fairfax (62.4 percent), and Loudoun (62.3 percent). The region's share of residents with Graduate or Professional Degrees is 26.7 percent, which is more than double the national share of 12.4 percent.

Figure 3: Educational Attainment of Population (2019)



Source: US Census Bureau, American Community Survey, 2015-2019 Averages

Many of these workers support the federal government either directly or with federal contracting firms. As part of the broader National Capital Region, Northern Virginia is home to large federal government facilities including the Pentagon, US Patent and Trade Office (USPTO), National Science Foundation (NSF), Defense Advanced Research Projects Agency (DARPA), Central Intelligence Agency (CIA), Quantico Marine Corps Base, and Fort Belvoir among others. About 80,000 individuals work directly for the federal government within the region, but the impact of the federal government goes far beyond direct employment. In 2020, the federal government supplied $48.8 billion of procurement spending in the

region.[9] This procurement spending supports the region's professional and business services sector, which makes up almost a quarter of the Northern Virginia job base.

The federal government also contributes greatly to the region's innovative capacity. The region is home to government agencies such as the Defense Advanced Research Projects Agency (DARPA), the Office of Naval Research (ONR), the Air Force Office of Scientific Research (AFOSR), and the National Science Foundation (NSF), which sponsor much of the nation's basic research. The region is also home to eight of the nation's 42 Federally Funded Research and Development Centers (FFRDCs) that undertake research and development on behalf of the federal government.[10] These federal agencies and institutions are important regional assets, but the region also has campuses of three R1 institutions in Virginia Tech, University of Virginia, and George Mason University. Over the past decade, the region has also benefitted from emerging bio-medical research centers such as Inova Center for Personalized Health in Fairfax (and its associated incubator—Inova Personalized Health Incubator) and the Janelia Research Campus in Loudoun County.

The region faces several growth challenges

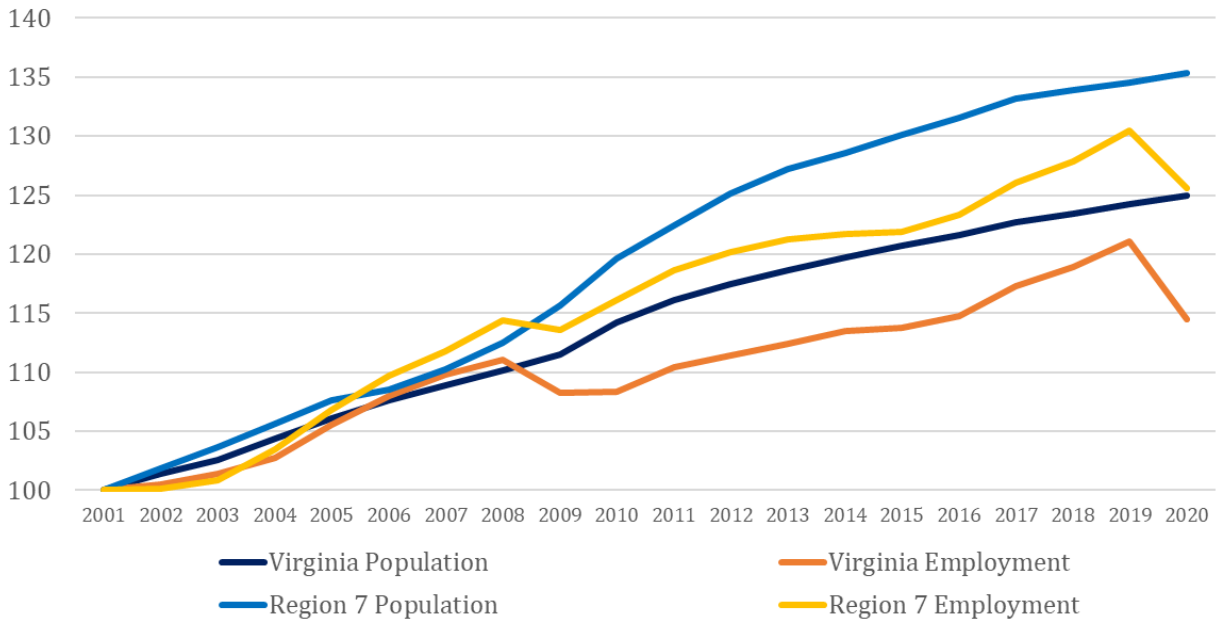
The region's heavy dependence on the federal government has been evident during the economic upheaval of the past 13 years. During the Great Recession from 2008 to 2010, the region's economy did not experience the shock that many other regions experienced; the region gained jobs over this two-period while the US lost more than six million jobs. However, during the ensuing recovery, Northern Virginia's growth stalled due to the impact of the federal budget cuts associated with Budget Control Act of 2011, which led to budget sequestration and a slower rate of job growth. The same insulating effect that the federal government provided during the Great Recession has again been evident during the COVID-19 pandemic, as the employment decline in Region 7 from 2019 to 2020 was just 3.7 percent, compared with 6.2 percent of Virginia and 5.4 percent for the entire US.

Figure 4 shows that, since 2008, Northern Virginia's population growth has outpaced its job growth—prior to 2008 employment and population growth had been tracking on similar trajectories. The COVID-19 pandemic further reinforced this trend, as population increased from 2019 to 2020 while employment declined significantly. Moreover, the jobs being created have been disproportionately in the delivery of personal services in businesses that serve customers in the region (in particular the federal government and businesses that benefit from proximity to Washington DC, such as hospitality).

[9] USASpending.gov, data extracted May 7, 2021

[10] https://www.nsf.gov/statistics/ffrdclist/

Figure 4: Index of Employment and Population Growth (2001=100)



This over-dependence on services sector jobs has four important limiting effects on economic growth. First, the economic multiplier effects of such labor-focused activity are limited since there is relatively little up-stream supply chain effects in the service sectors. [11] Secondly, service related jobs, generally, occur in businesses that have lower profit margins than product-related businesses, because a product business can sell the fruit of labor many times, and not just once. This means that all things being equal a service related business will grow more slowly than one that sells a product and generates less taxable profits or labor on a comparative basis. Lastly, product-based businesses tend to sell for higher multiples on earnings and profits when acquired, thereby creating more wealth for the employees through stock option participation (at least some of which is reflected in wage data) which also supports a cycle of funding for small businesses – successful entrepreneurs are often serial entrepreneurs and become investors in other small businesses.

Additionally, product-based businesses can sell their products more easily around the world. In effect, a product-based business is exporting the benefits of the labor applied by leveraging it through a physical product that can be sold. This allows businesses based in Region 7 that sell a product to generate income derived from sources outside of the region. Therefore, a greater focus on technology product companies will both increase wages (all things being equal) and result in a net increase in regional wealth.

[11] There are three notable exceptions to this "rule." Wireless telecom services; internet publishing, broadcasting, and web portals; and data processing and hosting service all deliver job multipliers of almost 4.0 or higher in the Commonwealth, meaning for every sector job, at least 3 other jobs are supported in the state economy according to the IMPLAN input-output model. All of these are important sectors in Region 7.

Not surprisingly, Region 7's over-representation in government employment impacts regional wage growth measures. According to data from Chmura Economics, between the end of 2016 and end of 2020, average wages in Region 7 grew at a slightly lower annual rate (3.7 percent) than did Virginia or the US (both 4.0 percent).

Even though wage growth has slowed, the region's per capita income ($82,964) remains much higher than the nation ($56,490) or the Commonwealth ($59,657). However, these relatively high incomes are somewhat offset by the region's high cost of living. According to the Cost of Living Index as reported by EMSI, the Index for Region 7 as of 2019 was 118.6, meaning that the overall cost of goods and services is 18.6 percent higher in the region than nationally. Much of this is driven by the relatively high cost of housing, which is almost 70 percent more expensive than the national average. The cost of living is particularly high in Arlington and Alexandria, each of which has an Index value around 140. Cost of living is less of an issue in outlying areas such as Prince William County, which has an Index value of 105.

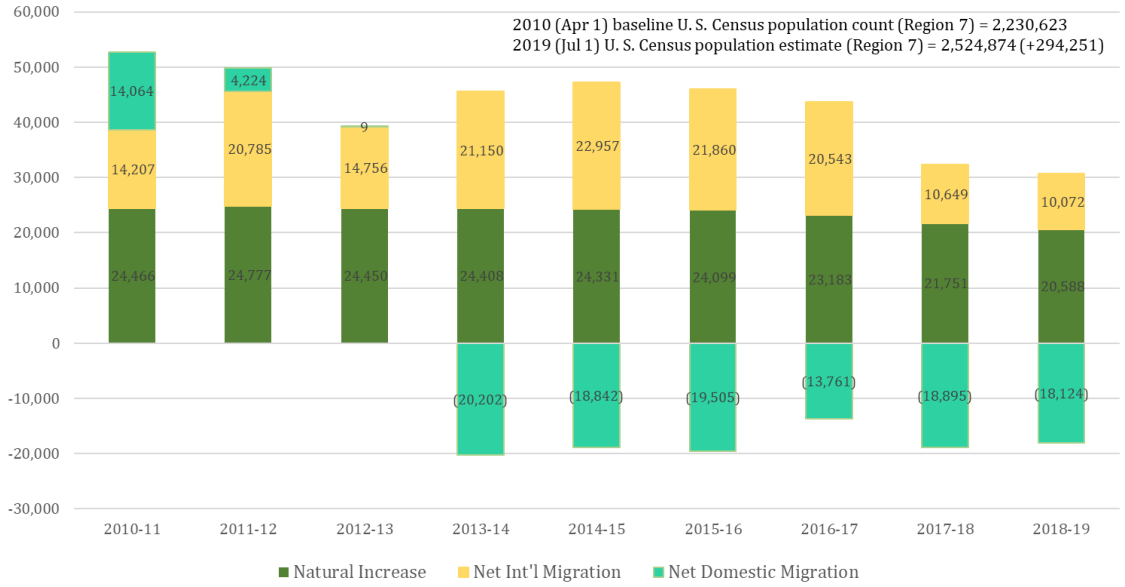
The slower wage growth and high cost of living contributes to the region's relatively high labor force participation rate, which stood at 70.6 percent in 2019, compared with 61.0 percent nationwide and 63.3 percent for Virginia. The COVID-19 pandemic had a dramatic effect on lowering labor force participation in the region, as it declined to 66.7 percent (-3.9 percent) in the region, while the national rate only declined to 59.5 percent (-1.5 percent). Still, the region's labor force participation rate remains well above national and state averages. This is attributable to both demographic and economic reasons. Demographically, the high proportion of prime working age residents and the high level of educational attainment (reflected in its earning capacity) both contribute to higher labor force participation. Economically, the region has relatively more economic opportunity and this too draws people into the workforce. However, many workers are drawn into the workforce out of necessity rather than opportunity. For many households, it is difficult to afford to live in Northern Virginia without multiple incomes.

Since 2013, even as the region's population has increased by 136,000, net domestic migration has been at negative 109,000 people. The region's population growth has been entirely driven by natural increase (+139,000) and net international migration (+107,000). These trends illustrate that Northern Virginia is becoming a less attractive place to live relative to other locations in the US. This presents a serious concern, as domestic in-migrants tend to be younger and more educated and add both vitality and skill to the region's labor force.

