The I-64 Innovation Corridor Opportunity Study

December 2021 – Full Report

Introduction

Cities around the world have learned that intentional collaboration, not competition, with other metro areas drive scale and economic success for both localities. In Virginia, RVA757 Connects has been advancing this model for Richmond (RVA) and Hampton Roads (757). The result has put the I-64 Innovation Corridor, an 8,000-square-mile contiguous region, on the map of America's megaregions.

RVA757 Connects, a 501(c)(3) organization, is an inclusive, mutually supportive network of leaders representing community, business, and higher education. The organization identifies, supports, and advances major opportunities, initiatives, and projects that meaningfully benefit both the Richmond and Hampton Roads regions.

In 2021, RVA757 Connects received a grant from GO Virginia Region 4 (Richmond) and 5 (Hampton Roads) to conduct the **I-64 Innovation Corridor Opportunity Study**, a research initiative to better understand the size, dynamics, and promise of the I-64 Innovation Corridor. This document is the full report of this study: goals, approach, resources, major findings, and implications for the I-64 Innovation Corridor.

Study Goals and Leadership

The two goals of the I-64 Innovation Corridor Opportunity Study:

- Profile the current and future state of the I-64 Innovation Corridor.
- Identify the Corridor's full potential in growing the economies and quality of life in both the Richmond and Hampton Roads regions.

This study was guided by a Research Council – a leadership committee set up to design and direct this investigation. Members included business leaders, economists, economic development officials, workforce industry professionals, and representatives of institutions of higher education (see side bar).

While this all-volunteer group provided considerable input and guidance, it should be noted that their participation in this study does not reflect a formal review or endorsement of this body of work by their respective organizations.

I-64 Innovation Opportunity Study Research Council

- Brian Anderson, President/CEO, ChamberRVA
- Shawn Avery, President & CEO, Hampton Roads Workforce Council
- Rachel Burgess, Managing Partner, SIR
- Glenn Carrington, Dean, Norfolk State University
- Chris Chmura, Economist, Chmura Economics & Analytics
- Brian Davis, Executive Director, Virginia Career Works
- Renee Haltom, Vice President and Regional Executive, Federal Reserve Bank of Richmond
- Steve Harrison, Vice President, Business Intelligence & Communications, Hampton Roads Alliance
- Bob Holsworth, Managing Partner, DecideSmart
- John W. Martin, CEO, SIR & the Institute for Tomorrow
- Michael Rao, President, VCU
- Doug Smith, President & CEO, Hampton Roads Alliance
- Bryan K. Stephens, President/CEO, Chamber Hampton Roads
- Jeff Tanner, Dean & Professor of Marketing, Strome College of Business, Old Dominion University
- Jennifer Wakefield, President/CEO, Greater Richmond Partnership

Supporting Data Resources and Consultants

The Southeastern Institute of Research (SIR) facilitated and supported the work of the Research Council. Two primary data resources mined for this study were JobsEQ and trends research from SIR's Institute for Tomorrow.

JobsEQ is an economic database and software tool created by Chmura Economics & Analytics (Chmura), a Richmond-based quantitative research, economic development, and workforce consulting firm. JobsEQ is a comprehensive industry, occupation, and employment database used by cities, counties, and states to profile and compare relative economic performance. Chris Chmura, Ph.D., Founder & Chief Executive Officer of Chmura, was engaged to help the Research Council identify, mine, and report on Richmond, Hampton Roads, the I-64 Innovation Corridor, and comparative regions using data from the JobsEQ proprietary database and software.

The Institute for Tomorrow (IFT), a division of SIR, is a research-based think tank that identifies trends shaping the future of business and economic development. IFT shares trend insights through customized reports, keynote speeches, and the media. IFT's insights have been featured in the *Los Angeles Times, Washington Post, Chicago Tribune, Toronto Star, BusinessWeek, The Wall Street Journal, Barron's, and on NBC Nightly News, CBS News, MSNBC,* and *NPR's Morning Edition.* The IFT shared 25 key trends that are shaping the future of the I-64 Innovation Corridor.

Study Approach

The Research Council organized this study around a series of iterative questions related to megaregions and the current and future state of the I-64 Innovation Corridor. This included:

- *Is interregional collaboration across America really happening?*
- *What is the I-64 Innovation Corridor today?*
- *What is the current and projected future state of the Corridor – population, employment, gross domestic product?*
- *What are the key trends shaping future opportunities for the I-64 Innovation Corridor?*
- *What will it take to realize the I-64 Innovation Corridor's full potential?*
- *How can RVA757 Connects help advance the I-64 Innovation Corridor?*

Over the course of nine months, the Research Council reviewed data on these topic areas, discussed and debated their meanings, and identified the key findings and related implications. This document is the compilation of all data and key findings.

Short summary presentation reports for Region 4 and Region 5 are also available.

Report Organization

The I-64 Innovation Corridor Opportunity Study report is organized around five broad topics areas:

- **Topic 1 – Megaregions and Innovation Corridors:** This report begins with a broad overview of U.S. megaregions and innovation corridors, showcasing the interregional activities taking place across America.
- **Topic 2 – Current State:** This section profiles the I-64 Innovation Corridor in terms of population, employment, commute patterns, major industries, and workforce occupations. This includes the industry clusters where the megaregion is strongest when compared to other peer regions. This section also includes a profile of the I-64 Innovation Corridor's talent pool and talent pipeline in terms of what degrees are being awarded, as well as the current state of talent attraction and retention in the megaregion.
- **Topic 3 – Future of Work:** Topic three profiles the future of work in the I-64 Innovation Corridor, pointing to the likely defining characteristics of what "work" will be like in 2030 – projected industry composition, occupations and job types, work arrangements, workplace locations, and work culture.
- **Topic 4 – Future Scenarios:** This section addresses the looming question of tech-driven job disintermediation. At what scale will robots displace workers? What can we do to mitigate job disintermediation?
- **Topic 5 – Desired State:** Topic five profiles the most promising industry clusters of tomorrow and what it will take to turn them into an economic development advantage for the I-64 Innovation Corridor, as well as what we can do to address the brain drain (the loss of talent).

Thank You GO Virginia Regions 4 and 5

This report is now helping business, economic development, education, workforce development and training, and government leaders gain a more nuanced understanding of the growth of megaregions and innovation corridors, benefits of interregional cooperation, and the current and potential future state of the I-64 Innovation Corridor.

Study findings and implications are also directing RVA757 Connects' future agenda, including ways to work with GOVirgina's regions 4 and 5 to drive the economic success of the Richmond and Hampton Roads regions.

On behalf of RVA757 Connects and the Research Council, we want to thank GO Virginia, regions 4 and 5, for their support in making **I-64 Innovation Corridor Opportunity Study** possible.

GO VIRGINIA | VIRGINIA INITIATIVE FOR GROWTH & OPPORTUNITY IN EACH REGION

Topic 1:

U.S. Megaregions and Innovation Corridors

1. Megaregions
2. Innovation Corridors
3. Conclusion

RVA757 connects

I-64 INNOVATION CORRIDOR

The Original Three Megaregions

Boston's Rt.128 Corridor

North Carolina's Research Triangle

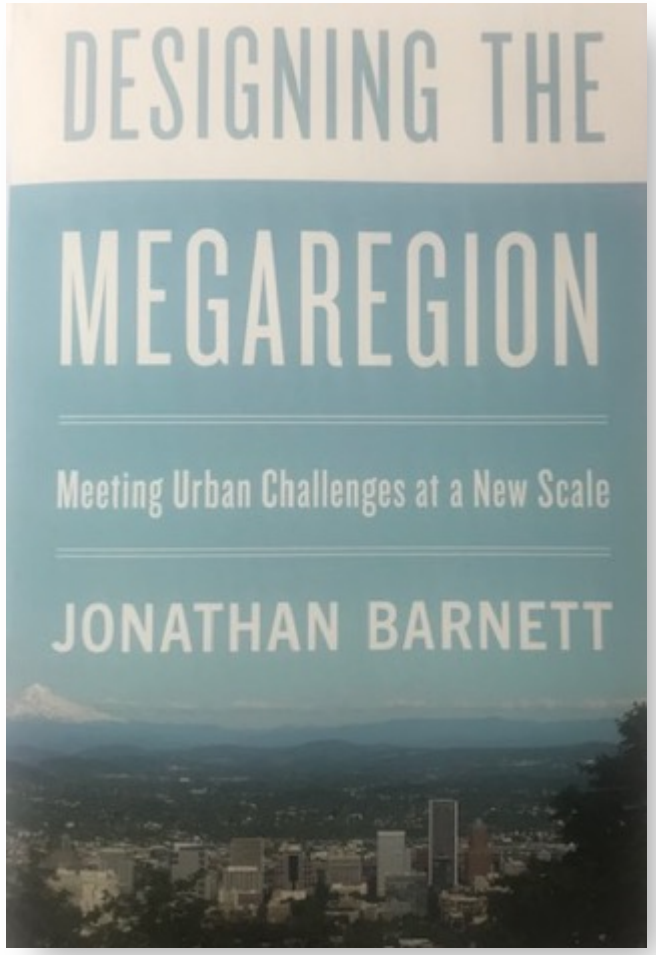
California's Silicon Valley

Today, More than 70% of Our Nation's Population and Jobs Are Located in 12 Megaregions

Megaregions Defined

"Megaregions are becoming the new competitive units in the global economy, characterized by the increasing movement of goods, people and capital among their metropolitan regions."

Jonathan Barnett

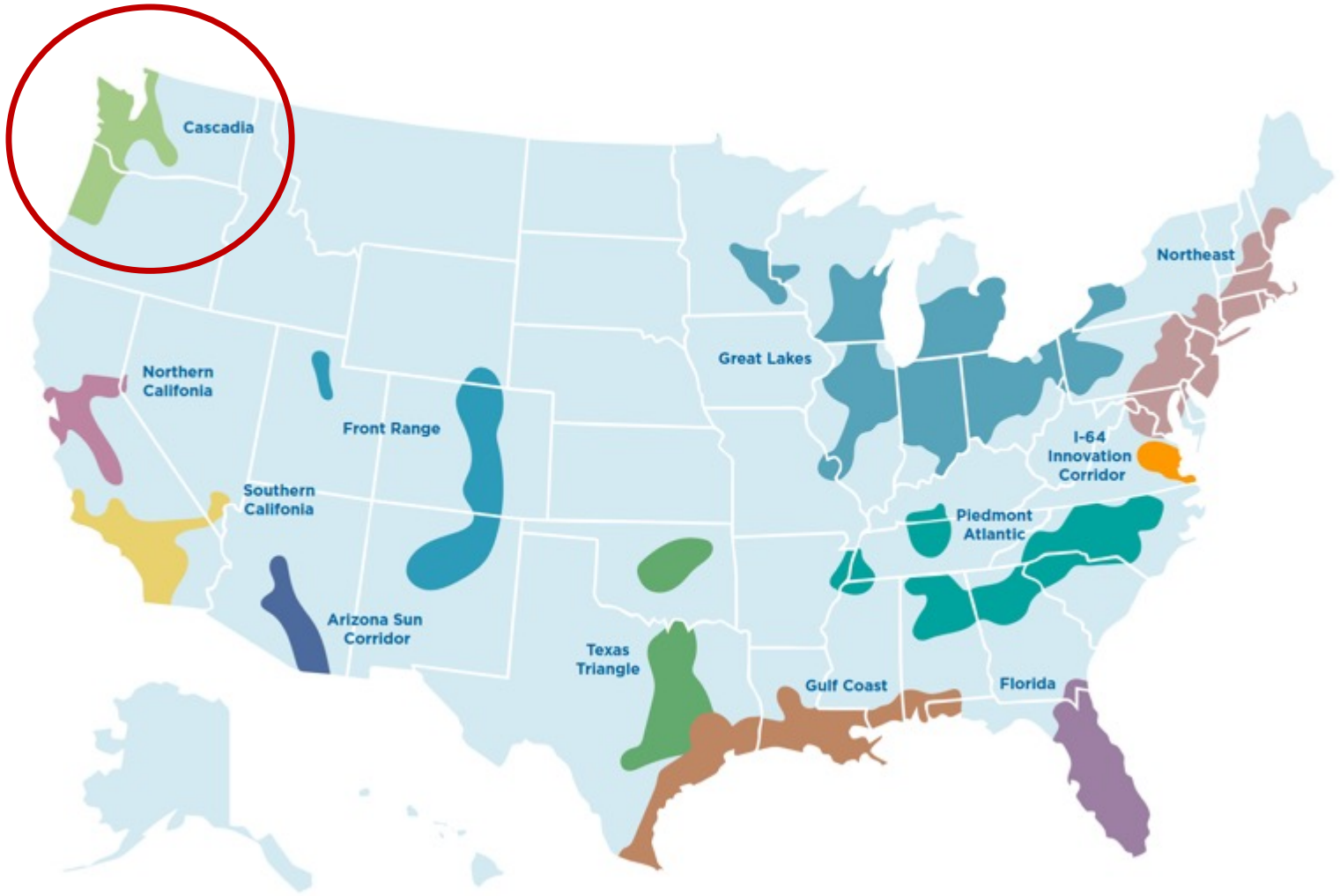


Successful Megaregion Design is All About Intentionality

Example:

Cascadia Megaregion

Portland – Seattle – Vancouver



Cascadia Megaregion

Portland – Seattle – Vancouver

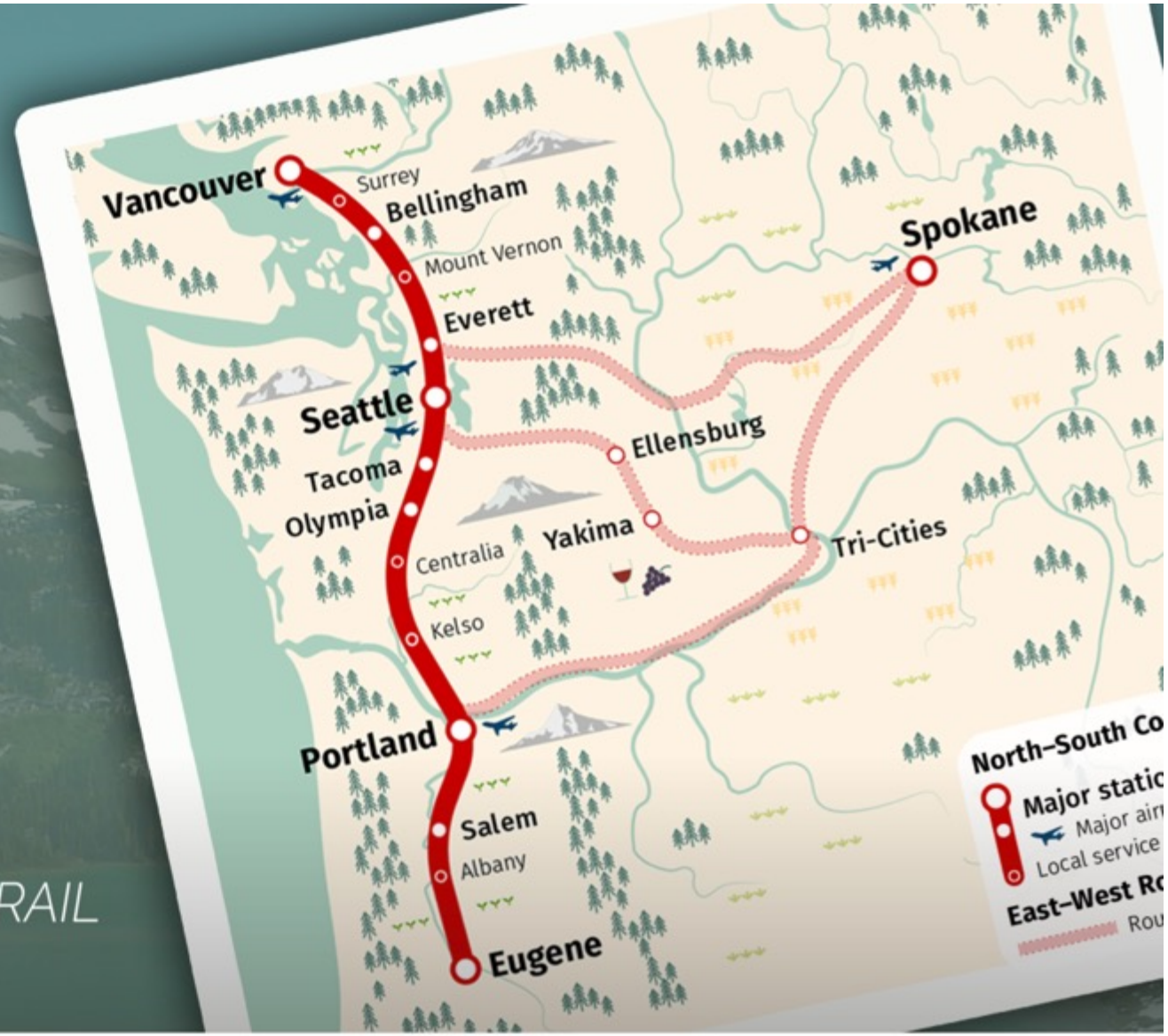
The Department of Transportation for Washington State just released a new report identifying the next joint steps for the governments of British Columbia, Washington, and Oregon to take in order to realize ultra-high-speed rail, linking Vancouver, Seattle, and Portland.

The $900K report was funded equally between all three jurisdictions and Microsoft.

"My vision for the megaregion — stretching from Washington, north to British Columbia, and south to Oregon — includes a transportation system that is fast, frequent, reliable, and environmentally responsible. Such a system would unite us in our common goals related to economic development, shared resources, affordable housing, new jobs, tourism, multimodal connections, and increased collaboration."

Governor Jay Inslee, Washington State

CASCADIARAIL



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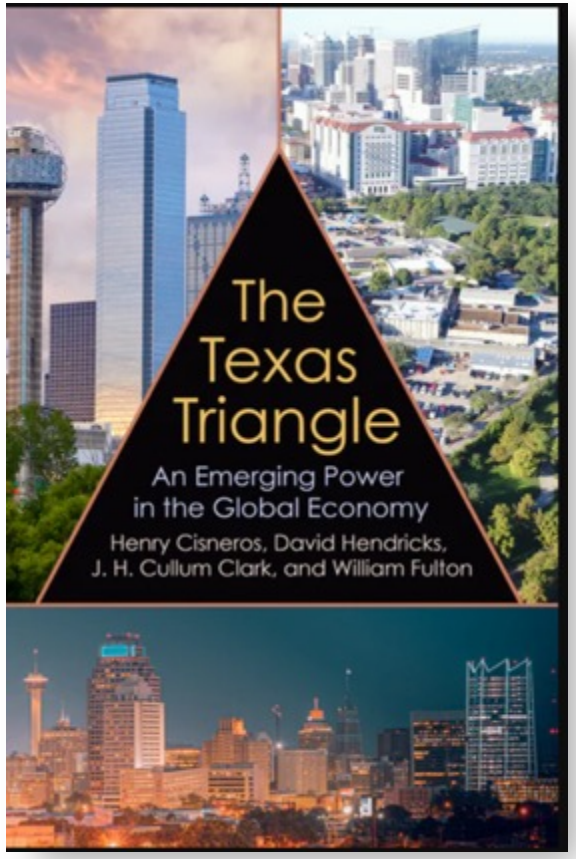
The Texas Triangle

The Texas Triangle

The sleeping giant of megaregion is the Texas Triangle, which is comprised of three metropolitan complexes: Dallas-Fort Worth at the northern tip, Houston-Galveston at the southeastern point, and Austin-San Antonio at the southwestern edge. This thirty-five-county megaregion is the same geographical size as the state of Georgia.

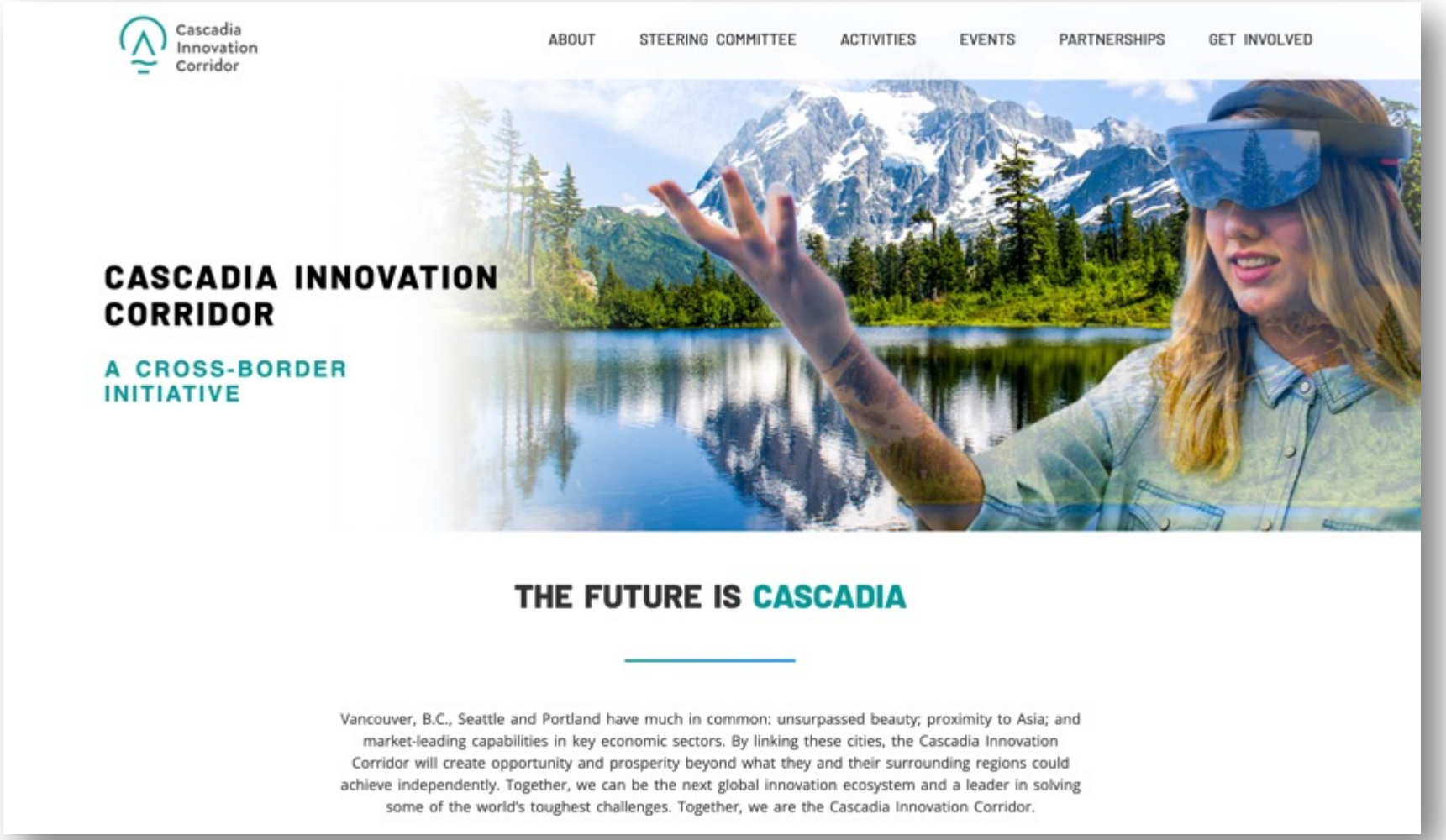
In a just-released study, titled *The Texas Triangle: An Emerging Power in the Global Economy,* the case is made that the Texas Triangle soon will include four of the ten most populous cities in the United States. Together, these Texas metro areas will represent the fifteenth largest economy in the world. The study details the trajectories of the four metros areas and integrates them into a larger force organized around effective collaboration.