About 28 percent of out-of-state in-migrants are aged 25-34 and 44 percent of out-of-state in-migrants had at least a 4-year degree. These in-migrants are often attracted by relatively high paying jobs and amenities that are attractive to young professionals. However, the growing costs associated with having a family or purchasing a home (the average housing price in the Northern Virginia region was $601,186 as of April 2021) may lead mobile workers to look elsewhere. This is likely to become an even larger problem as the pandemic has made teleworking an accepted practice by many employers, allowing workers to retain their high-paying jobs in areas like Northern Virginia while living in lower-cost markets. This problem will be exacerbated if the region's real estate community does not reorient workspaces to accommodate remote employees. On the positive side, Northern Virginia continues to attract international in-migrants. International in-migrants are generally higher educated, as almost 41.4

percent of the Go Virginia Region 7 foreign born population 25 years and older in 2019 had least a bachelor's degree or higher, compared to 32.7 percent of the foreign born population 25 years and older in the across the nation.[12]

Figure 5: Annual Estimates of the Components of Region 7 Population Change



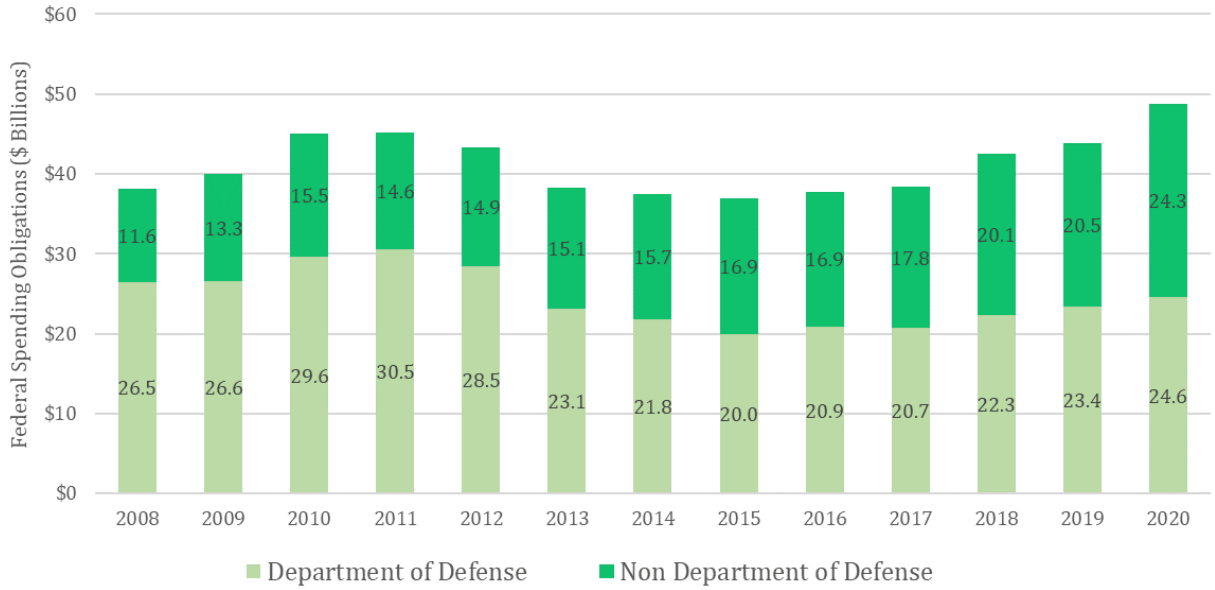
Source: US Census Bureau, Population Estimates Program

[12] It should be noted that long term trends show that comparatively high levels of domestic out-migration is a recurring theme for the Washington, DC Metropolitan Area, with the notable exception of when the US economy is in, or recovering from, a recession. Young people come to work on Capital Hill and then move on to other jobs in other regions as their careers develop.

Federal spending is foundational to the region's economy

Although Northern Virginia has worked hard to diversify and expand its economy over the past several decades, the federal government still drives much its economy. In fact, the federal government and the many contractors that support it represent the region's primary 'export' industries. Even though the work is performed locally for local customers, federally driven activities bring 'new' money from outside the region. Within Northern Virginia there are over 88,000 direct federal government jobs. This accounts for 47 percent of total Federal Government employment within the Commonwealth of Virginia.

Figure 6: Federal Spending Obligations in GO Virginia Region 7



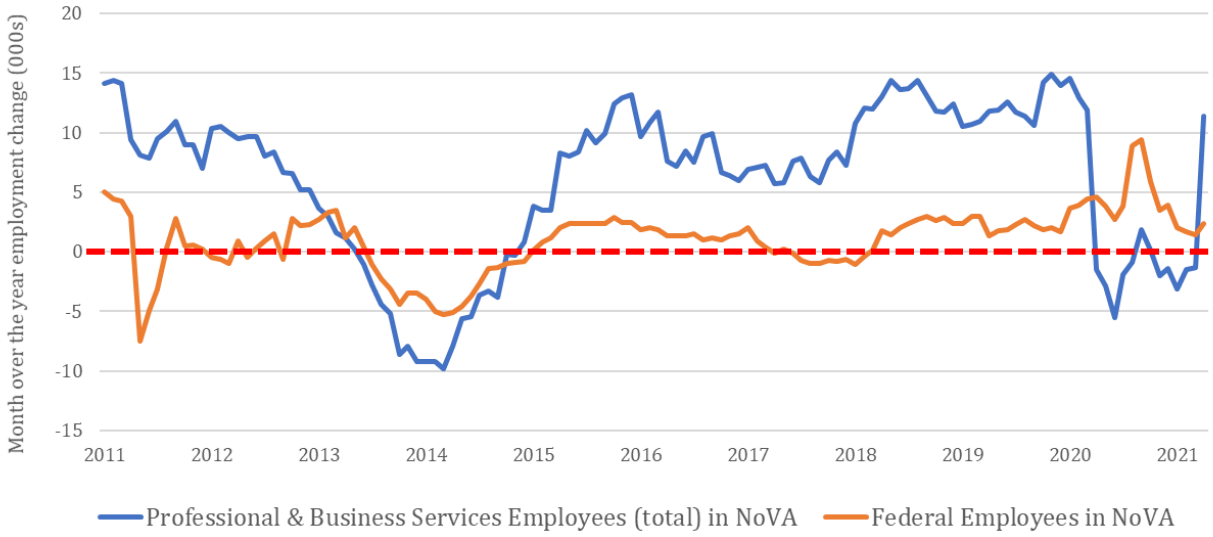
Source: USASpending, Data Vintage May 7, 2021

The impact of the federal government goes far beyond direct employment. The Professional and Business Services sector—the region's largest—employs approximately 427,000 workers throughout the region and federal contracting supports many of those jobs. The reliance on federal spending poses a unique regional challenge because federal spending decisions are largely outside of local control.

Figure 6 shows that in FY 2020 federal procurement spending in the region was $48.8 billion. Over the past 13 years federal spending has shifted away from Department of Defense (DOD) spending. In 2008, 70 percent of federal spending in the region was DOD-related; by 2020, the DOD share had decreased to 50 percent. From 2008 to 2020 the amount of non-DOD spending more than doubled, increasing by 109 percent, while DOD spending declined by 7.4 percent. From 2014 to 2019 the largest increases in non-DOD spending in the region by agency were: General Services Administration (+$1.6B), Department of State (+$1.1B), Department of Homeland Security (+$761M), and Veterans Administration (+$630M). From 2019 to 2020, the COVID-19 pandemic led to dramatic increases in spending for the Small Business Administration (+$1.1B) and Department of Health and Human Services (+$418M). These one-year bumps are likely to come back down as the impacts of the pandemic recede.

To place the impact of federal spending in the region in context, Northern Virginia receives 7.3 percent of total Federal procurement, and 5.8 percent of DOD procurement spending.[13] Within the broader Washington, DC metro area, Region 7 receives about half of the metro area's total federal contracting dollars; and more than 70 percent of its DOD procurement spending. The outsized role that the federal government plays in the region has important economic consequences. As noted above, the professional and business services sector is foundational to the region's economic base, and Figure 7 shows that the spending cuts associated with sequestration in 2013 and 2014 resulted in substantial year over year declines in professional and business services employment that tracked with direct federal employment. From 2015 through 2019, federal employment remained relatively flat, but the professional and business services sector showed strong increases. On the other side of the coin, the region's federal presence shores up its employment base during times of private-sector turmoil. While the COVID-19 pandemic causing private sector job losses through much of 2020, the region's federal employment base showed its strongest increases in the past decade.

Figure 7: Northern Virginia Month over the Year Federal and Professional & Business Services Employment



Source: Bureau of Labor Statistics, Current Employment Statistics

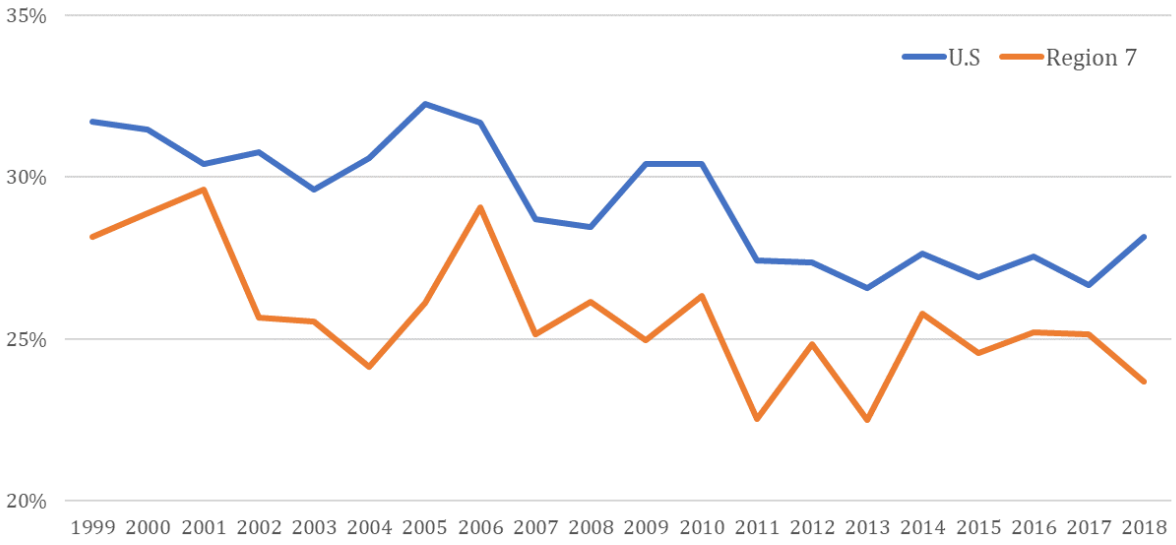
The professional and business services sector contains many of the region's technology workers, and these activities are also highly influenced by federal spending. Over one-third (36 percent) of 2020 federal procurement spending ($34.8 billion) in the DC metro area goes to computer-related industries. In fact, the Washington metro area receives 59 percent of all the federal contracting in computer systems design services, custom computer programming services, and other computer-related services.

[13] USASpending.gov, data extracted May 7, 2021

As a result, it is an important driver of the region's technology industries and supports many of its computer-related occupations.

Another challenge for the region is that while it has innovative assets to leverage, the Federal government drives the innovation economy more than venture capital. The Department of Defense is a large purchaser of technology in the region, but it is starting to look to regions such as Silicon Valley or Boston for their technology needs. There are several distinct innovation challenges facing the region. First, given that government services drive the region's technology firms, there is a lower tolerance for risk here than in other places. As a result, start-ups are less likely to contribute jobs than in other locations. Figure 8 shows that the percent of jobs created by young firms (5 years old or less) has consistently remained lower in Region 7 compared with national averages. The share of jobs created by young firms has declined both regionally and nationally. As of 2018, just 23.7 percent of jobs in the region were created by young firms compared with 28.1 percent of all jobs in the US.

Figure 8: Percent of Jobs Created by Young Firms (5 years old or less)



Source: US Census Bureau, Longitudinal Employer-Household Dynamics, Quarterly Workforce Indicators

Second, the region's challenges in retaining innovative and entrepreneurial companies through market maturity, originally identified by Amplifier Advisors in 2016,[14] remains with limited improvement. Recent upticks in the availability of VC funding may address this issue, but programs that support inward investment deserve prioritization.

[14] Aberman, J. (2016) "*Building Entrepreneurial Innovation in the Greater Washington Region*," Report to the 2030 Group

Economic and workforce analysis

Driven to a great degree by federal government contracting, Northern Virginia's professional and business services sector employs over 389,000 workers, and accounts for roughly 26.5 percent of the region's total employment. Figure 9 shows the largest industries within the professional and technical business services sector and provides greater detail about the types of activities included in this sector. Two of these industries—computer systems design and related services; and management, technical and scientific consulting services—are greatly affected by federal spending. Combined, these two industries represent about 182,000 jobs in the region, with *average* salaries exceeding $150,000. Moreover, these industries are highly concentrated in the region; computer systems design and related services is five times more concentrated in the region than it is nationally, and management, technical and scientific consulting services is more than four times more concentrated based on location quotients.

While this would appear to give the region a distinct competitive advantage in these industries, recent growth trends show that over the past five years these industries experienced very little growth. For instance, computer systems design and related services; and management, technology and scientific consulting services grew 1.9 percent and 2.5 percent, respectively, annually in the United States over the past five years, and within Region 7 these industries' employment also keep up with this growth. This is due to many of the factors discussed above including a strong dependence on federal procurement spending and an inability of regional firms in these sectors to sufficiently diversify into more commercial market opportunities.