Innovation Corridors

Mirroring the interregional collaboration within megaregions, a growing number of adjacent cities are now working together to increase the movement of goods, people, capital, and ideas between their regions. Most often, this collaboration is taking the form of innovation corridors. Examples are provided on the next few slides with information from their respective websites.

Cascadia Innovation Corridor



Cascadia Innovation Corridor
https://connectcascadia.com/

The Cascadia Innovation Corridor includes Vancouver, B.C.; Seattle; and Portland. By linking these cities, the Cascadia Innovation Corridor's mission is to create opportunity and prosperity beyond what they and their surrounding regions could achieve independently. Together, they are building the next global innovation ecosystem and planning a high-speed rail system to connect these three cities.

Florida High-Tech Corridor

Florida High-Tech Corridor
https://floridahightech.com/

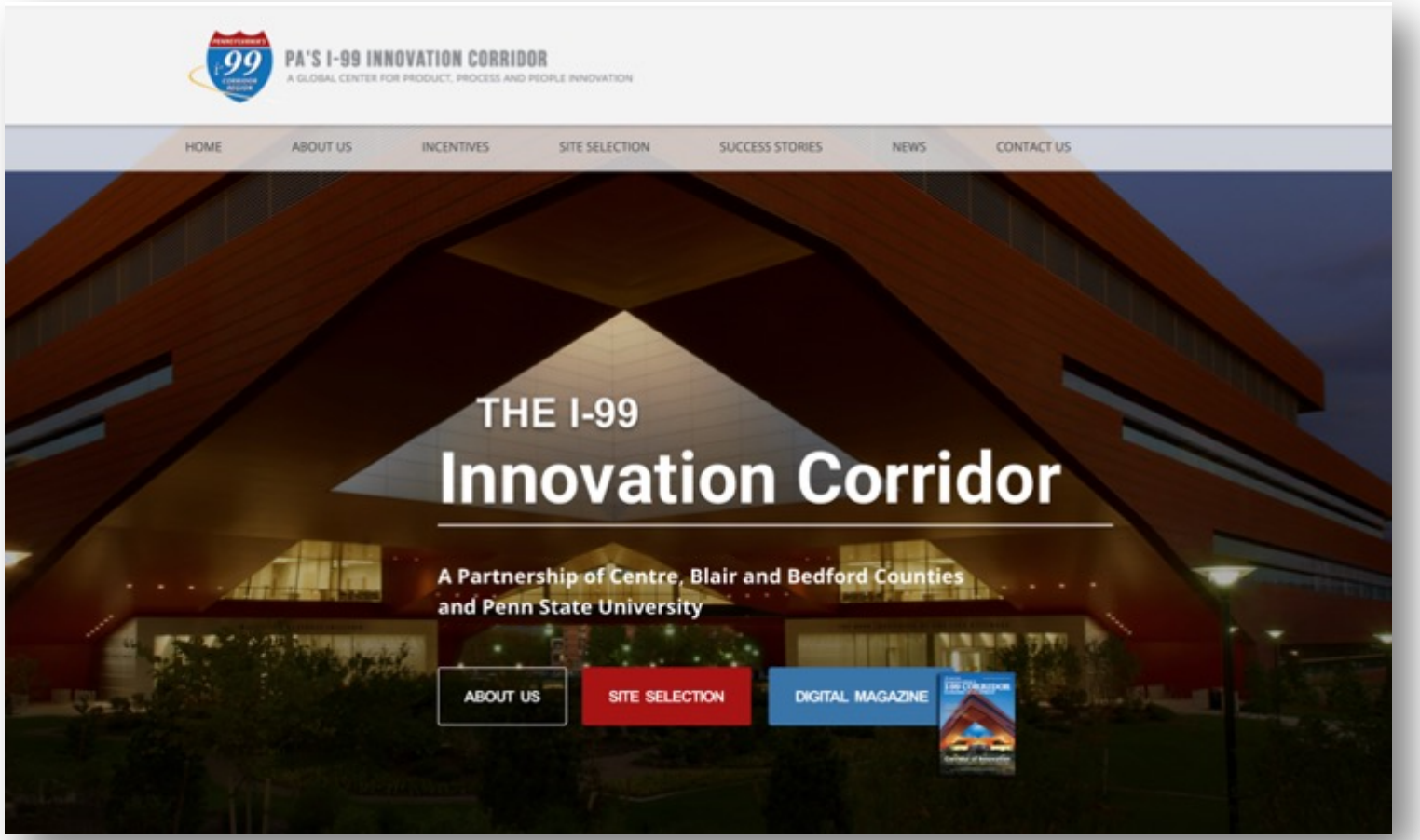
Three state universities are facilitating collaborations between partners in academia, industry, and economic development to create communities with unlimited potential across a 23-county region spanning the state.

I-69 Innovation Corridor

I-69 Innovation Corridor
https://www.usi.edu/outreach/i-69-innovation-corridor

The I-69 Innovation Corridor spans the southwestern Indiana and northwestern Kentucky region. This is a regional initiative focused on driving transformational change by creating cultural and environmental support for innovative capacity.

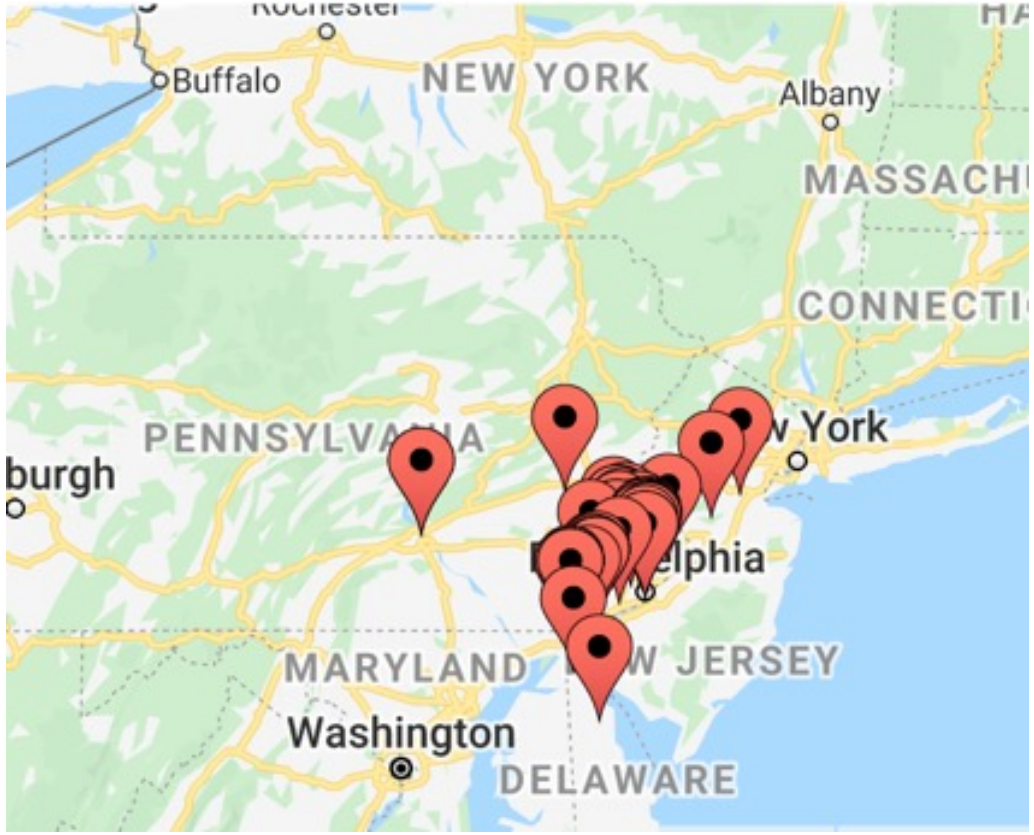
PA's I-99 Innovation Corridor



I-99 Corridor
https://www.i99corridor.org/

The I-99 Innovation Corridor joins the Altoona and University Park campuses of Pennsylvania State University along with the economic development organizations in Blair, Bedford, and Centre counties. The region is home to numerous precision manufacturers, life science firms, technology-based companies, and materials-related industries. Linking the cross-state corridors of I-80 and I-76, the I-99 Innovation Corridor is a university research center supporting corporate America's essential needs: their products, processes, and people.

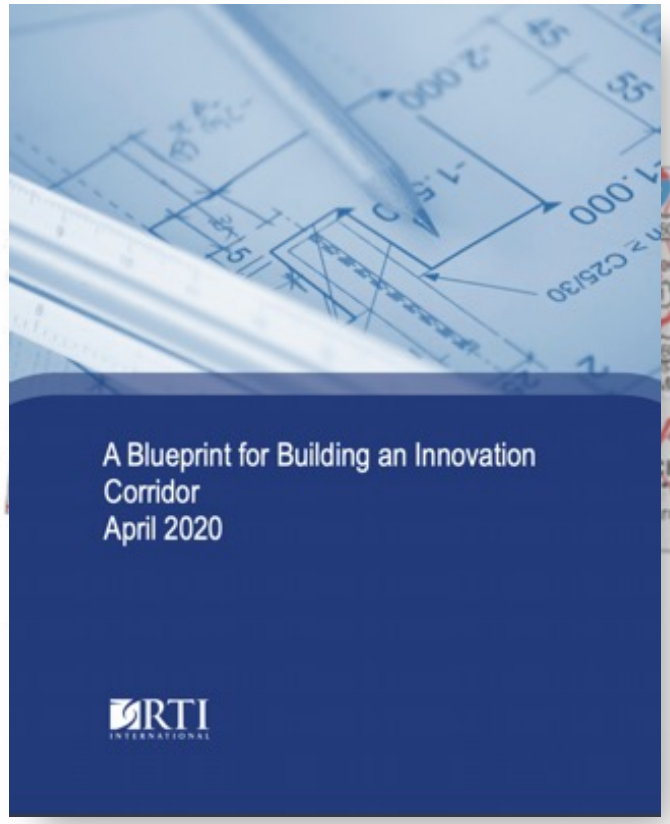
Delaware Valley Innovation Corridor

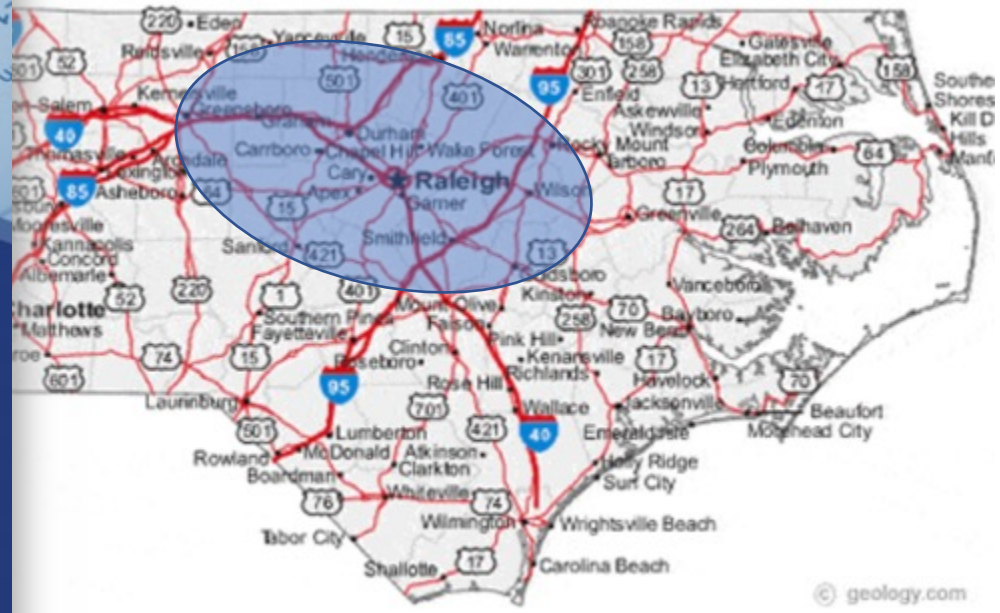


Delaware Valley Innovation Corridor
https://www.pasbdc.org/technology/delaware-valley-innovation-corridor

The Delaware Small Business Development Center (SBDC) and Pennsylvania SBDC are working together to repurpose and grow the technology talent available in the region. These two SBDCs are leveraging unique, complementary services and expertise to spur the growth of new and established small firms, based primarily on leveraging technological development and innovation. The goal is to create a model of a long-term, sustainable innovation ecosystem for technology businesses in the Delaware Valley.

NC Innovation Corridor

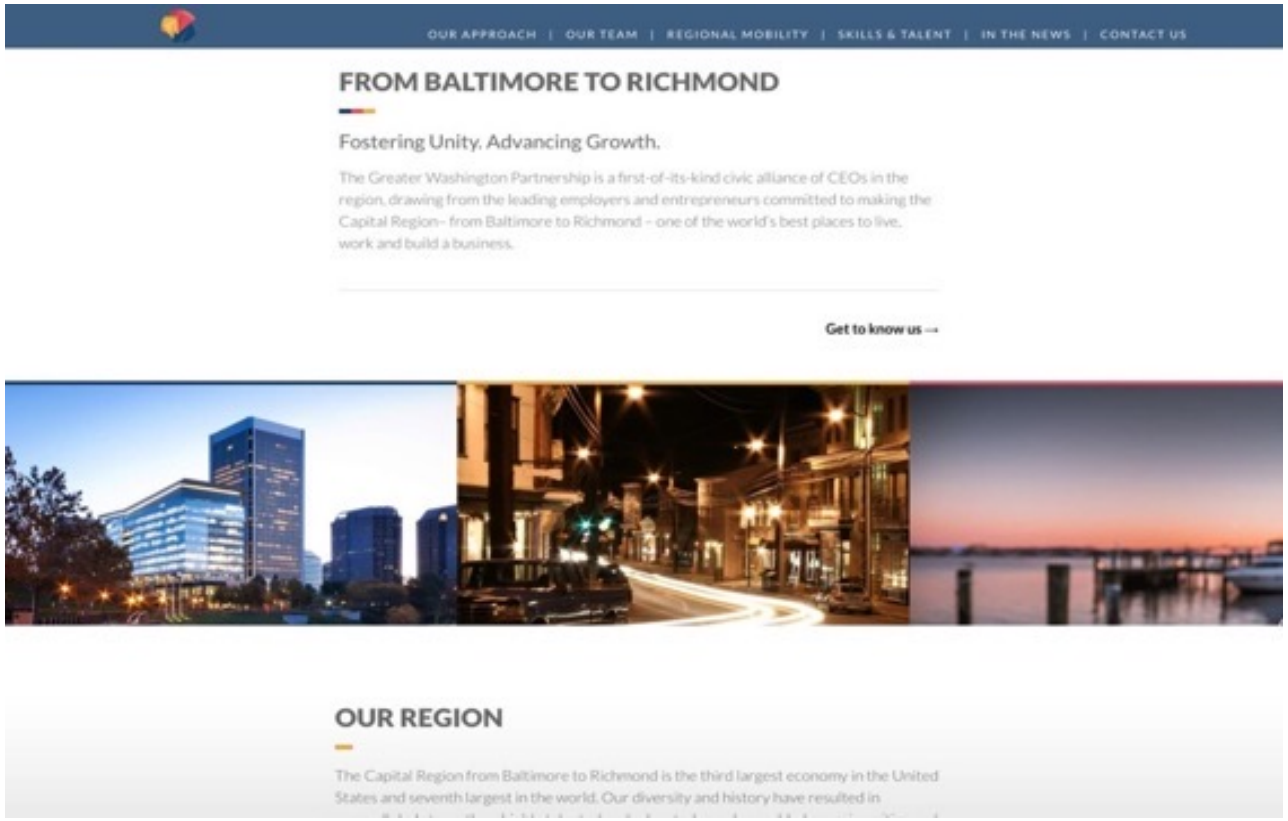




Research Triangle
https://www.rtp.org

Research Triangle Park (RTP) is composed of Raleigh, Durham, and Chapel Hill. Founded in 1959 and located at the center of three Tier-1 research universities, RTP is the largest research park in the United States and a premier global innovation center. Its 7,000 acres house hundreds of companies, including science and technology firms, government agencies, academic institutions, startups, and nonprofits. RTP recently unveiled an ambitious plan, *A Blueprint for Building an Innovation Corridor,* to expand its innovation footprint across central North Carolina.

Balt.-Richmond Innovation Corridor



GREATER WASHINGTON PARTNERSHIP
FROM BALTIMORE TO RICHMOND
FOSTERING UNITY
ADVANCING GROWTH

Greater Washington Partnership
https://greaterwashingtonpartnership.com

Greater Washington Partnership (GWP) includes metro areas from Baltimore to Richmond. The Partnership's mission is advancing inclusive growth across the region. To this end, the Partnership recently announced the formation of CoLab, an action-oriented coalition of employers and academic institutions to attract and grow "tech talent."

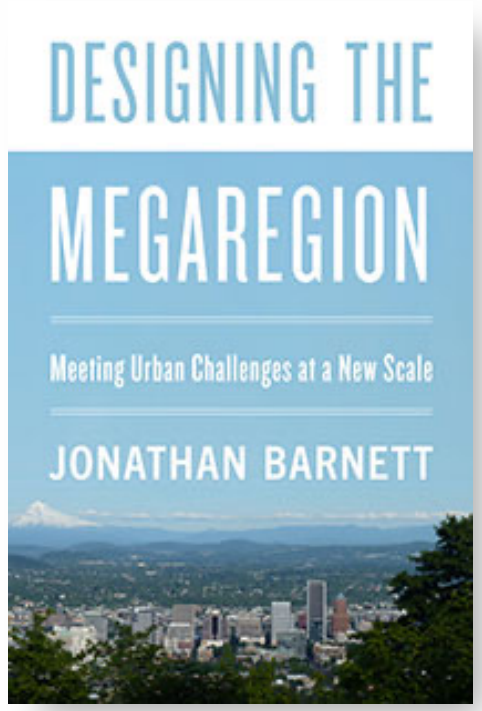
Conclusion:
Megaregions and Innovation Corridors Are Real and Are Active

There are two primary forces fueling the growing momentum of megaregions and innovation corridors. The first one is the growing realization that intentional collaboration across borders creates a positive, catalytic economic impact on the combined region's footprint. The second momentum-building force is the growing realization that we are facing new threats and challenges on a megaregional scale. Planning to date has been the domain of cities and counties. Planning systems and relationships are not in place to address larger-scale issues that cross borders. The Brookings Institute, one of the most respected thought leaders in economic development and city-building, points to the COVID pandemic as a case in point.

According to Brookings, COVID exposed cracks in our ability to plan and respond, and the consequences were profound. Failure to coordinate governance across local and state lines cost lives, caused untold economic damage, and led to disproportionate harm on marginalized individuals, households, and communities. Brookings' white paper on this topic makes the case for more collaborative planning on a megaregional scale: https://www.brookings.edu/research/in-the-age-of-american-megaregions-we-must-rethink-governance-across-jurisdictions/.

Continued . . .

Brookings' case builds on the work of urban design expert, Jonathan Barnett. In *Designing the Megaregion*, Barnett describes the benefits of collaboration on a megaregional scale. He makes the case for managing growth using mostly private investment, without having to wait for massive government funding or new governmental structures. Barnett lays out practical ways of rethinking and acting to meet urban challenges at a new scale. This includes helping new development fit into its environmental setting; inspiring local transportation systems to plan together on a larger, interconnected scale; and redirecting economic forces to make megaregions equitable places.



In summary, the answer to the I-64 Innovation Corridor Opportunity Study Research Council's first question – *Is interregional collaboration across America really happening?* – is a resounding yes. Megaregions and innovation corridors are an evolutionary step in urban development, becoming the new economic unit in a global economy.

Topic 2:

Current State of the I-64 Innovation Corridor

1. Size & Growth
2. Labor Market
3. Commute Patterns
4. Industry & Occupation Mix
5. Clusters
6. Alumni
7. Talent Retention & Attraction

RVA757 connects

I-64 INNOVATION CORRIDOR

What is the I-64 Innovation Corridor?

One can view the Richmond-Hampton Roads relationship from several perspectives:

- Regional Collaborators: Two neighboring regions that are collaborating to help each other thrive and grow in a global economy.
- A Megaregion: The 13th U.S. megaregion (see previous map). While relatively smaller than most megaregions, this region meets the common criteria for being a megaregion. This includes being a contiguous area with more than one major city center; a large, combined population; and significant output measured by GDP.
- An Innovation Corridor: The I-64 Innovation Corridor that runs from Richmond to Hampton Roads along interstate I-64.