Figure 9: Largest Industries in Northern Virginia's Professional & Business Services Sector

NAICS	Industry	2020 Employment	Avg. Annual Wages	Location Quotient	Annual % Emp Change (2015-2020)	
					Region 7	US Total
5415	Computer Systems Design and Related Services	119,542	$154,746	5.49	1.60%	1.92%
5416	Management, Scientific, and Tech. Consulting Services	62,207	$144,072	4.09	2.65%	2.51%
5617	Services to Buildings and Dwellings	30,123	$37,895	1.45	-1.43%	0.62%
5511	Management of Companies and Enterprises	29,508	$198,301	1.28	2.73%	0.82%
5413	Architectural, Engineering, and Related Services	28,466	$139,851	1.91	-0.02%	0.90%
5412	Accounting, Tax Prep., Bookkeeping, and Payroll Services	21,549	$123,604	2.13	1.89%	0.49%
5613	Employment Services	16,532	$69,147	0.52	3.63%	-0.99%
5417	Scientific Research and Development Services	15,756	$146,671	2.11	2.77%	1.79%
5616	Investigation and Security Services	15,677	$71,752	1.72	-0.07%	0.62%
5411	Legal Services	9,800	$126,754	0.87	-1.21%	0.21%

Source: EMSI

Despite regional challenges, these activities remain critical components of the region's economic base and their importance is widely recognized. Northern Virginia has a robust, relatively well funded, and

highly professional network of jurisdiction-based economic development agencies. These agencies represent their respective service areas in a very effective manner. However, unlike some Virginia regions, Northern Virginia does not have a single regional development organization to do regional marketing.

Figure 10: Industry targets identified by economic development organizations

	Arlington Co.	Alexandria City	Fairfax Co.	Prince Wm. Co.	Loudoun Co.
ICT & IT Services	X	X	X	X	X
Cyber Security	X	X	X	X	
Med-Tech			X	X	X
Ed-Tech			X		
Fin-Tech			X		
Data Analytics	X		X	X	
Data Centers					X
Federal Agencies & Contracting (incl. Aerospace)	X		X	X	X
Professional Services		X	X		
Corporate Headquarters	X	X	X		
Entrepreneurship		X		X	X
Transportation & Logistics				X	X
Life Sciences (incl. Trans. Medicine)			X	X	
Food & Agriculture					X
Light Manufacturing				X	
Media & Digital Content	X				
Prof. & Trade Associations	X	X			
Research & Development			X		

Source: Individual jurisdiction economic development offices

A review of local economic development strategies reveals (Figure 10) that there are some industries—IT services and cybersecurity—that are targeted by most or all major jurisdictions. Most jurisdictions also continue to prioritize federal government agencies and contractors, particularly those in the defense and aerospace sectors. There are differences between the closer-in and outlying jurisdictions, though. For example, Arlington, Alexandria, and Fairfax emphasize office-based jobs, while Loudoun and Prince William include several industrial-oriented targets. Each jurisdiction's targets are tied to their unique competitive advantages:

- Arlington County's targets are reflective of its close ties to Washington, DC, and include media & digital content, corporate headquarters, and professional and trade associations.
- Alexandria's focus includes professional and trade associations, as well as entrepreneurship and small business development.
- Fairfax County has a strong emphasis on the application of emerging technologies and the intersection of "Big Data" with fields such as translational medicine, artificial intelligence, Internet of Things, and wireless communications.
- Loudoun County continues to emphasize data centers and its transportation and logistics sector clustered around Dulles International Airport, but it also targets agriculture and agribusiness.
- Prince William County's targets include businesses that require manufacturing, warehousing, and R&D space, such as logistics & supply chain, light manufacturing, and biotechnology companies.

In addition to the targets set by the major jurisdictions, Region 7 also contains four smaller cities (Fairfax City, Falls Church, Manassas, and Manassas Park) and 14 town governments, including larger jurisdictions such as Leesburg (population of 53,000), Herndon (25,000), and Vienna (16,000). Several of these jurisdictions have their own unique targets for business development. These include:

- All the smaller cities (Fairfax, Falls Church, Manassas, Manassas Park) also target technology businesses, echoing efforts by their surrounding counties.
- Since many of the small cities and towns offer historic charm, most of them prioritize tourism and hospitality in their business development efforts; this is particularly the case for the Loudoun County towns (Leesburg, Middleburg, Purcellville, etc.)
- Several of the smaller jurisdictions are focused on arts and creative development, including Fairfax City, Herndon, Leesburg, and Dumfries.

Many of the region's key industry clusters serve the federal government

About the cluster analysis

To gain a better understanding of Northern Virginia's economic base, we have examined the region's key industry clusters. Industry clusters are groups of industries connected by some form of interdependence (often through their supply chain or labor requirements). The cluster analysis presented below is based on the US Cluster Mapping Project's [15] cluster definitions. The US Cluster Mapping Project research team developed cluster categories based on the interdependence of US industries.[16] As a result, this standardized set of cluster categories were developed to enable comparative analysis among US regions.[17]

The clusters analyzed here reflect many of the industries targeted by the region's economic developers and represent the most relevant 'traded' clusters in the Northern Virginia economy. These activities all bring new money into the regional economy and therefore drive economic growth. The cluster analysis here will help to answer several key questions, including: 1) is the cluster large and growing? 2) does the cluster provide good jobs? and 3) does the cluster provide the region with unique competitive advantage? Figure 11 shows the region's primary economic clusters. Each bubble reflects several factors:

- ***Average wages:*** Average wages (on the Y-axis) provide an indication of the quality of opportunities available in the industries that make up that cluster.

---

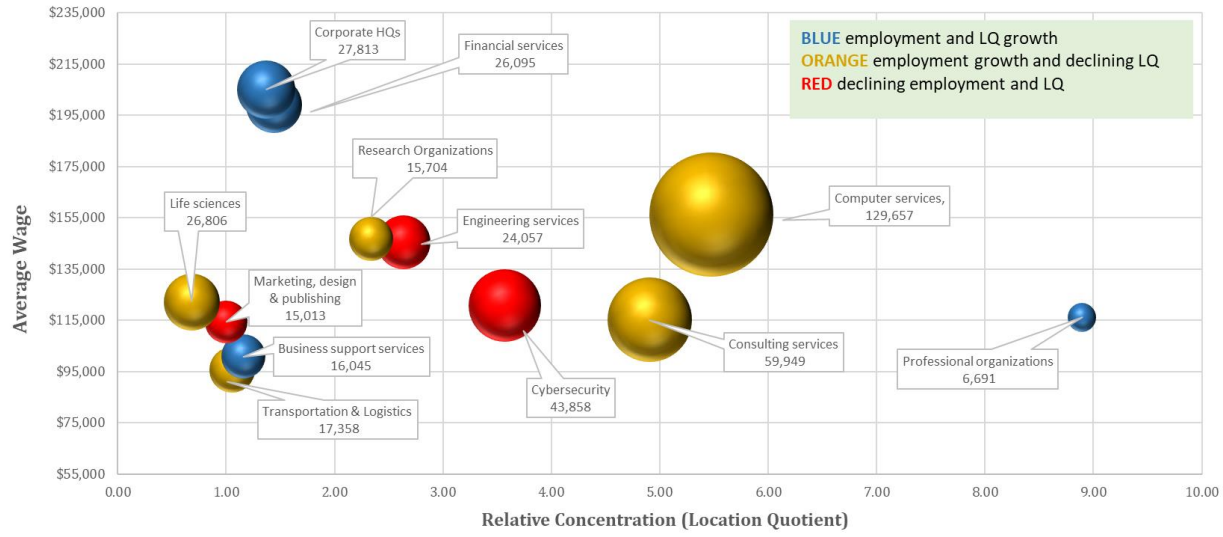
[15] The US Clusters Mapping Project is an initiative undertaken by Harvard Business School, MIT Sloan, and Temple Fox School of Business and funded by the US Economic Development Administration. http://www.clustermapping.us/about

[16] Specifically, the US Cluster Mapping Project considered co-location of industry employment and establishments, input-output linkages, and industries with similar occupational staffing patterns (http://www.clustermapping.us/content/cluster-mapping-methodology).

[17] In two instances—Cybersecurity and Life Sciences—the GMU Center for Regional Analysis developed unique cluster definitions, where the US Cluster Mapping's cluster classifications did not provide definitions representative of their activities in Northern Virginia.

- ***Relative concentration:*** We measure relative concentration (on the X-axis) using location quotients (LQ). LQs measure the relative percentage of the region's cluster employment, as compared with the cluster's national employment share. An LQ greater than 1.0 means that one might assume the region has more workers than are required to make the product or service to supply in-region demand. The excess employment would presumably be used to produce extra products or services for export from the region, thus indicating a potential regional advantage.
- ***Employment:*** The size of the bubble shows the number of jobs in those regional clusters. The employment numbers displayed here represent total employment, and as a result include both wage and salary jobs and self-employed individuals.
- ***Recent trends:*** The color of the bubbles reflects cluster trends over the past five years.[18] Green clusters experienced growth in both employment and relative concentration, thereby indicating that these clusters became more regionally competitive. The yellow-orange clusters experienced employment growth and declining relative concentration and thus are failing to keep pace with national trends. Red clusters lost both employment and relative concentration over the past five years.

Figure 11: Region 7's Industry Clusters (2015-2020)



Source: EMSI, Cluster definitions from U.S. Cluster Mapping Project

Key industry cluster trends

The region's three largest clusters—computer services, consulting services, and cybersecurity—are all heavily influenced by government contracting. Change in these clusters has been uneven over the past five years. Computer services and consulting services both posted reasonably strong job gains from 2015

[18] These data are provided by EMSI and represent the annual averages for 2015 and 2020.

to 2020, but their LQs declined in the region, indicating that these sectors grew at a slower pace locally than nationally. Cybersecurity suffered a slight net job loss from 2015 to 2020 (about 300 jobs); this is likely tied to the long-term decline in DOD contracting in the region.

The computer services cluster is the region's largest traded cluster with more than 129,000 jobs and among the highest paying, with an average wage of $156,000. Over the past five years, Northern Virginia's computer services cluster added more than 10,000 jobs, an annual growth rate of 1.6 percent. Over the same period, the overall computer service cluster in the US added 374,000 jobs, an annual growth rate of 3.0 percent. This disparity highlights the region's challenged competitive position relative to other IT centers around the country. The custom computer programming services industry is the largest industry within the cluster. With more than 81,000 jobs, this industry accounts for 33 percent of total cluster employment, and its growth trends have mirrored the computer services cluster broadly. Computer system design services and computer facilities management services are two industries in the computer services cluster that have grown faster locally (2.8 percent and 3.3 percent, respectively) than they have nationally (2.4 percent and 1.2 percent, respectively). That said, they make up only 3 percent of total cluster employment (6,710 jobs).

The consulting services cluster is another high paying cluster ($115,000 annual average wage) that is highly dependent on federal spending. The cluster now employs nearly 60,000 workers. Although this is up more than 6,000 jobs from 2015 and represents an annual growth rate of 2.3 percent, the region's LQ declined because the cluster grew by 3.1 percent annually during the same period. Much like the computer services cluster, this cluster remains highly concentrated in the region, but it is experiencing an erosion of its competitive advantage.

The region's cybersecurity cluster was defined differently than the other clusters because there is no defined cybersecurity industry in the Harvard project. As a result, we looked at this cluster through the lens of occupational data and considered employment trends in the five occupations most relevant to cybersecurity.[19] In most instances, growing cyber-related activities do not revolve around entirely new jobs being created, but rather workers in jobs related to, for instance, network administration to take on additional tasks and responsibilities. However, this is not always the case within Northern Virginia where the presence of the federal government and the national security complex means the region has cyber jobs dedicated specifically to cybersecurity. According to the US Bureau of Labor Statistics, the Washington, DC metro area has nearly twice as many information security analysts as any other metro area (New York has the next most). Even with the importance of cybersecurity to the region, trends in this cluster resemble those of the other federally dependent clusters above the Cybersecurity cluster lost 0.1 percent of its jobs in the region while the national cluster increased by 0.9 percent annually.

Four clusters—financial services, corporate HQs, business support services, and professional organizations—experienced growth in both employment and relative concentration. Among the key traded clusters identified in Figure 11, the professional organizations cluster was the smallest (6,700

[19] These occupations (and their Standard Occupational Classification (SOC) Codes) include: Computer Systems Analysts (15-1121), Information Security Analysts (15-1122), Database Administrators (15-1141), Network and Computer Systems Administrators (15-1142), and Computer Network Architects (15-1143).

jobs), but most highly concentrated (LQ of 8.89). This reflects the locational advantages for advocacy organizations to be in the National Capital Region. The corporate HQ and financial services clusters have not only shown strong growth, but they are also far and away the highest paying clusters in the region, as each has average wages in excess of $198,000.

In addition to Cybersecurity, two other clusters in the region lost jobs between 2015 and 2020, though they are among the smallest clusters. Marketing, design, and publishing lost about 1,000 jobs over this period and its LQ declined from 1.11 to 1.00, meaning that this cluster is now equally concentrated in Northern Virginia as it is nationally. Engineering services lost about 250 jobs, but remains highly concentrated in the region, with an LQ of 2.64. Among the key clusters, the only one that has an LQ below 1.00 is Life Sciences, which did add more than 1,000 jobs from 2015 to 2020, but still saw its LQ decline from 0.70 to 0.68.