Given the rise of innovation corridors in the markets surrounding Richmond and Hampton Roads, RVA757 Connects is most often using the I-64 Innovation Corridor designation.

Whatever classification perspective or name is used, the facts remain the same. Together, the Richmond and Hampton Roads regions make a compelling story.

1

I-64 INNOVATION CORRIDOR TODAY

SIZE & GROWTH

KEY TAKEAWAYS

SIZE & GROWTH

- The I-64 Innovation Corridor, comprised of the Richmond and Hampton Roads combined markets, total 3.1 million residents and 1.4 million workers, placing the megaregion on par with the Charlotte, Denver, and Nashville regions.
- When viewed as a megaregion, the I-64 Innovation Corridor exhibited slower population growth from 2009 through 2019 when compared to Charlotte, Denver, and Nashville regions. Their growth rates are three times greater than what we are experiencing in the I-64 Innovation Corridor.
- The I-64 Innovation Corridor's forecasted employment growth from 2020 through 2030 is also expected to lag these other regions.

Megaregion Comparisons

Region	Population (2019)	Population Annual Average Growth (2009-2019)	Employment (2020Q3)	Forecast Employment Growth (Average Annual Rate 2020Q3-2030Q3)
Raleigh-Cary, NC MSA	1,390,785	2.3%	662,325	1.6%
Nashville-Davidson--Murfreesboro--Franklin, TN MSA	1,934,317	1.7%	1,034,884	1.5%
Charlotte-Concord-Gastonia, NC-SC MSA	2,636,883	1.7%	1,276,784	1.4%
Denver-Aurora-Lakewood, CO MSA	2,967,239	1.7%	1,572,471	1.4%
Orlando-Tampa FL Megaregion	5,802,978	1.8%	2,689,782	1.3%
Jacksonville, FL MSA	1,559,514	1.6%	721,122	1.2%
Atlanta-Sandy Springs-Alpharetta, GA MSA	6,020,364	1.4%	2,834,590	1.1%
Columbus, OH MSA	2,122,271	1.2%	1,076,754	0.7%
Charlottesville, VA MSA	218,615	0.9%	113,625	0.5%
Richmond, VA MSA	1,291,900	0.9%	656,014	0.5%
Washington-Arlington-Alexandria, DC-VA-MD-WV MSA	6,280,487	1.2%	3,267,882	0.4%
I-64 Innovation Corridor (without Eastern Shore)	3,067,223	0.6%	1,437,029	0.2%
I-64 Innovation Corridor (including Eastern Shore)	3,111,249	0.6%	1,455,055	0.2%
Virginia Beach-Norfolk-Newport News, VA-NC MSA	1,768,901	0.4%	778,697	-0.1%

Source: JobsEQ® by Chmura

3 Million Population Size – Comparison

In 2020, Richmond's and Hampton Roads' Metropolitan Statistical Area or MSA population were 1.3 million and 1.8 million, respectively. Combined, Richmond's and Hampton Roads have 3+ million people.

In terms of relative population size, the Richmond and Hampton Roads MSA regions are the 44th and 37th largest MSAs in the country. Combined, both regions make the top 20 list in terms of the largest MSAs in America (see sidebar).

Top 20 U.S. Metropolitan Statistical Areas (MSA)

1. New York-Northen NJ 19,752,408
2. Los Angeles-Long Beach-Santa-Ana 14,100,584
3. Chicago 10,340,685
4. Dallas-Ft.Worth-Arlington 7,775,098
5. Houston-Sugarland-Baytown 7,380,824
6. Atlanta-Sandy Springs-Marrieta 7,077,814
7. Miami-Ft Lauderdale-Miami Beach 6,459,442
8. Washington-DC-Arlington-Alexandria VA 6,319,959
9. Philadephia-Wilmington 6,149,832
10. Riverside-San Bernadino-Ontario 5,839,053
11. Phoenix-Mesa-Scottsdale 5,836,205
12. Boston-Cambridge-Quincy 4,493,489
13. Detroit-Warren-Livona 4,467,449
14. San Francisco-Oakland-Freemont 4,156,137
15. Seattle-Tacoma-Everett 3,708,247
16. Minneapolis-St.Paul-Bloomington 3,592,940
17. Tampa-St.Petersburg-Clearwater 3,408,555
18. San Diego-Carlsbad-San Marcos 3,167,189
19. St.Louis 3,009,016
20. Baltimore-Towson 2,888,579

2

I-64 INNOVATION CORRIDOR TODAY

LABOR MARKET

KEY TAKEAWAYS

LABOR MARKET

- Combining the RVA and 757 labor markets puts us in another league with the Nashville, Charlotte, Denver, and Columbus MSAs.
  - RVA MSA employment = 656,014
  - 757 MSA employment = 778,697
  - I-64 Innovation Corridor combined employment = 1.4 million
- Adding Charlottesville and the Eastern Shore increases the talent pool for the Megaregion.
  - 131,000 additional workers
  - In particular, Charlottesville adds an additional 22,000 healthcare workers.

The I-64 Innovation Corridor total workforce, including Charlottesville, is 1.5 million people.

Region	Population (2019)	Employment (2020)
Charlottesville, VA MSA	218,615	113,625
Richmond, VA MSA	1,291,900	656,014
Virginia Beach-Norfolk-Newport News, VA-NC MSA	1,768,901	778,697
I-64 Innovation Corridor	**3,279,416**	**1,548,336**

Source: JobsEQ® by Chmura

Megaregion Comparisons

Region	Population (2019)	Employment (2020Q3)
Washington-Arlington-Alexandria, DC-VA-MD-WV MSA	6,280,487	3,267,882
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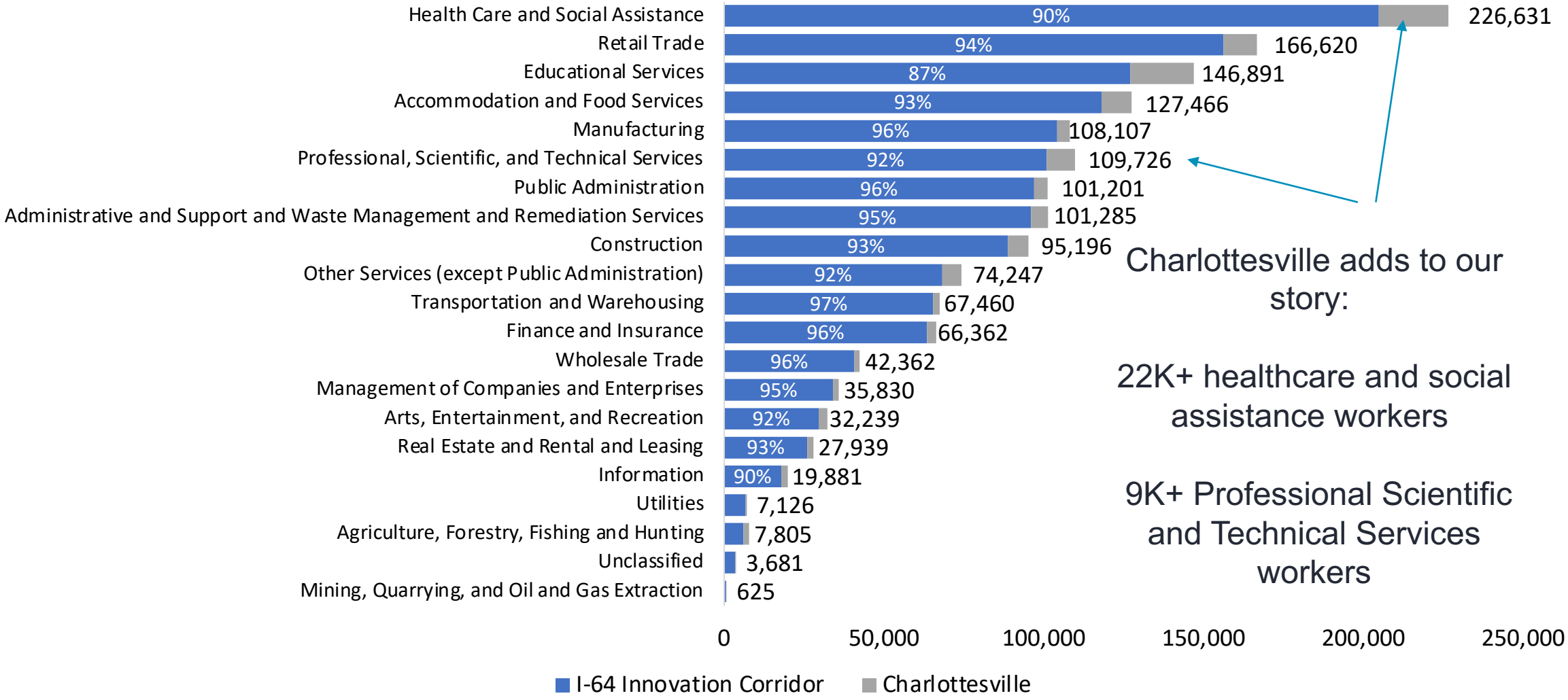
Source: JobsEQ® by Chmura

I-64 Innovation Corridor with Charlottesville



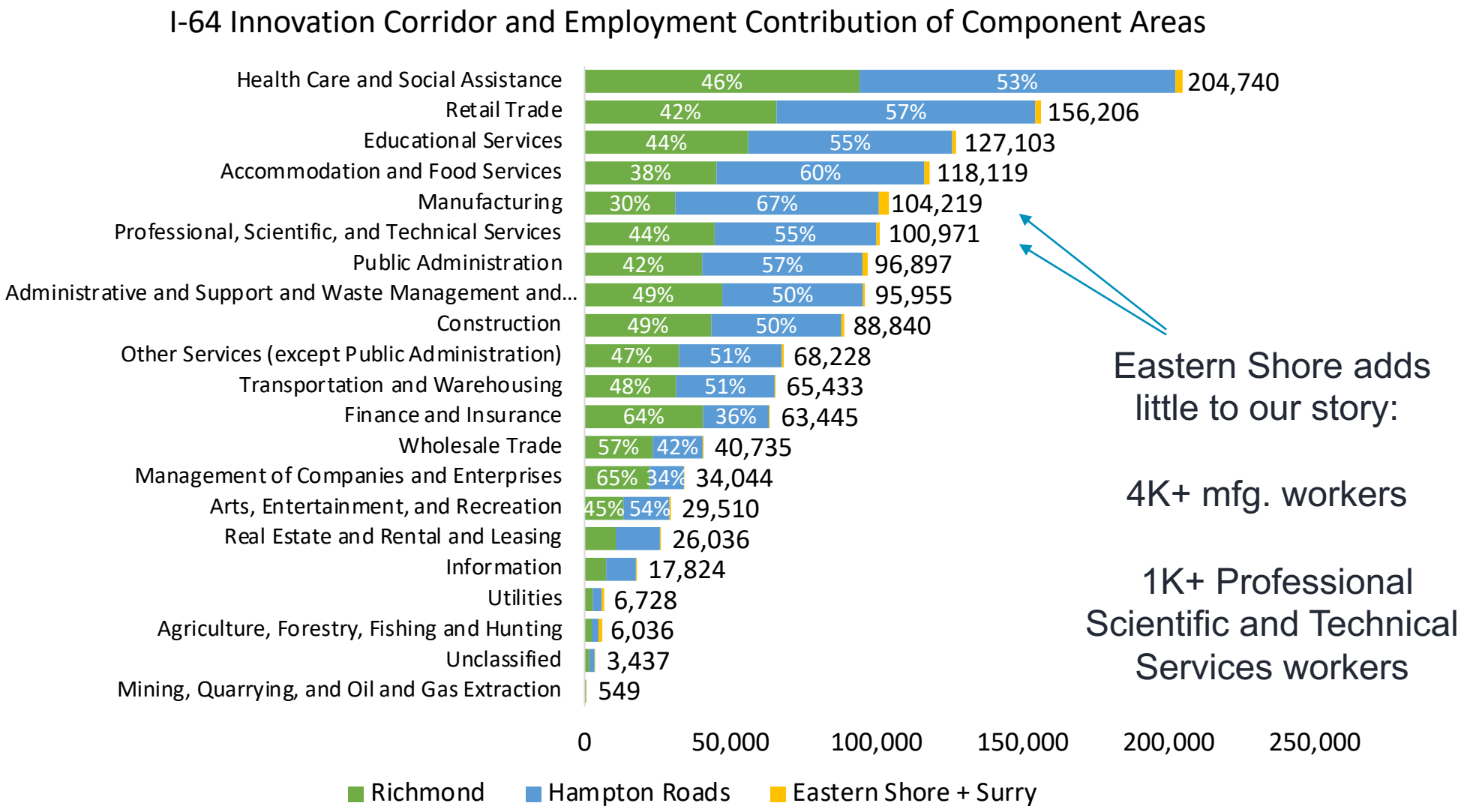
Charlottesville adds to our story:

22K+ healthcare and social assistance workers

9K+ Professional Scientific and Technical Services workers

Source: Chmura, JobsEQ®

I-64 Innovation Corridor with Eastern Shore



Source: Chmura, JobsEQ®

3

I-64 INNOVATION CORRIDOR TODAY

COMMUTE PATTERNS

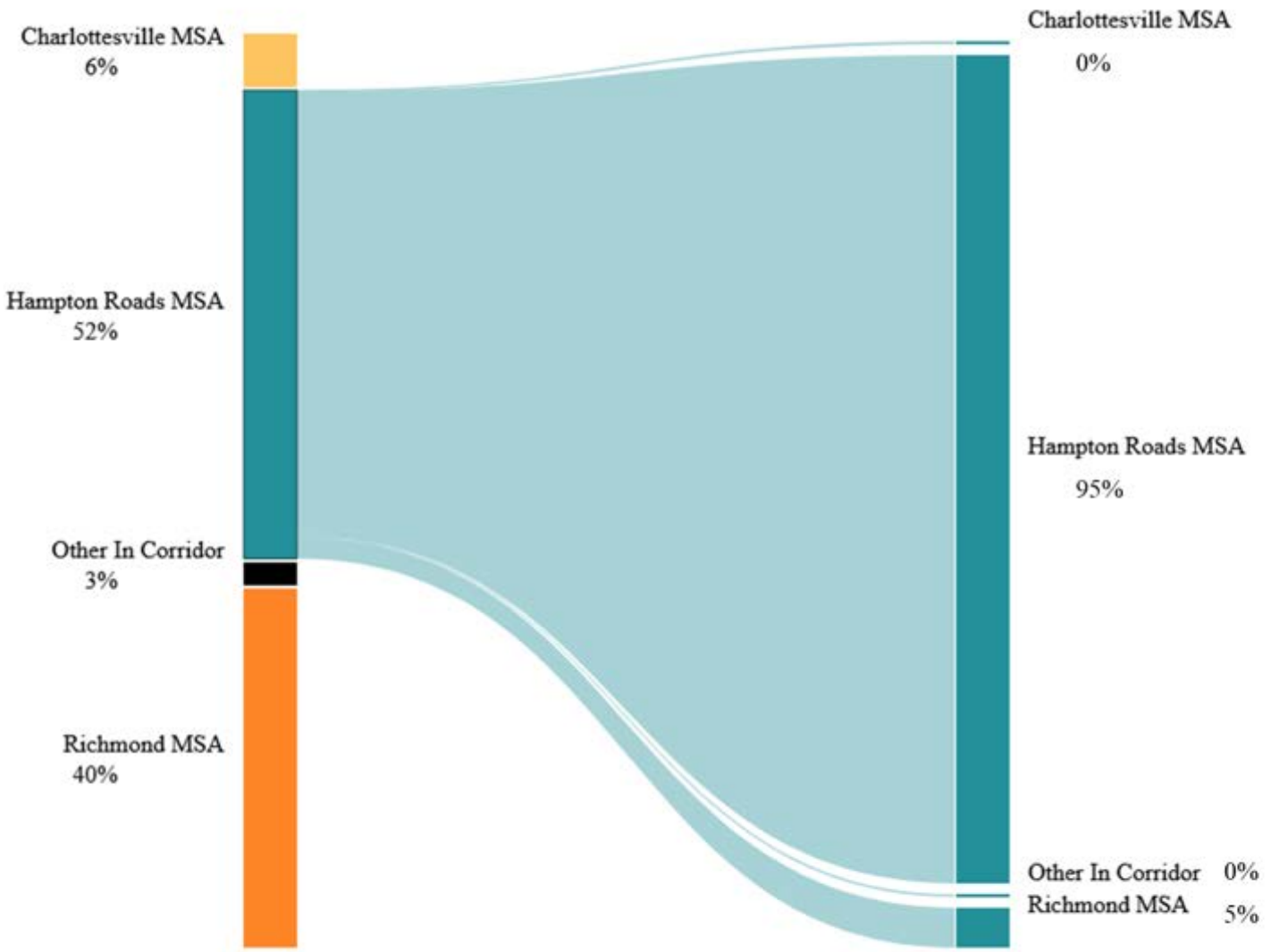
KEY TAKEAWAYS

LABOR MARKET

- Commuting patterns show most commuters stay within their metropolitan statistical areas (MSAs).
- Residents of the counties of York and James City and the City of Williamsburg commute both within Hampton Roads and to Richmond.
- The impact of COVID-19 on remote work is discussed in Topic 2*:* Future of work.

Place of Residence

Place of Work

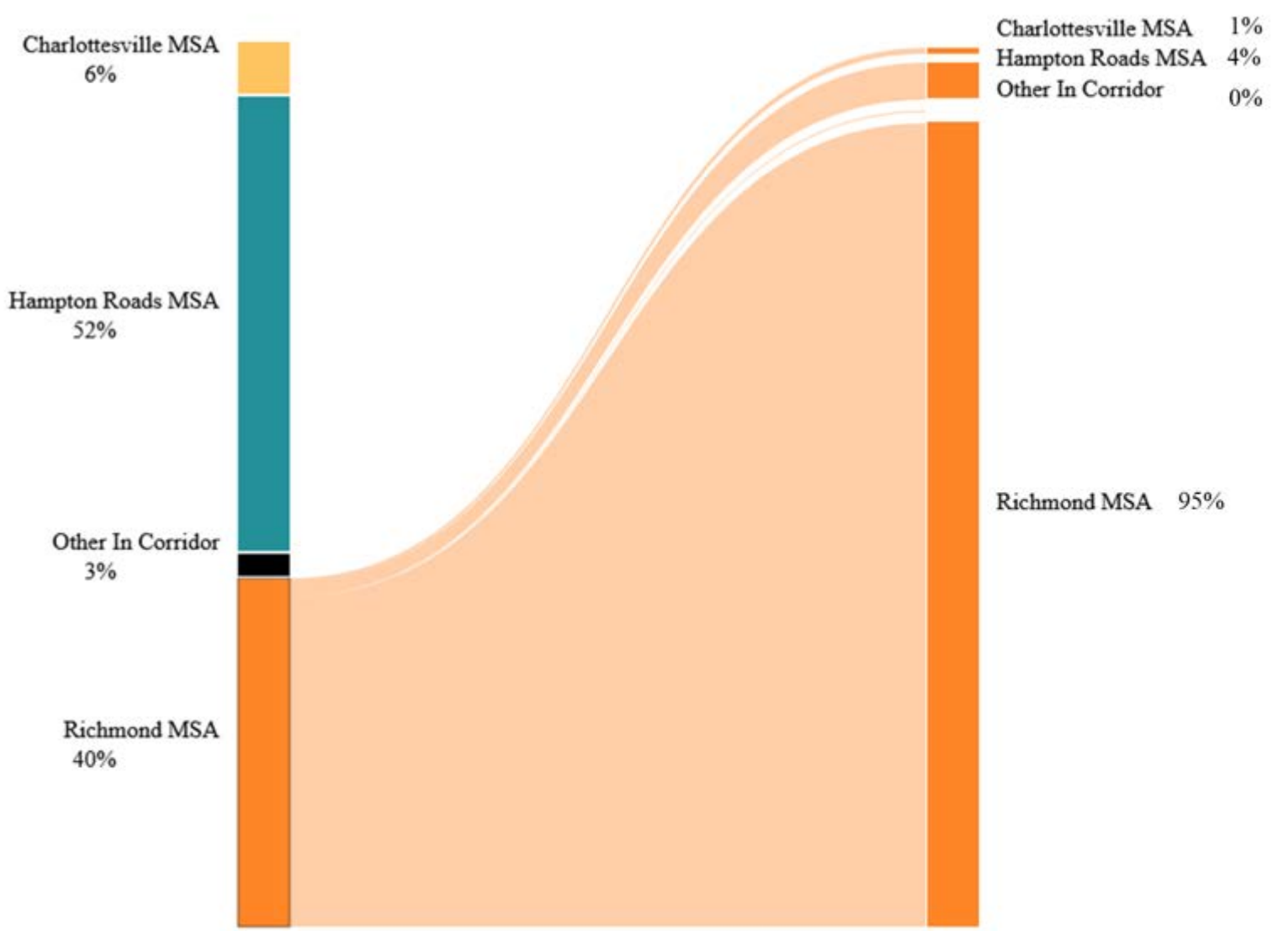


95% of workers in the 757 also live in the 757.