Computer-related occupations are crucial across the region's key clusters

In addition to a heavy dependence on the federal government, one of the other commonalities among the clusters described above is the need for significant numbers of capable technology workers. As noted above, business leaders and workforce leaders all note that there are many more IT and technology-related jobs available in the region than qualified candidates, and this lack of technology workers significantly impedes the ability for technology firms to grow and expand. The region's pressing need for additional IT talent is highlighted in the workforce analyses commissioned by NVCC and both of the region's workforce boards.[20]

An analysis of each cluster's staffing patterns shows that computer-related occupations[21] account for significant shares of the industry clusters identified above. Naturally, computer-related occupations are most prominent within the computer services clusters, where they account for 58.6 percent of all jobs. However, they also represent critical components of other key regional clusters such as research organizations (15.8 percent), corporate headquarters (14.4 percent), engineering services (10.7 percent), and consulting services (11.9 percent). For each of these industries, the percentage of employment in computer related occupations increased over the past two years.

While not a traditional IT center like Silicon Valley or Research Triangle, Northern Virginia remains a significant IT center. This is perhaps best illustrated by the high relative concentration of the region's largest computer-related occupations. Figure 12 shows that nearly all the region's largest computer-related occupations are more than twice as concentrated in the region's workforce as they are in the national workforce. Most notably, information security analysts are more than eight times more concentrated in the region than nationally. This reflects the importance, and relative competitiveness, of the region's cybersecurity industry, which offers services to government and commercial sectors.

---

[20] E.g. White, M. "Assessing Alexandria/Arlington's Regional Labor Market", George Mason University Center for Regional Analysis, prepared for the Alexandria/Arlington Regional Workforce Council.; Northern Virginia Workforce Development Board (Area #11) Local Plan, and NVTC Greater Washington *Technology Workforce Needs Assessment*.

[21] Specifically, all occupations that fall within SOC 15-1000.

Figure 12: Computer Occupations in Northern Virginia

Position Title	2020 Jobs	2020 LQ	Median Earnings 2020	Job CAGR 2015-2020	Projected Job CAGR 2015-2020	2020 Position Openings
Software Developers/QA Analysts & Testers	50,329	3.83	$119,632	5.8%	1.8%	4,281
Computer Systems Analysts	12,406	2.40	$116,953	-4.4%	1.0%	995
Information Security Analysts	10,872	8.52	$120,789	7.0%	2.6%	1,063
Network and Computer Systems Admins	10,699	3.48	$97,039	-0.6%	0.4%	711
Computer User Support Specialists	9,817	1.68	$64,532	1.6%	1.6%	886
Computer Occupations, All Other	8,745	2.53	$121,861	1.8%	0.6%	689
Computer Network Architects	5,127	3.59	$142,642	-1.6%	0.4%	327
Database Administrators and Architects	4,336	3.63	$119,872	8.2%	0.8%	328
Computer Network Support Specialists	3,996	2.39	$78,585	0.4%	0.6%	303
Computer Programmers	3,634	2.30	$108,862	-3.8%	-0.6%	240
Web Developers & Digital Interface Designers	3,029	2.14	$90,021	9.0%	1.2%	255
Computer & Information Research Scientists	2,108	7.35	$153,091	11.6%	0.8%	180

Source: EMSI

Growth projections by occupation from EMSI suggests that, excepting computer programmers, computer occupations will continue to add jobs over the next few years, albeit at a relatively slow rate for most occupational groups. Most of the occupations shown in Figure 12 are expected to grow at a rate of less than 1.0 percent annually, and the only group projected to grow at an annual rate of at least 2.0 percent is information security analysts, which would further reinforce the region's high concentration of workers in this category.

As Figure 13 illustrates, Region 7 has been competitive among major metro areas in the US in terms of adding jobs in computer-related occupations over the past five years. Growth in these occupations in Region 7 has also outpaced the rate of growth for the entire Washington MSA. It should be noted that these growth figures are only through 2019 and do not account for the impacts of the COVID-19 pandemic in 2020. They also do not reflect the expected impacts of Amazon HQ2 in Arlington that is likely to boost hiring for several computer-related occupations in the next few years.

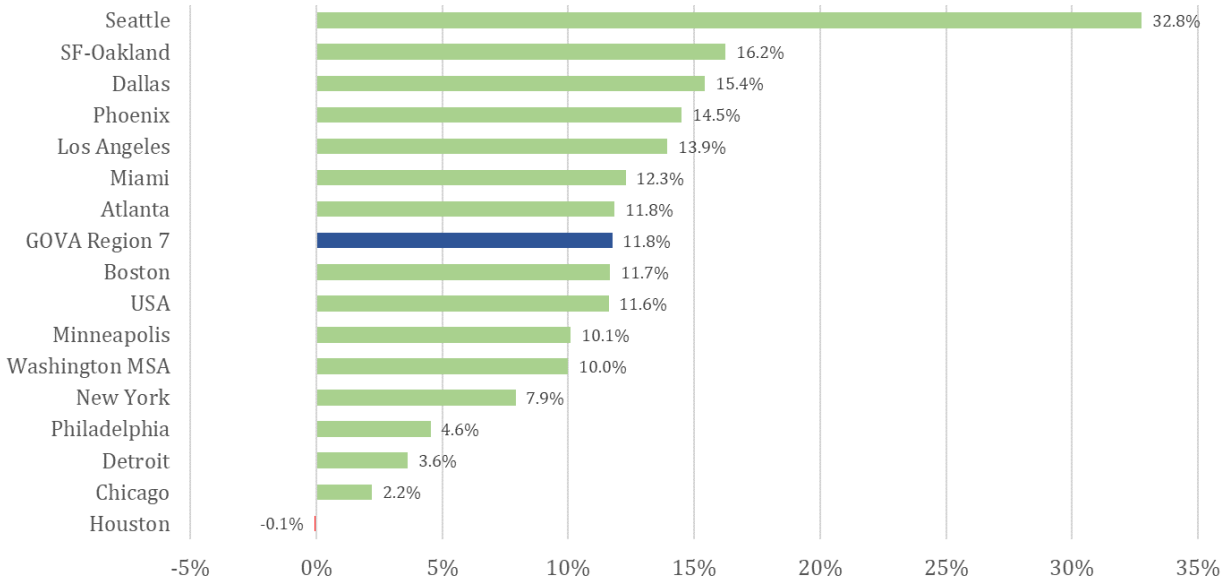
These projections often provide a longer-term gauge of demand, whereas job posting data shows that there is a more immediate and significant demand for jobs like information security analysts (4,402 jobs), applications software developers (2,803 jobs), and computer user support specialists (1,486 jobs).[22,23] Similarly, a review of job posting data from Burning Glass Technologies reveals the magnitude of the need for computer related workers in the region. As of March 2020, the last month reported

[22] These job data were posted for May 9 to June 8, 2021

[23] The job posting data presented here were accessed through Chmura Economics JobsEQ online data tool. Where these real-time LMI systems like Help Wanted Online or Burning Glass are powerful tools for analyzing current labor demand, they come with several important caveats. For instance, not all online job advertisements lead to actual jobs or hiring, as in some case employers may just be looking to build a pool of potential applicants. Additionally, not all job openings are posted online. Larger employers and positions that require greater levels of education tend to advertise job openings online than small employers seeking lower-skilled workers. As a result, a large IT contractor is more likely to advertise its jobs online than a small lawn care company, or for that matter a small IT company. For more information about the strengths and weaknesses of Real-Time LMI and several of the main vendors, please see: http://www.jff.org/publications/real-time-labor-market-information-environmental-scan-vendors-and-workforce-development

before the effects of the COVID-19 pandemic began to take hold, there were 26,376 postings for jobs in Computer and Mathematical occupations in the Washington MSA. This represented 26 percent of all postings in the region and was twice as many posting as for any other occupational category.[24]

Figure 13: Growth in computer-related occupations (2015-2019)



Source: Bureau of Labor Statistics; EMSI

Not only are these jobs critical to many of the region's priority clusters, but they also make important contributions to the region's overall well-being because most of these occupations tend to pay wages well above the regional average. Eight of the region's twelve largest computer-related occupations pay average wages more than $100,000 per year. Even the one occupation that pays the lowest wages—computer user support specialists, which has an average wage of $64,500—should not be dismissed. It is an important 'middle skill' job that often provides an entry point for workers without a 4-year college degree to launch careers in information technology.[25]

The region is facing a shortage of technology workers

Over the past several years a consensus has emerged among businesses, economic development officials, and other stakeholders that Northern Virginia has an insufficient number of technology workers. As noted above, sectors that have the greatest needs for tech workers have been growing at a slower rate in the region than nationally, and the region has been experiencing an outflow of domestic migrants for several years running. The region is in a national, and even international, competition for talent and is finding it increasingly difficult to compete for talent with other metro areas that can provide similar employment opportunities paired with a lower cost of living, more affordable housing,

[24] Data from Burning Glass Technologies COVID-19 Open Data Initiative: https://www.burning-glass.com/research/open-data-job-postings/

[25] Harpel, E. and White, M. (2017) "Career pathways for middle-skill jobs in the Greater Washington region's leading industry clusters" prepared for The 2030 Group. Available at: http://cra.gmu.edu/regional-workforce-research/

easier commutes, and related lifestyle advantages. This disadvantage is likely to be exacerbated by the impacts of the shift to remote work that was accelerated by the COVID-19 pandemic in 2020.

In 2016, the Northern Virginia Technology Council commissioned a *Technology Workforce Needs Assessment* for the Greater Washington area.[26] This study found that employers faced five specific hard-to-fill competency areas:

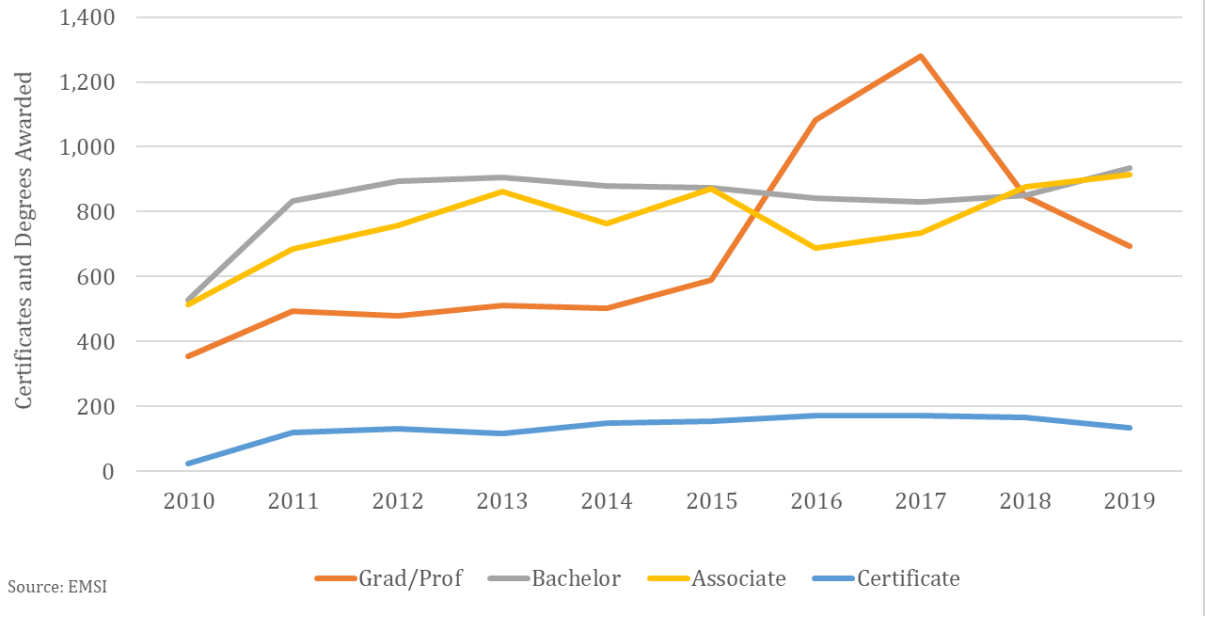
- Big data and analytics,
- Cyber security and privacy,
- Data center and cloud infrastructure,
- Network systems, and
- Programming and software development.

As part of this study, employers also noted that soft skills (e.g., written and verbal communication, problem solving and critical thinking, and relationship management) are also vital considerations. Employers also noted, depending on the nature of the work, the need for U.S. citizenship, security clearances, and 4-year degrees to meet the requirements of federal agencies. Security clearances were particularly important for network systems work.