Source: Chmura, JobsEQ®

Place of Residence

Place of Work

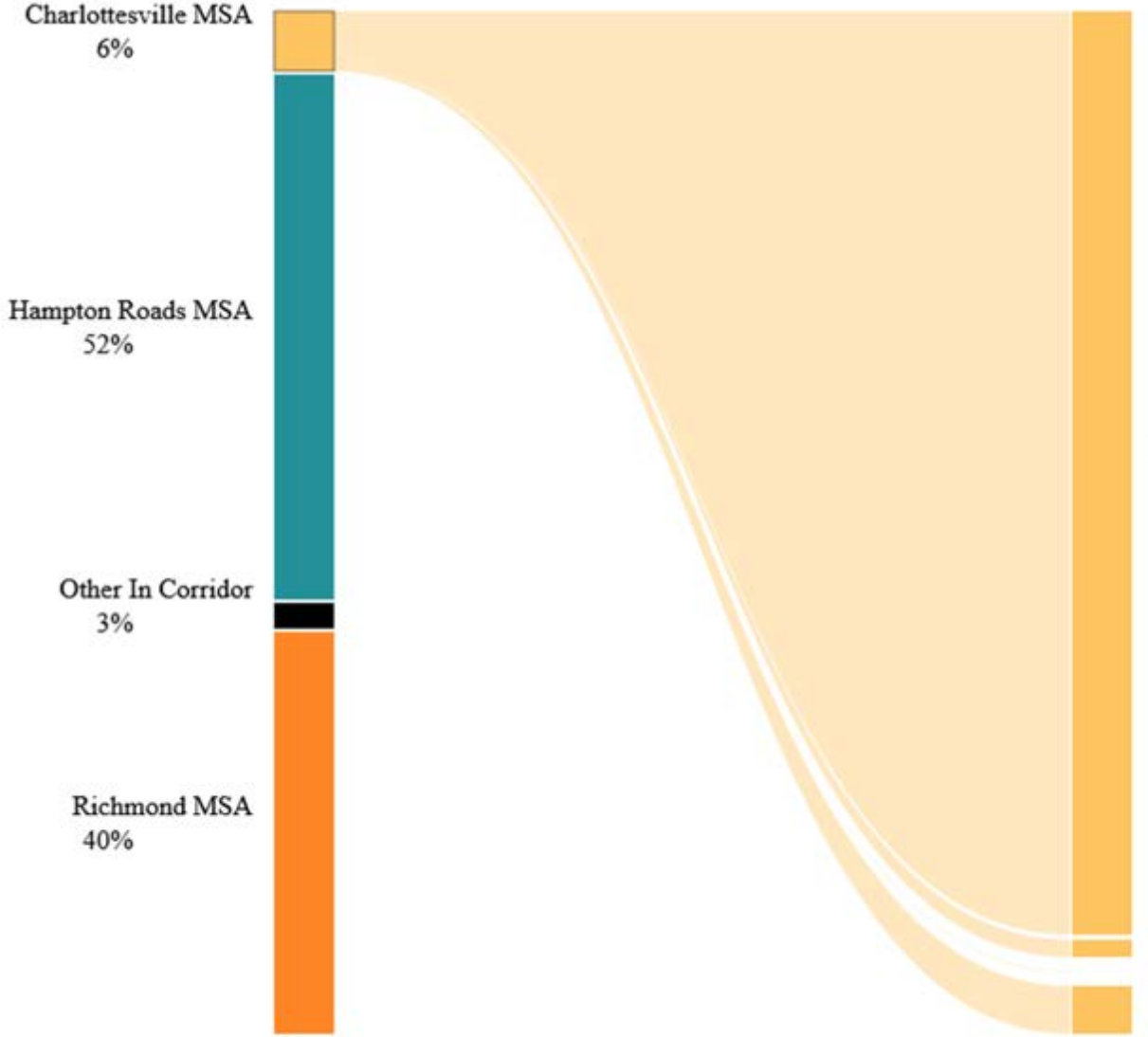


95% of workers in RVA also live in RVA.

Source: Chmura, JobsEQ®

Place of Residence

Place of Work

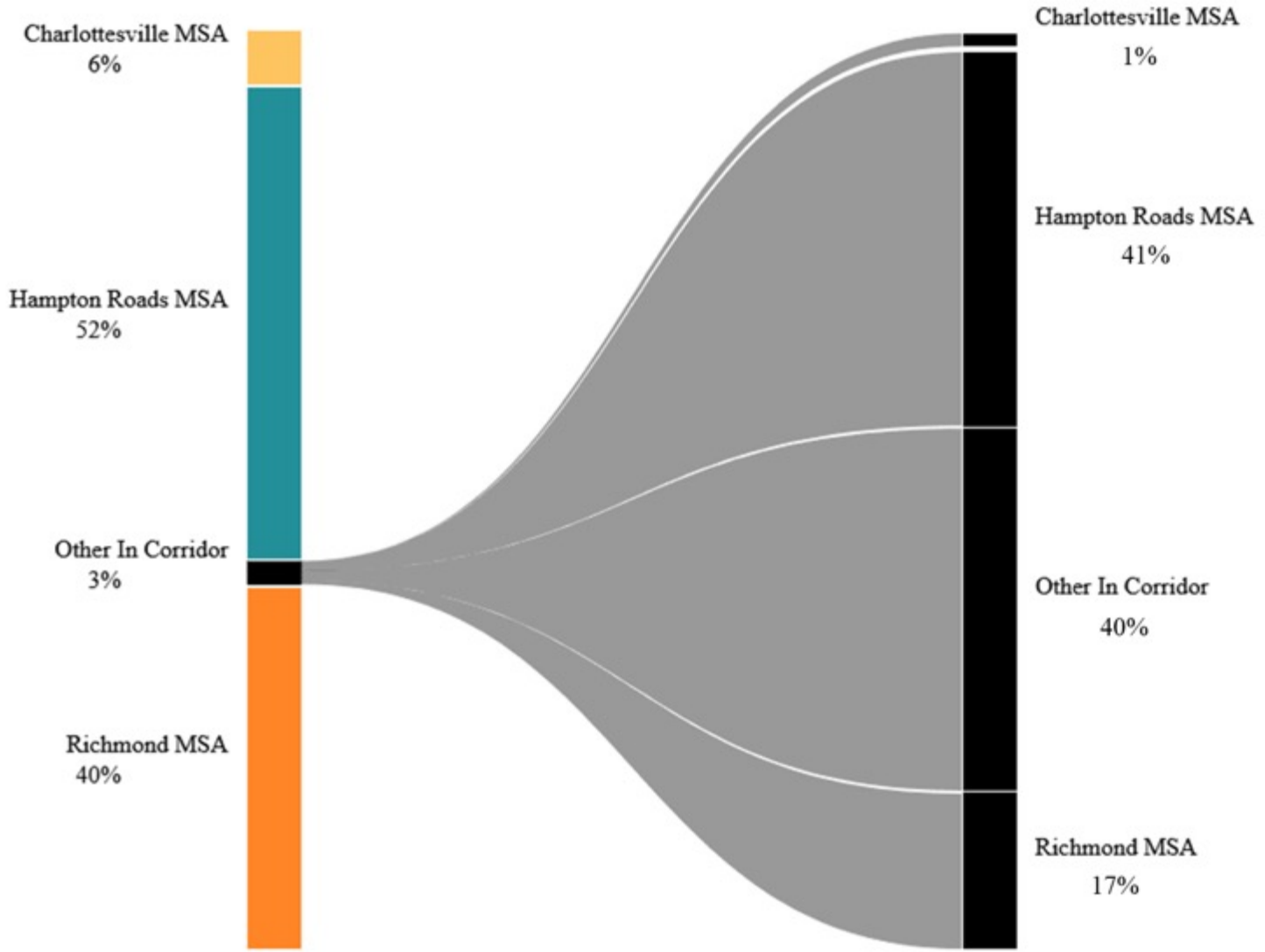


93% of workers in Charlottesville MSA also live in the Charlottesville MSA.