Figure 14 shows that degree completions in computer and information sciences fields from the region's post-secondary institutions have declined in recent years after experiencing an uptick in the wake of the Great Recession. From 2010 to 2017, the number of degree completions more than doubled, increasing from 1,422 to 3,019. This increase was led by graduate & professional degree completions, which increased from just 354 in 2010 to 1,280 in 2017. However, completions declined to 2,676 in 2019, with a particularly severe drop in the number of graduate and professional degrees awarded. The number of Associate's degrees has steadily increased over the past decade, but the number of graduates from certificate programs remains very low. This suggests an opportunity for more specialized training for entry-level occupations in these fields.

[26] http://www.nvtc.org/documents/NeedsAssessment.pdf

Figure 14: Completions from Computer & Information Science Programs



Source: EMSI

Figure 15 shows that 44 percent of the degrees completed in the region were for Information Technology. Other programs with significant numbers of completions included Computer & Information Sciences (General), Computer Science, and Computer and Information Systems Security/Assurance. Institutions such as George Mason University and Northern Virginia Community College were responsible for many of these graduates, as Bachelor's and Associate's degrees each accounted for about 35 percent of the total number of degrees. These graduates are important for Northern Virginia, but also for the Commonwealth more broadly. Around 45 percent of Virginia's graduate or professional degrees in computer and information sciences were completed in Northern Virginia, as were 35 percent of its computer and information sciences Associate's and Bachelor's degrees.

Figure 15: Completions from Computer and Information Science Programs in Region 7, 2018-2019

CIP Code	Program Title	Certificate	Associate's Degree	Bachelor's Degree	Graduate or Professional Degree	Total Awards
11.0101	Computer and Information Sciences, General	66	57	237	95	455
11.0103	Information Technology	13	354	597	206	1,170
11.0401	Informatics	24	0	66	104	194
11.0501	Computer Systems Analysis/Analyst	0	0	3	0	3
11.0701	Computer Science	0	268	27	15	310
11.0801	Web Page, Digital/Multimedia & Info Resources Design	23	1	2	0	26
11.0802	Data Modeling/Warehousing & Database Admin	0	0	0	152	152
11.0901	Computer Systems Neworking & Telecom	4	2	2	37	45
11.1003	Computer and Information Systems Security/Assurance	3	206	0	85	294
11.1006	Computer Support Specialist	0	27	0	0	27
	Total	**133**	**915**	**934**	**694**	**2,676**

Source: EMSI

Increasing the number of degree completers is a necessary step in addressing the region's shortage of technology workers, but this will not sufficiently address the immediate challenge facing the region. Many employers and key stakeholders acknowledge that workers do not necessarily need degrees to do their jobs, but they do need specific skills (e.g., competency in specific programming languages or applications). Industry recognized credentials are one way in which workers can demonstrate to employers that they possess these skills, and they do not need to spend four (or even two) years to obtain these skills.

While the region will continue to attract talent, the growing importance of industry-recognized skills presents opportunities for native Northern Virginia workers—workers who already accept high housing costs and transportation challenges in exchange for superior cultural amenities and being a part of the national capital region. Short or boot-camp style courses can provide opportunities for new workers—or workers looking to shift careers—to obtain the skills relatively quickly they need to work in the region's technology clusters. There are numerous programs already underway in the region to do just that. For instance, the region's workforce investment boards can help to subsidize the cost of training for dislocated workers. Workforce funding can also be used to subsidize the initial salary of retrained workers, thereby reducing some of the risk perceived by companies who hire workers from these less than traditional labor pools.

Based on the findings of the research team's Enhanced Capacity Building grant project, Reskilling Leisure, Hospitality, and Retail Workers for Technology Jobs, we now know that workforce readiness, beyond technical skills, is a key concern Region 7 technology employers. Results of a pilot program, Tech Set by Marymount University, will inform Region 7 leadership on strategies and programs for enhancing workplace readiness among students that will enhance employee success and employer performance.

Priority Goals

Based on the information briefly described above, input from regional stakeholders, and a highly collaborative and deliberative process, the Region 7 Council identified seven strategic priority industry clusters for the Economic Growth and Diversification Plan. Each of these clusters is represented in each of the three technology communities described above.

The Key Industry Clusters that will serve as a focus of the Region 7 Economic Growth and Diversification Plan implementation include:

- Computer software (including data sciences, artificial intelligence, and autonomy)
- Cybersecurity (including services and products)
- Consulting Services
- Financial Services
- Engineering Services
- Research Organizations
- Emerging technologies (nano technology, material sciences, and quantum computing)
- Healthcare (including healthcare services, medical devices, genomics, proteomics, and other life sciences)

Among these industries, Region 7 will show particular interest in projects focused on:

- Cross-sectoral innovation that creates unique products, or integrates participants within or across existing technology business clusters
- Emerging technology innovations (product and process)
- Advanced computer software
- Talent preparation and matching with employer demands, particularly in technology employment.
- Support for established technology-based commercial businesses with high growth potential.
- Enhancing the quality of support for entrepreneurial education and networking post COVID pandemic to promote the formation of new technology based commercial businesses with high growth potential.
- Leveraging federal and state research and commercialization funding to create and expand commercially-focused businesses with special interest in activities related to:
    - Autonomous transportation,
    - Nano-scale technologies,
    - Advanced materials.

Maintaining and enhancing Region 7's competitive position for attracting growth and investment in these key regional sectors will require collaborative action and innovative approaches to meeting long run challenges and responding to labor market and business operating disruptions related to the COVID-19 pandemic. The persistent challenges of skilled labor availability, taking advantage of existing regional competitive assets, and supporting creative solutions to market weaknesses drives the selection of priority goals and project selection for the Region 7 Council including:

1. Strengthening Northern Virginia's technology workforce through talent development and workforce attraction,
2. Accelerating the development of high growth potential technology product companies,
3. Enhancing the regional innovation eco-system through industry change and management enhancement, technology transfer and intellectual property commercialization, and enhancing funding opportunities in the entrepreneurial sector,
4. Address issues throughout the Region 7 economy and across all priority goals to expand high value opportunities that enhance economic equity and opportunity.
5. Identify and, where possible, attract project proposals that address key challenges in the Region 7 economic development and innovation eco-systems, including industries that support targeted sectors.

These consensus goals will inform the regional council's decision-making process, but the council will also consider any high impact project that contributes to the overarching GO Virginia goal of achieving private-sector driven job growth in high-wage sectors through interjurisdictional cooperation. Given the changing dynamics of work location (work from home), especially if hybrid work plans dominate workplace agreements, the council will welcome project proposals that consider workforce issues in neighboring GO-Virginia regions that contribute economic benefits to the Region 7 economy.

The descriptions below identify the types of strategies the regional council will consider, prospective performance measures, and potential partners and sources of match funding. The Region 7 Council identified a strong preference for high-impact projects, meaning that there will likely be few total projects, but that each successful applicant will receive substantial support. However, the plan does allow for meaningful smaller projects that may represent pilot efforts for innovative programs that can be tested with less initial funding and supported more fully after proof-of-concept. Therefore, we have provided a scale to indicate the expected budget required to complete each strategy.

- **$**=Projects requiring less than $100,000 of GO Virginia funding
- **$$**=Projects requiring between $100,000 and $500,000 of GO Virginia funding
- **$$$**=Projects requiring more than $500,000 of GO Virginia funding

It will be the responsibility of the proposers to describe the specific project elements and how their proposed initiatives will benefit multiple jurisdictions in Northern Virginia, or multiple jurisdictions throughout the Commonwealth. They will also be required to identify and describe how they will track outcome and output measures, and gain commitments from key partners. In some instances, the proposed projects will involve scaling up current, ongoing initiatives so that they can sustainably serve more participants or more jurisdictions over time. In these instances, proposals will benefit by being able to demonstrate and quantify the impacts of their existing efforts.

The projects that are ultimately funded will be determined by the quality of the proposals and the extent to which they align with the regional priorities. The next section lays out the Council's goals and will guide project funding decisions.

SPECIAL FUNDING OPPORTUNITIES: The Region 7 Council will undertake a review of ARPA (American Rescue Plan) programs for potential sources of matching funds supporting project applications and strategic initiatives across G&D Plan goals. While these funds are temporary, many of the programs supported by ARPA can last through 2027, which makes this a viable source of funding to support GO-Virginia projects and initiatives.

SPECIAL PROGRAM EMPHASIS: The Region 7 Council will engage in planning and activities designed to particularly encourage project proposals that include or emphasize programs that will enhance equity of opportunity for historically underrepresented communities.

Goal #1: Strengthen Northern Virginia's Technology Workforce

To achieve its growth potential Region 7 must have an abundant quantity of labor at all levels of skill attainment to support the technology industry. Each of the three technology communities in Region 7 has specific needs. However, there are also commonalities. For example, while a government contractor may require an employee to be able to achieve security clearances, and a commercial technology product company may not, both have an agreed need for employees who have work readiness skills (for example, the ability to write a concise and clear email). Identifying these commonalities will be essential for any program to achieve scale and sustainability.

As the corporate world moves away from a uniform approach to face-to-face work, and adopts more flexible employment models, the real estate community and regional governments face an

unpredictable environment. Traditional models of building utilization and tax strategies are under stress and will continue to be challenged. Real estate market experts such as Avison Young are observing a dramatic change in how landlords and businesses are utilizing real estate. Coworking facilities for startup entrepreneurs are becoming less important than flexible spaces for existing businesses, as individuals work from home or start businesses through zoom. Mixed use neighborhoods and buildings are growing importance, since "where you work" is becoming less important than "where you live." GO-Virginia Region 7 should be aware of these changes and formulating talent development and attraction efforts with recognition of these trends and, where possible, support and facilitate coordination of effort across targeted industries and the related real property sector.

The continued emergence of labor substituting technologies (artificial intelligence, autonomy, and robotics) raises the bar on the skills required for higher value added employment. Modern labor must be able to use these emerging technologies in creative ways, to avoid being substituted. In many ways the emergence and growing ubiquity of these new labor substituting technologies is analogous to the first industrialization waive caused by the adoption of steam power. In that case human and animal labor was substituted by steam power, and human labor adapted to value added activities that used steam power. A similar transition is occurring today. Regions in the United States and the world that create individuals who can utilize labor saving technologies in innovative ways will have a higher concentration of higher value jobs, and more vibrant business ecosystems. The Region 7 council explicitly acknowledges the importance of and support for programs engaged in preparing incumbent workers for new career paths in preparation for the eventual adoption of labor substitution technologies among regional employers.

Region 7 must produce the technology workers, both in terms of quality and quantity, needed to grow and enhance the competitiveness of its regional technology firms, attract existing businesses from other regions and start new ones. Without a vibrant and talented technology workforce, Region 7 will not achieve its growth potential.

Challenge: The number of workers entering technology-related occupations is insufficient to meet regional demand.

- Efforts should include preparing workers who are just entering the labor force and those switching careers—to choose technology-related careers. This will include programs addressing hard skills and soft skills appropriate for the region's targeted industries.
- Look to leverage existing non-degree training and certification programs, expanding apprenticeship and internship opportunities, and programs supporting exiting military, where possible.
- Include incumbent worker training opportunities that are relevant, accessible, and affordable.
- Support program efforts to retain workers in the region choosing remote work.

Work with commercial real estate community to ensure that blend of available workspaces matches to the requirements of both local employers and regional talent.

- Work with the Economic Development Alliance to coordinate and support potential projects aimed at attracting new workers to the region to help meet industry labor needs.

Strategies and Expected Outcomes

Strategy 1.1: Strengthen and expand non-degree programs (e.g., certifications and credentials) that allow workers to enter and advance in technology careers.

- *Performance measures:* Certifications and credentials granted
- Funding required: $-$$$

Strategy 1.2: Establish and expand internships, apprenticeships and other work-based learning opportunities that prepare workers and provide them with experience in technology careers.

- *Performance measures:* Program placements, completions, placements in permanent full-time positions
- Funding required: $-$$$

Strategy 1.3: Strengthen and expand programs that prepare veterans and other underserved community candidates with soft and hard skill development and related certifications necessary to enter technology careers.

- *Performance measures:* Program placements, completions, placements in permanent full-time positions
- Funding required: $-$$

Strategy 1.4: Identify and develop programs recognizing career pathways that can guide current and future technology workers through an articulated series of educational programs (including credit and non-credit programs from both public and private training providers) that will allow them to advance their careers from entry-level to middle-skill positions and on through to more leadership positions. Supported programs in this strategy will have clearly distinct offerings from currently available programming.

- *Performance measures:* Program participants, cluster employment, cluster average wages.
- Funding required: $-$$

Strategy 1.5: Strengthen and expand technology-oriented incumbent worker training programs that keep the workforce of small- and medium-sized firms (SMEs) current and competitive.

- *Performance measures:* Number of SMEs participating in incumbent worker training programs, jobs created/retained due to training
- Funding required: $$

Strategy 1.6: Organize regional cluster networks to promote collaborative workforce development and training solutions.

- *Performance measures:* Participating companies, cluster employment
- Funding required: $

Strategy 1.7: Support ideation sessions and invite innovative proposals targeting regional issues impacting workforce retention to lower the incidence of skilled workers leaving Northern Virginia.

- *Performance measures:* Development of worker retention programs in collaboration with appropriate regional entities.
- Funding required: $-$$

Strategy 1.8: Identify and support programming for workforce attraction in collaboration with the Economic Development Alliance.

- *Performance measures:* Development/completion of workforce attraction program implementation with subsequent measures of program success to be determined in collaboration with the EDA.
- Funding required: $-$$

Strategy 1.9: Develop a regional data system to continuously track and monitor the availability of technology workers with the region's education and training pipelines.

- *Performance measures:* Students and workers in education and training pipeline, number of technology workers.
- Funding required: $$

Strategy 1.10: Work with the Economic Development Alliance, regional landlords and developers to assist in the modification and repurposing of existing and future real estate to match with the post-COVID flexibility requirements of both individual talent and regional employers.

- *Performance measures:* Net real estate absorption and new business attraction from out of region.
- Funding required: $

Potential partners:

- Public school systems, particularly Career and Technical Education Programs
- Regional Workforce Boards
- Colleges and universities (e.g., George Mason University, Northern Virginia Community College, Virginia Tech, Marymount, UVA, etc.)
- Industry groups (e.g., Northern Virginia Technology Council)
- Private and non-profit training providers
- Economic Development Alliance
- Virginia Economic Development Partnership
- Potential partners will be both regional and cross-regional entities, especially where project can leverage existing regional and state-level collaborations

Potential sources of matching funds:

- Workforce Innovation and Opportunity Act funding
- Local jurisdictions
- Regional foundations
- Private sector companies

- Industry groups and associations
- ARPA programs

Goal #2: Accelerate the Development of High Growth Technology Product Sectors

The COVID-19 pandemic has had a dramatic effect on Region 7's ecosystem that supports new business formation. The largest change has been in traditional networks and the process of new business formation. Face-to-face networks that were used to connect entrepreneurs with resources, potential partners and funding have made the difficult transition to online. Many of these networks have suffered from lack of sponsorship and membership dues, as the utility of online networking has been questioned. Face-to-face clustering of entrepreneurs in co-working spaces has also been constrained. Meanwhile, entrepreneurs with existing networks have been launching new businesses, or growing them successfully.

The bifurcation between experienced entrepreneurs who have networks, and less connected entrepreneurs, have never been as pronounced as it is now. Interviews with entrepreneurs and founders done in preparation of this report consistently stated that this bifurcation is a significant challenge for the region. It has resulted, for example, in risk capital pooling and competing heavily to back experienced entrepreneurs, and largely ignoring inexperienced entrepreneurs or people of less traditional backgrounds.

Meanwhile, the region's marketplace for risk capital is very chaotic and fragile. Over the last twenty years Region 7 and the Greater Washington region has gone from one of the largest markets for risk capital investment, to one that is generally in the bottom fifth of the United States most active risk capital markets. Since January 2020 according to PitchBook, the Greater Washington region attracted more than $8 billion in risk capital. While this number is significant, it is a very small part of an international trend towards investment in technology product companies. Significantly, in the Greater Washington region there are very few investors who make this market their primary investment focus, and there are very few multiple investors. It is important to note that the largest repeat investor in Region 7 is the CIT Gap fund, and very few investors have made multiple investments of any size during this period. The implication of this is that while the region is benefitting from a large influx of risk capital, it is not indigenous to this market, or committed to developing its infrastructure.

Additionally, much of the capital being deployed is coming from sources that are very sensitive to macro economic conditions, either because they are mandated to seek returns driven by market changes (hedge funds, private equity funds and corporate venture capital) or their risk tolerance is affected by their overall wealth maintenance strategies (family offices and hedge funds).

Region 7 must identify and support strategies to reinforce an ecosystem of university and private networking, resource sharing, educational and funding networks that are closely tied to the region's success. Collaborating with the local business community, particularly the largest technology employers in the region will be essential. Developing regionally focused sources of risk capital, while closely coordinating with the Commonwealth's established funding sources is essential.

Challenge: The existing ecosystem to support the support growth of technology product focused businesses is fragile, fragmented, and invisible to many potential participants.

To achieve an economic growth and wage growth rate that is closer to peer technology regions, and to serve its largest local customer, it is essential that Region 7 ensure that product-based technology businesses, and the entrepreneurs that start them, have ready access to the resources, facilities, and expertise necessary to grow their business and expand their commercial customer base. Region 7's ability to generate high paying employment will be directly affected by its success in establishing and growing business enterprises that utilize technology, while maintaining its existing success in in businesses in government services, consulting services, hospitality and construction.

Traditionally, regional economic development plans have focused on two primary areas for increasing technology business employment: encourage the formation of small technology businesses (aka, startups) and seek to develop funding sources to finance the growth of such companies. While these dual foci have not been incorrect in their orientation, they are not specific enough to foster successful growth of Region 7. Region 7 has specific attributes that require that economic development on technology innovation by tailored with care.

It is essential that Region 7's strategies to develop and expand economic growth focus efforts in the following:

- Fostering the growth and development of business that are *specifically* engaged with creating or using technology as a product.
- Differentiating between businesses that are merely small, and those that are at an initial stage of development into a rapidly scaling (jobs, revenues, tax base) business.
- Appreciating that technology is broader than software and computer hardware and includes other high growth areas such as human health, material sciences, climate change remediation and energy.
- Creating sustainability in the form of permanent support structures, networks and funding sources that can survive and overcome macro-economic shocks.
- Creating a diverse and talented workforce that is suited for leading and working in rapidly growing technology product businesses.
  Increase and expand interconnection between Region 7's largest commercial users of technology, and the support structures, networks and funding sources that drive the expansion of growing technology product businesses.
- Address inherent inequities in the availability of resources between experienced entrepreneurs and those who are less experienced or do not have access to resources due to social or economic factors.

Strategies and Expected Outcomes

Strategy 2.1: Build greater awareness, across all demographic and economic groups, of existing and emerging business support programs and resources available to promote the expansion of technology product businesses.

- *Performance measures:* Increased participation in existing or new programs targeted to Growth Companies in priority clusters
- Funding required: $-$$

Strategy 2.2: Support programs designed to assist technology product based businesses to enter new markets, both domestically and internationally, and to respond to market challenges and opportunities created by the pandemic.

- *Performance measures:* Companies served, new sales by small- and medium-sized establishments (SMEs) in target clusters
- Funding required: $-$$

Strategy 2.3: Develop economic gardening programs that provide growth-minded small businesses (in the priority clusters) with customized competitive market and business intelligence on markets, customers, competitors, business processes, and innovation.

- *Performance measures:* Change in number of jobs and sales in participating firms
- Funding required: $$

Strategy 2.4: Encourage the permanent connection of regional sources of risk capital (angel, venture capital and private equity) to Region 7.

- *Performance measures:* Increase in investment funding for growth companies from regional sources.
- Funding required: $$-$$$

Strategy 2.5: Support new initiatives to provide resources for product technology entrepreneurs and leadership, including business mentorship, networking, resource sharing and other support activities. Initiatives pursued by Region 7 universities, not for profits and local economic development entities will be given priority consideration.

- *Performance measures:* Increase the number/size of growth companies offering technology products.
  Funding required: $$-$$$

Strategy 2.6: Support programs that train employees and leaders of businesses focused on consulting to reorient their businesses as product companies.

- *Performance measures:* Increase the number/size of growth companies offering technology products.
- Funding required: $$-$$$

Strategy 2.8: Support programs that create greater interconnection between the larger businesses in Region 7 that purchase technology products and the region's smaller but growing technology based businesses. Encourage corporate investment, pooling of business opportunities, sharing of talent requirements and other activities to encourage regional collaboration across and within the priority economic clusters identified in this plan.

- *Performance measures:* Increase the revenue of growth companies offering technology products; increase the number of mergers and acquisitions between businesses operating in Region 7 and Northern Virginia.
  Funding required: $$-$$$

Strategy 2.7: Conduct regional road mapping and resource surveys to provide a census of the businesses and resources constituting the region's technology product business ecosystem, and publicly share results.

- *Performance measures:* Increase the number/size of growth companies offering technology products.
  Funding required: $$-$$$

Strategy 2.8: Encourage the coordination of programing and efforts undertaken by Region 7 with a broader group of regions around the Commonwealth.

- *Performance measures:* Number of GO-Virginia regions participating in projects and activities formulated by Region 7.
- Funding required: $-$$$

Strategy 2.9: Specifically include targeted small and medium sized enterprises in job fairs resulting from GO-Virginia funded talent pipeline projects.

- *Performance measures:* Companies participating in job fairs, candidate placement.
  Funding required: 0-$

Strategy 2.10: Work with Economic Development Alliance on connecting small businesses to regional talent attraction initiatives. Consider grant funding programs that provide resources for small business to compete for out of area talent.

- *Performance measures:* Number of hires among small companies.
  Funding required: $

Strategy 2.11: Work with Economic Development Alliance and other regional entities on providing small business with resources to effectively manage the emerging, and likely persistent shift towards, a distributed workforce.

- *Performance measures:* Number of hires and employee retention among small firms.
- Funding required: $

Potential partners:

- Technology campuses at VT and GMU
- Business support providers (e.g., Mason Enterprise Center, Genedge Alliance, Tandem Product Academy)
- Industry groups (e.g., Northern Virginia Technology Council)
- Economic Development Organizations, Economic Development Alliance

- Chambers of Commerce
- Area incubators and accelerators
- Universities (e.g., George Mason University, Marymount University)
- Relevant state organizations (e.g., Virginia Economic Development Partnership, Center for Innovative Technology)

Potential sources of matching funds:

- Local jurisdictions
- Industry groups and associations
- Private sector companies
- ARPA funded entities

Goal #3: Expand the Commercially-Focused Technology Sectors

Northern Virginia's innovation ecosystem is quite different from other technology intensive economic regions in that Region 7 entrepreneurial enterprises often grow without venture capital because they are highly involved in and often dependent on government contracting and services revenues. This creates many situations where a consulting business develops technology that could be offered as a commercial product if the consulting business had the knowhow to do so. Additionally, these types of activities often result in intellectual property that is owned by the federal government but could be licensed for commercial use.

Additionally, Region 7 receives a large portion of federal funding of basic research and development. Much of this goes into the region's wealth of research assets ranging from post-secondary research institutions, bio-medical research campuses, and vital federal research agencies. The region is also unique in that it is home to nine of the nation's 43 Federally Funded Research and Development Centers (FFRDCs).

Particularly considering the fragility of existing private funding networks, Region 7 must enhance regions success in turning federal research and development efforts into a *local* commercial business engine. The amount of federal research and development funding into Region 7 dwarfs private risk capital. Creative programs that leverage federal funding, the states existing efforts and private business investment is essential.

Challenge: Proximity to the federal government and R&D creates an over reliance on consulting business models, but also provides a large amount of innovation funding that is underutilized in Region 7 when compared to other technology regions.

The region will have institutional, developmental, and financial resources to foster enhanced business development and growth opportunities in commercial markets. This will include product development, effective intellectual property transfer mechanisms, and product commercialization. Achieving the goals enumerated here will also be supported by the creation, dissemination, and adoption of innovative practices in business and government; the development of a workforce skilled in change management to effectively compete under rapidly changing market conditions; and an understanding of how

networking will be successfully undertaken in an era characterized by hybrid and remote workers. This Goal is closely related to Goal #2 but includes opportunities for strategies and projects beyond emerging enterprises.

Strategies and Expected Outcomes

Strategy 3.1: Support programs that connect technology product entrepreneurs with holders of intellectual property in clusters identified by Region 7 as high priority, and aid in the initial steps of commercialization, including prototyping, market analysis, go-to-market planning and business formation.

- *Performance measures:* Participating companies, sales from commercialized technologies, jobs created/retained
- Funding required: $$-$$$

Strategy 3.2: Create an innovation voucher program that would provide small, established technology companies with discreet amounts of funding to access not-for-profit expertise from universities, national laboratories, and/or nonprofit research centers. These grants would enable companies to prepare assessments of research needs, analyze technology transfer options, or identify technology solutions.

- *Performance measures:* Vouchers granted, sales resulting from new technologies, jobs created/retained
- Funding required: $$-$$$

Strategy 3.3: Support programs that connect experienced technology entrepreneurs with scientists and researchers to develop commercialization pathways and new business formation.

- *Performance measures:* New business formation and commercial revenue.
- Funding required: $-$$

Strategy 3.4: Support programs that encourage the commercialization of technologies derived from federal research and development programs focused on small business, including the Small Business Innovative Research and Small Business Technology Transfer Research programs.

- *Performance measures:* Participating companies, grants obtained, sales from commercial technologies, job growth, risk capital funding success.
- Funding required: $-$$

Potential partners:

- Business support providers (e.g., Mason Enterprise Center, Genedge Alliance)
- Industry groups (e.g., Northern Virginia Technology Council)
- Private sector companies
- Area incubators and accelerators

- Locally-based Federally Funded Research and Development Centers (e.g., Rand Corporation, MITRE)
- Government operated federal labs.
- Research universities (e.g., George Mason University, Virginia Tech, George Washington University, University of Virginia)
- Bio-medical research campuses (e.g., Inova Center for Personalized Health, Janelia Research Campus)
- Federal research agencies (e.g., DARPA, NSF, USPTO)

Potential sources of matching funds:

- Local jurisdictions
- Industry groups and associations
- Commercial partners

Ongoing regional initiatives

- Innovation Commercialization Assistance Program (ICAP) is a Virginia-wide technology commercialization and incubation assistance program that supports academic, government and commercial incubators in their support of innovators bringing new technologies to the marketplace. The program provides counseling, access to mentors with domain expertise and lean startup-based instructional programs with specific focus on IT, big data, and cybersecurity firms. ICAP is a program of Virginia's Small Business Development Council (SBDC) Network.[27]
- The Center for Innovative Technology's (CIT) Commonwealth Research Commercialization Fund (CRCF) accelerates innovation and economic growth in Virginia by advancing solutions to important state, national, and international problems through technology research, development, and commercialization.[28]
- The Center for Innovative Technology (CIT) provides workshops and support concerning SBIR and STTR programs.[29]
- George Mason University has an Executive in Residence through the School of Business' Mason GovCon Initiative.[30]

[27] https://www.virginiasbdc.org/programs/icap/

[28] http://www.cit.org/initiatives/crcf/

[29] http://www.cit.org/events/?F_c=3

[30] http://business.gmu.edu/govcon/about/

Implementing Northern Virginia's GO Virginia Economic Growth and Diversification Plan

As the Northern Virginia's GO Virginia efforts move from the planning phase to implementation, the regional council will undertake several activities to advance it efforts and achieve its goals. These activities will include:

- **Ongoing outreach:** The regional council will continuously work to build awareness of the region's GO Virginia efforts. Regional council members and representatives will ensure that key stakeholders' groups (e.g., local elected officials, city and county staff, business groups, economic and workforce development organizations, etc.) throughout the region are aware of GO Virginia opportunities. This outreach can be used to generate interest in submitting GO Virginia proposals. The more proposals the regional council receives, the more likely it will be able to fund high quality projects with greater likelihood of success. Outreach efforts will also allow the regional council to identify potential opportunities, such as successful local initiatives that could be scaled up to, for instance, train more workers, serve more companies, or deliver to a wider set of jurisdictions, both in Northern Virginia and throughout the Commonwealth. ***This outreach now includes marketing programs specifically designed to enhance awareness of Region 7 programs and to attract new applications for funding.***
- **Proposal development:** To encourage applications that meet the most critical goals of this plan, the Region 7 Council will develop a Request for Proposal (RFP) process where the desired program is specified with the intent to attract qualified applicants to perform the scope of work.
- **Encouraging partnerships:** The council's outreach efforts can help facilitate potential partnerships if different groups are working on similar efforts that would benefit from collaboration. On August 1 the Council announced a request for letters of interest for projects. A project review committee will review incoming concepts and identify the most promising in terms of impact, goals alignment, and partnership opportunities. The Council will encourage partnerships among localities and help identify potential matching resources.
- **Increasing administrative efficiencies:** The Council will actively encourage administrative efficiencies in all projects. Review criteria for prospective projects will include a factor for administrative efficiency and cost savings. The Project Review Committee will identify opportunities for cost savings and administrative cost reductions as part of the screening process. Projects that increase the footprint of existing initiatives are likely to provide strong opportunities for increasing the impact on the region, without significantly increasing the administrative costs. Moreover, this increased regional collaboration and avoiding redundant efforts will likely reduce regional competition.
- **Laying the groundwork for financial sustainability:** In its selection of projects, the Council will emphasize matching resources to meet the requirements for GO Virginia funding. The Executive Committee and project review committees will continue to identify resources to support plan implementation. The Council is also currently examining the best options and procedures for securing matching fund contributions from the participating localities. The Council budget for its

second year (FY2018-2019) will lay out the matching resources for projects and Capacity Building funds.

- **Setting procedures for effective evaluation:** Information gathering will be vital to the plan's implementation. It will be important for the regional council to track the outputs of its investments (e.g., number of workers trained, companies served), but also the outcomes of these efforts (e.g., growth of key clusters, rising wages) and how those outcomes demonstrate that the region is achieving its stated goals. The Economic Growth and Diversification Plan identifies some potential performance metrics and expected outcomes for each of the strategies. However, a key consideration when reviewing the proposals will be the proposer's ability to identify and describe how they will track outcome and output measures. It will be particularly important for them to demonstrate their ability to collect information on core measures such as jobs created/wage levels or increased sales because these are the measures that will quantify the broader economic impacts of the GO Virginia investments.[31]
- **Promoting successful investments:** The region council will also make dedicated efforts to promote the impact of its GO Virginia investments. The Region 7 Council will actively promote its accomplishments through presentations to regional groups and traditional and social media. The council will produce an annual report that describes the economic impacts of the regional council's investments and provides narratives to put a face on the data.
- **Routinely revisiting and adapting the plan:** The Economic Growth and Diversification Plan will be a living document. The COVID-19 continues to have impacts on the regional economy and is affecting the way we conduct business. It is almost certain that the pandemic's impacts on business processes will endure through this 2-year planning cycle. Given related uncertainties about the long-term effect of the pandemic on the regional economy, and the legislative uncertainty of further federal support programs, the Council will revisit elements of this plan as circumstances call for.

[31] Jobs, labor income, and sales are key inputs for economic impact modeling software such as IMPLAN (www.implan.com).

Appendix A: GO Northern Virginia Regional Council (Region 7) Members

Name	Company/Agency	Sector
Sid Banerjee	Clarabridge/Qualtrics	Consulting
Matt McQueen	Peraton	Gov-con
Todd Rowley	Old Dominion National Bank	Finance
Marty Nohe	Appliance Connection	Small Bus.
Paul Liberty	George Mason University	Higher Ed
Dr. Irma Becera	Marymount University	Higher Ed
Eileen Ellsworth	Community Foundation for Northern Virginia	Non-profit
Aneesh Chopra	Albright Stoneridge Group	Consulting
David Guernsey	Guernsey Office Products	Retail & Dist
Nicholas Jordan	Neustar	Corp. Mgmt
Greg Leisch	Newmark Grubb Knight Frank	RE Research
Buddy Rizer	Loudoun Economic Development	Local Gov't
Danny Vargas	VARCom Solution	Marketing
Michael Forehand	Inova	Health Care
Scott Price	Dominion Energy	Utilities
John Wood	Telos Corporation	Technology
Todd Yeats	The Boeing Company	Gov-Con
Dr. Scott Brabrand	Fairfax Co. Public Schools	K-12
Todd House	Washington Gas	Utilities
Hon. John Foust	Fairfax Co. Board of Supervisors	Local Gov't
Kate Bates	Arlington Chamber of Commerce	Bus. Org.
David Tarter	Tarter NoVa Law	Legal
Dario Campolattaro	Summit Insurance Services	Insurance
Dr. Anne Kress	Northern Virginia Community College	Higher Ed
Jennifer Taylor	Northern Virginia Technology Council	Bus. Org.
Sumeet Shrivastava	Array Information Technology	Gov Con

Appendix B: The Plan Development Process

The process for completing the GO Northern Virginia Regional Council's Economic Growth and Diversification Plan began in May 2021, when the George Mason University Center for Regional Analysis (CRA) was contracted to develop the plan. To support the plan development, a small plan review committee was established to assist CRA by providing early feedback on presentation materials and plans for engaging the regional council. This plan review committee was also tasked with reviewing the initial draft of the Economic Growth and Diversification Plan. CRA also leveraged scheduled meetings to work with the GO Northern Virginia Regional Council. These meetings, described in more detail below, involved facilitated discussions to arrive at consensus decisions about regional priorities and goals.

Research, analysis, and outreach

The consulting team solicited input from regional stakeholders, such as economic development organizations, workforce investment boards, higher education, local jurisdictions, and other groups that might be involved in supporting future GO Virginia efforts (e.g., Mason Enterprise Center). These stakeholder conversations included discussions about key issues facing the region and areas of opportunity, as well as ongoing initiatives and partnerships. This engagement continued throughout the process.

Review of existing plans

CRA also reviewed other existing regional documents to identify the trends, issues, and ongoing regional initiatives most relevant to the goals of the Go Virginia. The region is uniquely positioned not only as a Virginia region, but also as part of the National Capital region. As a result, the process included reviewing reports specific to Northern Virginia and its jurisdictions,[32] as well as those that speak to issues facing the Greater Washington metro area.[33] These reports provided additional input on regional priorities, issues, and ongoing regional efforts. Several of these relevant plans are described below, with particularly emphasis placed on the elements that either specifically or more generally address the three goals prioritized by the GO Northern Virginia Regional Council.

- NOVA Economic Development Alliance: One of the most important regional changes since the last update of the Region & G&D Plan has been the creation of a NOVA Economic Development Alliance, which includes all local economic development agencies in Northern Virginia.[34] This entity formalizes shared initiatives among all NOVA jurisdictions with early work focusing on the development and implementation of talent attraction strategies and initiatives. This entity is

[32] White, M. "Assessing Alexandria/Arlington's Regional Labor Market", George Mason University Center for Regional Analysis, prepared for the Alexandria/Arlington Regional Workforce Council.; Northern Virginia Workforce Development Board (Area #11) Local Plan,

[33] *State of the Region: Economic Competitiveness Report 2016*, Metro Washington Council of Governments.

[34] Northern Virginia Economic Development Alliance – Information about the Northern Virginia Economic Development Alliance (novaeda.org)

also serving as a clearinghouse for support programs available to businesses during the pandemic.

- **Metro Washington Council of Governments *Region Forward:*** MWCOG's Regional Forward Initiative[35] established shared goals among business, nonprofits, and elected leaders in the metro Washington region to address key regional issues related to land use, transportation, climate and energy, the environment, education, housing, health and human services, and the economy. The economic goals speak to the need for a more diversified, stable, and competitive economy. The importance of having a skilled workforce is an issue of growing importance and MWCOG has released two reports that highlight the region's demand, particularly for STEM-related occupations.[36]
- **Fairfax County Community Outcome Area:** In addition to target industry assessments, this plan also recognizes existing and emerging initiatives to broaden the impact of economic development programming and activities to geographic areas and demographic cohorts that are a part of underserved communities. An example of one such plan reviewed in the development of the G&D Plan is the Community Outcome Area: Economic Opportunity for Fairfax County.[37]
- **Arlington County Economic Development Commission:** Though the most recent update to ACEDC's strategic plan is from 2018, it remains a useful guidepost of local economic development planning.[38] The commission is also exploring important topics that offer insights into issues related to the future of work/workspace in the area.
- **Global Cities Initiative, *Greater Washington Metro Export Plan:*** The Brookings Institution and JP Morgan Chase Global Cities Initiative—supported by the Metro Washington Council of Governments (MWCOG), the Greater Washington Board of Trade, and the Consortium of Universities of Greater Washington—encouraged the region's public and private leadership to become more globally engaged. The result of this effort was a *Greater Washington Metro Export Plan*.[39] This plan laid out four strategic objectives to increase exports from the region including:
    1. Strengthen global engagement of mid-sized firms in the biotech, cybersecurity, and IT sectors;
    2. Promote and market Greater Washington's global advantages to grow exports and attract trade and investment;
    3. Streamline and enhance Greater Washington's export assistance ecosystem; and
    4. Drive participation in exporting from Greater Washington's small and midsized professional services firms.
- **Alexandria/Arlington Regional Workforce Council's Featured Reports*:*** This critical regional workforce agency has recently published two reports that speak to issues that are embedded in

---

[35] https://www.mwcog.org/community/planning-areas/regional-planning/region-forward/goals/

[36] https://www.mwcog.org/documents/2016/10/25/trends-in-workforce-demand/

[37] Economic Opportunity | Strategic Plan (fairfaxcounty.gov)

[38] edcstrategy_2018rev.pdf (arlingtonva.us)

[39] https://www.mwcog.org/documents/2017/01/11/greater-washington-metro-export-plan/

this updated G&D Plan and available on the agency's website.[40] One deals with basic professional skills that cut across industries and occupations and have been a core finding of the project team's previously referenced enhanced capacity building project on reskilling hospitality and other workers for tech sector jobs. The other report addresses core competencies needed for individuals to succeed as an independent or "gig" worker.

- **Prince William County 2021-2024 Community Strategic Plan:** This plan includes specific issues that guides the development of this county's economic development activities by focusing on the development of a resilient economy that offers access and economic opportunity for all county residents.[41]

Regional analysis

GO Virginia Economic Growth and Diversification Plans must be data-driven strategies. To that end, CRA analyzed several regional economic and demographic trends. Prior to formally starting the economic growth and diversification planning process, CRA presented baseline indicators data at the May 10th regional council meeting. This information covered topics such as the region's dependence on federal procurement spending (particularly Department of Defense spending), a reliance on the federal government to drive regional innovation, and net domestic out-migration, which indicates potential threats exist to the region's ability to retain its most skilled workers. Given this earlier presentation and subsequent stakeholder input, CRA prepared more focused information in advance of the June regional council meeting. This analysis focused on the region's key 'export' clusters and high-demand occupations (i.e., clusters that bring new money into the region and, unlike sectors like retail, are not driven primarily by population growth).

Selecting priority clusters and identifying areas for action

The GO-Virginia Region 7 Council meeting in June 2021 kicked off the direct engagement with the full council for this planning process. The current G&D Plan served as a starting point but there was robust discussion at this and subsequent meetings in August and October on the selection of a final list of priority clusters. All previously selected clusters remained in the plan, but there were notable clarifications on sub-cluster targets to highlight important regional opportunities that are defined more by technology than traditional industry classifications such as nano-scale technologies, material sciences, and quantum computing. Healthcare, specifically healthcare products, and services driven by technology was added as sectors critical for the broader economic success of the region. Council members also strongly support the concept of leveraging federal R&D into commercial applications in three areas, nano technologies, advanced materials, and autonomous transportation, the latter of which has seen multiple projects within Region 7 that clearly show a competitive asset for this region in a rapidly emerging set of industrial technologies.

---

[40] Home Virginia Career Works (vcwalexandriaarlington.com)

[41] Draft-2021-2024_STRATEGIC_PLAN.pdf (pwcva.gov)

There were additional interactions with the Region 7 Executive Committee and continuous interaction with staff.

The planning process was impacted by on-going meeting restrictions and other impediments related to the pandemic. This resulted in less in-person engagement and due to project timelines, there was initially a compressed schedule of review by the Regional Council. Subsequent decisions to extend the deadline for submitting the planning document to DHCD for review allowed for a more deliberative process of refining this version of the G&D Plan.

Appendix C: Cluster Definitions and Supplemental Data

BUSINESS SUPPORT SERVICES

533110	Lessors of Nonfinancial Intangible Assets (except Copyrighted Works)
541199	All Other Legal Services
541214	Payroll Services
541930	Translation and Interpretation Services
541990	All Other Professional, Scientific, and Technical Services
561210	Facilities Support Services
561330	Professional Employer Organizations
561421	Telephone Answering Services
561422	Telemarketing Bureaus and Other Contact Centers
561920	Convention and Trade Show Organizers

COMPUTER SERVICES

518210	Data Processing, Hosting, and Related Services
541511	Custom Computer Programming Services
541512	Computer Systems Design Services
541513	Computer Facilities Management Services
541519	Other Computer Related Services

CONSULTING SERVICES

541611	Administrative Management and General Management Consulting Services
541612	Human Resources Consulting Services
541614	Process, Physical Distribution, and Logistics Consulting Services
541618	Other Management Consulting Services
541690	Other Scientific and Technical Consulting Services

CORPORATE HEADQUARTERS

551111	Offices of Bank Holding Companies
551112	Offices of Other Holding Companies
551114	Corporate, Subsidiary, and Regional Managing Offices

ENGINEERING SERVICES

541330	Engineering Services

FINANCIAL SERVICES

521110	Monetary Authorities-Central Bank
522120	Savings Institutions
522190	Other Depository Credit Intermediation
522210	Credit Card Issuing
522220	Sales Financing
522291	Consumer Lending
522292	Real Estate Credit
522293	International Trade Financing
522294	Secondary Market Financing
522298	All Other Nondepository Credit Intermediation
522310	Mortgage and Nonmortgage Loan Brokers
522320	Financial Transactions Processing, Reserve, and Clearinghouse Activities
522390	Other Activities Related to Credit Intermediation
523110	Investment Banking and Securities Dealing
523120	Securities Brokerage
523130	Commodity Contracts Dealing
523140	Commodity Contracts Brokerage
523210	Securities and Commodity Exchanges
523910	Miscellaneous Intermediation
523920	Portfolio Management
523930	Investment Advice
523991	Trust, Fiduciary, and Custody Activities
523999	Miscellaneous Financial Investment Activities
525910	Open-End Investment Funds
525990	Other Financial Vehicles
561450	Credit Bureaus

MARKETING, DESIGN & PUBLISHING

511120	Periodical Publishers
511130	Book Publishers
511140	Directory and Mailing List Publishers
511199	All Other Publishers
519110	News Syndicates
519120	Libraries and Archives
519130	Internet Publishing and Broadcasting and Web Search Portals
519190	All Other Information Services
541410	Interior Design Services
541420	Industrial Design Services
541430	Graphic Design Services

Marketing Design & Publishing Continued

541490	Other Specialized Design Services
541613	Marketing Consulting Services
541810	Advertising Agencies
541820	Public Relations Agencies
541830	Media Buying Agencies
541840	Media Representatives
541850	Outdoor Advertising
541860	Direct Mail Advertising
541870	Advertising Material Distribution Services
541890	Other Services Related to Advertising
541910	Marketing Research and Public Opinion Polling

PROFESSIONAL ORGANIZATIONS

813920	Professional Organizations

RESEARCH ORGANIZATIONS

541713	Research & Development in Nanotechnology
541714	Research & Development in Biotechnology (except Nanobiotechnology)
541715	Research & Development in Physical, Engineering, and Life Sciences (noi)
541720	Research and Development in the Social Sciences and Humanities

TRANSPORTATION & LOGISTICS

481111	Scheduled Passenger Air Transportation
481112	Scheduled Freight Air Transportation
481211	Nonscheduled Chartered Passenger Air Transportation
481212	Nonscheduled Chartered Freight Air Transportation
481219	Other Nonscheduled Air Transportation
484121	General Freight Trucking, Long-Distance, Truckload
484230	Specialized Freight (except Used Goods) Trucking, Long-Distance
485210	Interurban and Rural Bus Transportation
485510	Charter Bus Industry
488111	Air Traffic Control
488119	Other Airport Operations
488190	Other Support Activities for Air Transportation
488210	Support Activities for Rail Transportation
488490	Other Support Activities for Road Transportation
488510	Freight Transportation Arrangement
488991	Packing and Crating
488999	All Other Support Activities for Transportation

LIFE SCIENCES[42]

111000	Crop production
325199	All Other Basic Organic Chemical Manufacturing
325311	Nitrogenous Fertilizer Manufacturing
325314	Fertilizer (Mixing Only) Manufacturing
325320	Pesticide and Other Agricultural Chemical Manufacturing
325411	Medicinal and Botanical Manufacturing
325412	Pharmaceutical Preparation Manufacturing
325414	Biological Product (except Diagnostic) Manufacturing
327215	Glass Product Manufacturing Made of Purchased Glass
333314	Optical Instrument and Lens Manufacturing
334510	Electromedical and Electrotherapeutic Apparatus Manufacturing
334513	Instruments and Related Products Manufacturing for Measuring, Displaying, and Controlling Industrial Process Variables
334516	Analytical Laboratory Instrument Manufacturing
334517	Irradiation Apparatus Manufacturing
339112	Surgical and Medical Instrument Manufacturing
339113	Surgical Appliance and Supplies Manufacturing
339114	Dental Equipment and Supplies Manufacturing
339115	Ophthalmic Goods Manufacturing
339116	Dental Laboratories
423450	Medical, Dental, and Hospital Equipment and Supplies Merchant Wholesalers
424210	Drugs and Druggists' Sundries Merchant Wholesalers
541380	Testing Laboratories
541713	Research and Development in Nanotechnology
541714	Research and Development in Biotechnology (except Nanobiotechnology)
541715	Research and Development in the Physical, Engineering, and Life Sciences (except Nanotechnology and Biotechnology)
541720	Research and Development in the Social Sciences and Humanities
611310	Colleges, Universities, and Professional Schools
621511	Medical Laboratories

[42] Total employment for the Life Sciences cluster was calculated using a percentage of certain Industries, to represent only the portion of that industry performing work within Life Sciences. The individual employment figures for each 6-digit NAICS industry reflect the total for that industry, not the percentage used to calculate the overall cluster total.

CYBERSECURITY[43]

15-1211	Computer Systems Analysts
15-1212	Information Security Analysts
15-1241	Computer Network Architects
15-1244	Network and Computer Systems Administrators
15-1245	Database Administrators and Architects

HEALTH CARE SERVICES (Technology Focused[44])

62-1991	Blood & Organ Banks
62-2110	General Medical & Surgical Hospitals
62-2210	Psychiatric & Substance Abuse Hospitals
62-2310	Specialty Hospitals (noi)

Source: EMSI, data from 2020; Clusters defined by US Cluster Mapping Project. Health Care Services cluster definition from Teconomy.

[43] The Cybersecurity cluster was tabulated using occupational employment as opposed to industry employment. This was to reflect the industry crosscutting nature of Cybersecurity jobs.

[44] There is not formal distinction in industry definitions for technology focused healthcare. Therefore, the industries shown here are more generic than the intent of the Region 7 Council for plan implementation purposes.

Appendix D: Region 7 Project Pipeline and Awarded Projects

Project Pipeline

Project Name	Applicant	Investment Strategy
Tech Innovation and Equity in Computing Hub (TECH)	The Foundation of Fairfax County Public Schools in conjunction with FCPS and Arlington Public Schools (APS)	Workforce Development
Technology, Experience, Careers, Hiring (TECH) Mentorship Program	Arlington Economic Development (AED)	Workforce Development
Code Beats	Computer CORE	Workforce Development
Autonomous Vehicles	VA Tech and Fairfax Co. Gov't	Workforce Development
Cloud Computing	UVA	Workforce Development
ACER	Security University Foundation	Workforce Development
Nanotechnology Lab	George Mason University	Cluster Scale-Up, Workforce Development

Awarded Projects

Project Name	Applicant	Investment strategy
Smart City Works	Smart City Works	Cluster Scale-up
DEEP IET	NOVA - Northern VA Community College	Workforce Development
Community Medi-corps Program (Medi-corps)	GWU, Alexandria City and Arlington Public Schools, Alexandria Economic Dev. Partnership, et, al.	Workforce Development
Virginia Cyber Skills Academies	Women's Society of Cyberjitsu, SANS	Workforce Development
Northern Virginia Bioscience Center	Holladay Properties and PW Economic Development	Site Development

Awarded Projects Continued

Project Name	Applicant	Investment strategy
Tech Set	Marymount University	Workforce Development
Innovation Forward	Northern Virginia Economic Development Alliance	Capacity Building
Accelerate 2022	Esther Lee	Startup Ecosystems
Pivoting Technology Businesses for Post COVID-19 Environment	George Mason University/ Marymount Univ.	Fast Access
COVID-19 Diagnostic Testing, Contact Tracing & Stress Assessment for Nurses	George Mason University	COVID Response
Roadmap for Reskilling Leisure, Hospitality & Gig Workers for Tech Jobs in post COVID19 economy	George Mason University/ Marymount Univ.	Workforce Development
#BackToWork website	Northern VA Chamber of Commerce	COVID Response
#BackToWork webinar series	Northern VA Chamber of Commerce	COVID Response
SBDC ICAP Project	George Mason University	Startup Ecosystems
Virginia SBDC Cash Match CY2020-2021	George Mason University	Entrepreneurial
GENEDGE Alliance	Re-Tooling Virginia Manufacturers for Strategic Industries	Cluster Scale-up
VA Bio Connect	VA Bio Tech Association	Cluster Scale-up
Innovation Center Roadmap	NOVA Labs	Entrepreneurial
REI	George Mason University	Entrepreneurship
Future Kings	Future King, LLC	Workforce Development