Source: Chmura, JobsEQ®

Place of Residence

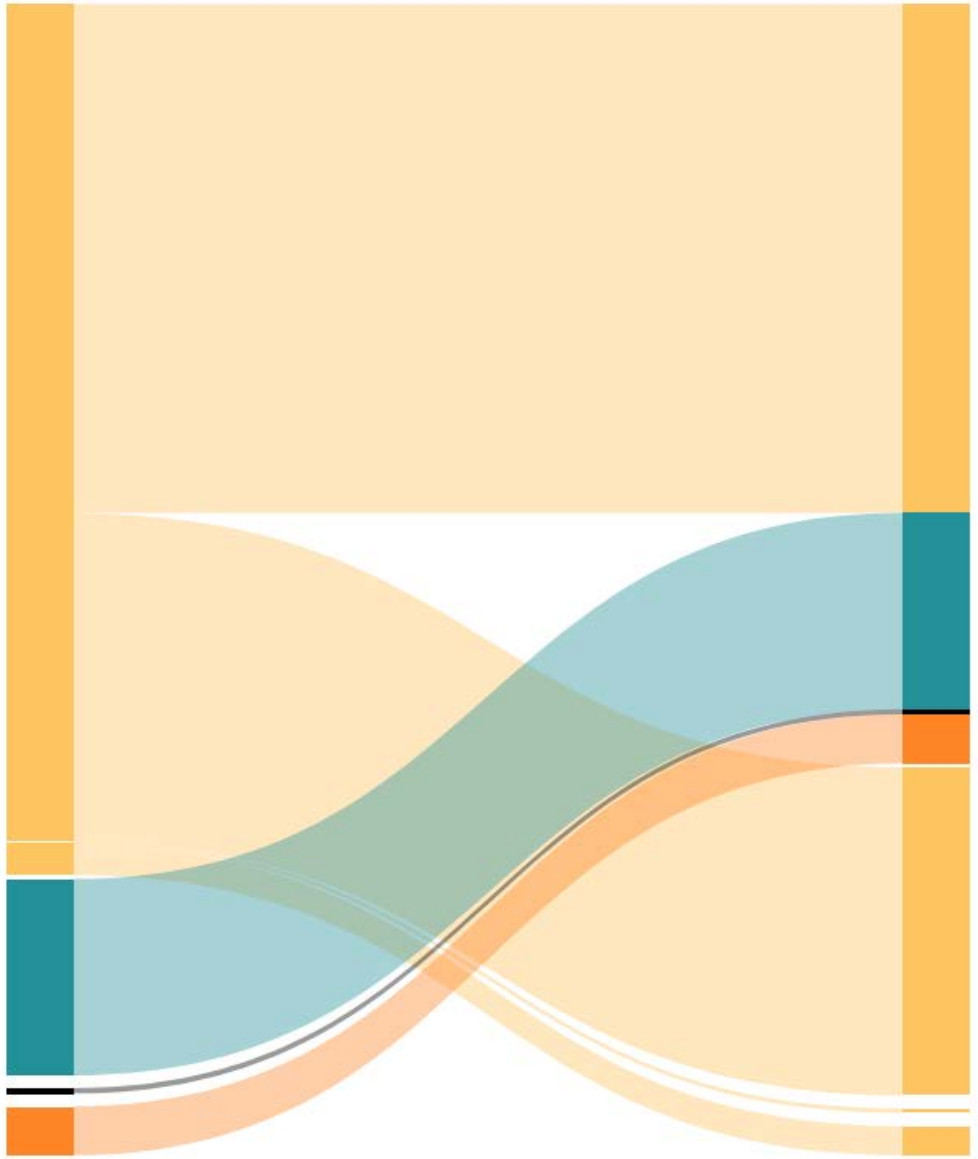
Place of Work



Source: Chmura, JobsEQ®

Place of Residence

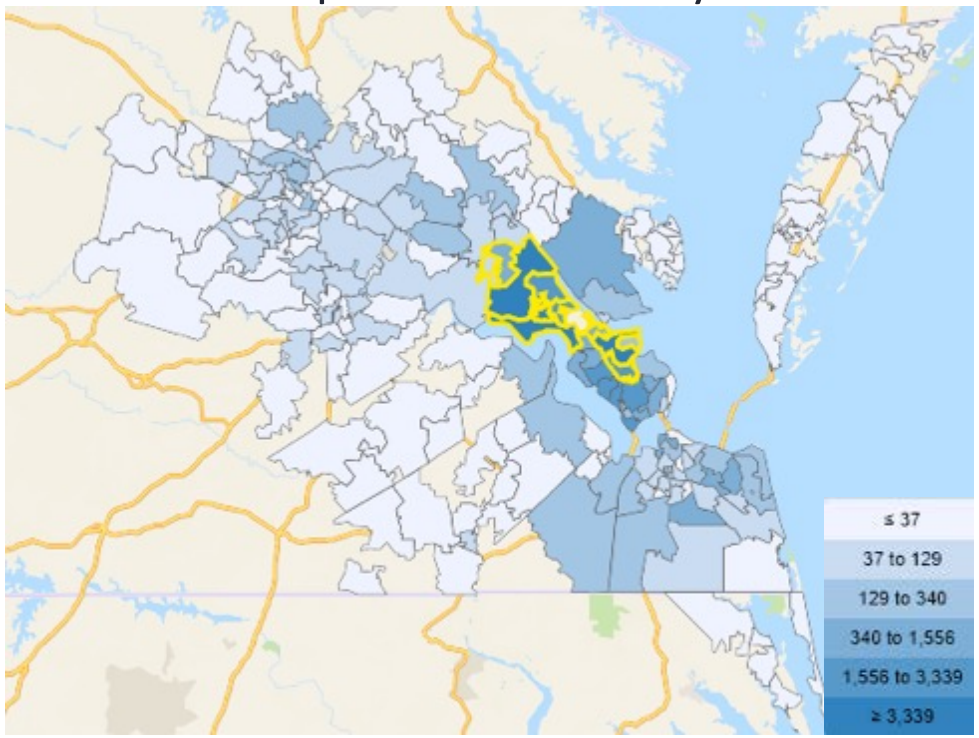
Place of Work



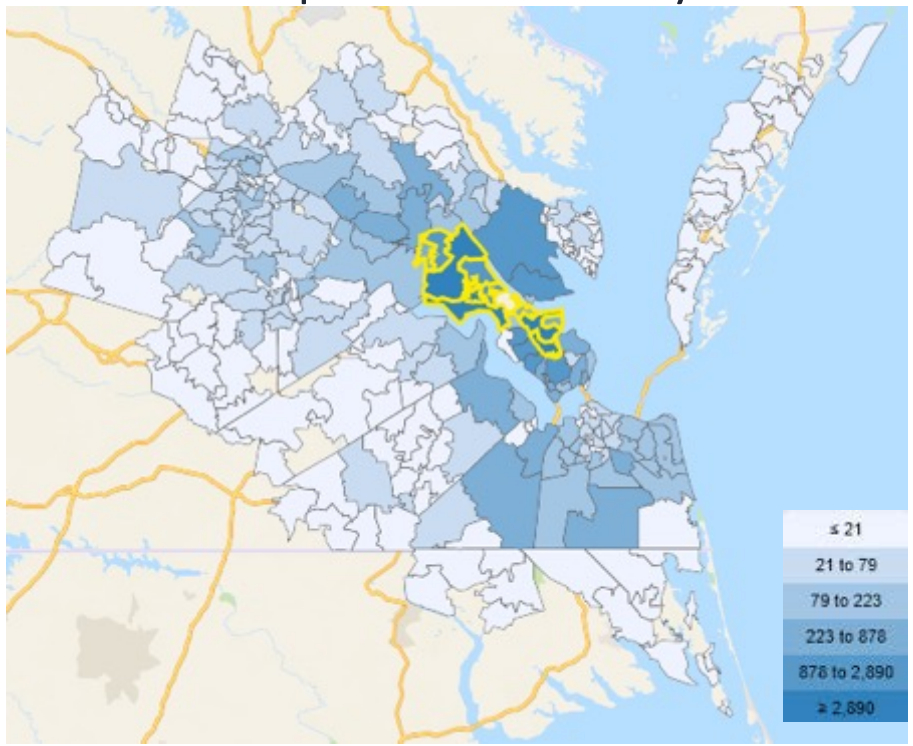
Source: Chmura, JobsEQ®

Greater Williamsburg area commuters come from and work in both MSAs.

Residents of Greater Williamsburg Partnership and Where They Work



Workers in Greater Williamsburg Partnership and Where They Live



Source: Chmura, JobsEQ®

4

I-64 INNOVATION CORRIDOR TODAY

INDUSTRY & OCCUPATION MIX

KEY TAKEAWAYS

INDUSTRY MIX

- Today, the I-64 Innovation Corridor industry mix is diverse with few advantages over other regions.
- By far, the highest industry specialization (based on Location Quotient) is ship and boat building because of its presence in the Hampton Roads MSA. The lowest industry specializations are computer systems design and related services, along with individual and family services.
- In addition to ship and boat building, the I-64 Innovation Corridor's industries with an advantage over other markets are:
    - National Security and International Affairs
    - Management of Companies and Enterprises
    - Justice, Public Order, and Safety Activities
    - Architectural, Engineering, and Related Services
    - Non-depository Credit Intermediation
    - Tourism – Other Amusement and Recreation Industries
- Like most regions around the country, the largest number of people in 2020 worked in restaurants and other eating places, followed closely by elementary and secondary schools.
- Eleven of the 20 largest industries in the Corridor pay an annual wage higher than $53,000 for the overall region. Banks (the non-depository credit intermediation industry) pay highest annual average wages at $125,014. This is closely followed by management of companies and enterprises at $116,114.
- Restaurants and other eating places pay the lowest annual average wage of $17,861, which reflects the fact that many workers in this industry are part time.

Top 20 Industries by Employment Richmond MSA

Orange highlight is an industry unique in the top 20 across all five regions

NAICS	Industry	Empl 2020Q3	Avg Ann Wages	LQ
7225	Restaurants and Other Eating Places	37,230	$18,560	0.91
6111	Elementary and Secondary Schools	34,589	$43,902	1.01
6221	General Medical and Surgical Hospitals	25,927	$67,589	1.01
5511	Management of Companies and Enterprises	22,291	$125,000	2.21
5613	Employment Services	17,604	$41,439	1.26
5222	Non-depository Credit Intermediation	15,835	$138,007	6.23
9221	Justice, Public Order, and Safety Activities	15,572	$60,950	1.87
6113	Colleges, Universities, and Professional Schools	14,870	$60,877	1.16
4451	Grocery Stores	13,381	$28,387	1.14
2382	Building Equipment Contractors	13,334	$57,118	1.30
5617	Services to Buildings and Dwellings	12,883	$31,042	1.14
6211	Offices of Physicians	12,336	$99,908	1.04
6241	Individual and Family Services	11,060	$30,042	0.90
8131	Religious Organizations	10,281	$26,323	1.36
4931	Warehousing and Storage	8,739	$49,549	1.47
4523	General Merchandise Stores, including Warehouse Clubs and Supercenters	8,338	$25,537	0.94
5415	Computer Systems Design and Related Services	8,028	$94,075	0.81
7139	Other Amusement and Recreation Industries	7,486	$19,466	1.34
5242	Agencies, Brokerages, and Other Insurance Related Activities	7,169	$93,120	1.26
5413	Architectural, Engineering, and Related Services	6,787	$86,670	0.96

Source: Chmura, JobsEQ®

Top 20 Industries by Employment Hampton Roads MSA

NAICS	Industry	Empl 2020Q3	Avg Ann Wages	LQ
7225	Restaurants and Other Eating Places	59,095	$17,472	1.22
6111	Elementary and Secondary Schools	48,922	$42,790	1.21
3366	Ship and Boat Building	41,477	$75,668	45.22
6221	General Medical and Surgical Hospitals	26,564	$66,988	0.87
9281	National Security and International Affairs	24,469	$91,587	7.79
6211	Offices of Physicians	17,559	$90,616	1.24
5413	Architectural, Engineering, and Related Services	16,238	$82,444	1.93
4523	General Merchandise Stores, including Warehouse Clubs and Supercenters	15,580	$27,696	1.49
4451	Grocery Stores	15,496	$23,918	1.11
9221	Justice, Public Order, and Safety Activities	15,249	$58,945	1.55
5613	Employment Services	15,028	$38,175	0.90
5617	Services to Buildings and Dwellings	14,331	$28,098	1.07
6113	Colleges, Universities, and Professional Schools	13,334	$55,694	0.88
2382	Building Equipment Contractors	13,112	$53,454	1.08
5511	Management of Companies and Enterprises	11,620	$99,081	0.97
6241	Individual and Family Services	10,878	$30,147	0.75
8131	Religious Organizations	10,196	$19,191	1.14
5415	Computer Systems Design and Related Services	9,983	$85,006	0.85
7139	Other Amusement and Recreation Industries	9,602	$21,143	1.45
6216	Home Health Care Services	9,526	$25,623	1.14

Source: Chmura, JobsEQ®

Top 20 Industries by Employment I-64 Innovation Corridor

NAICS	Industry	Empl 2020Q3	Avg Ann Wages	LQ
7225	Restaurants and Other Eating Places	97,645	$17,861	1.07
6111	Elementary and Secondary Schools	84,727	$43,145	1.12
6221	General Medical and Surgical Hospitals	52,794	$67,125	0.92
3366	Ship and Boat Building	41,480	$75,665	24.20
5511	Management of Companies and Enterprises	34,044	$116,114	1.52
5613	Employment Services	32,724	$39,973	1.05
9221	Justice, Public Order, and Safety Activities	31,183	$59,833	1.69
9281	National Security and International Affairs	30,434	$90,470	5.19
6211	Offices of Physicians	30,407	$93,801	1.15
4451	Grocery Stores	29,227	$25,935	1.12
6113	Colleges, Universities, and Professional Schools	28,242	$58,421	0.99
5617	Services to Buildings and Dwellings	27,482	$29,474	1.10
2382	Building Equipment Contractors	26,616	$55,191	1.17
4523	General Merchandise Stores, including Warehouse Clubs and Supercenters	24,389	$26,843	1.24
5413	Architectural, Engineering, and Related Services	23,412	$83,383	1.49
6241	Individual and Family Services	22,636	$30,019	0.83
8131	Religious Organizations	20,637	$22,717	1.23
5222	Non-depository Credit Intermediation	19,636	$125,014	3.48
5415	Computer Systems Design and Related Services	18,236	$89,208	0.83
7139	Other Amusement and Recreation Industries	17,355	$20,448	1.40

Source: Chmura, JobsEQ®

KEY TAKEAWAYS

OCCUPATION MIX

- Our occupation mix is also diverse with some strengths over other regions.
- Marine engineers and naval architects have the highest concentration of occupations in the Corridor. Ship engineers and nuclear engineers also have a LQ greater than 6 in the Corridor.
- While computer-related industries are not in the top 20 industries for the Corridor, individuals with computer skills are in the top 20 occupations because these workers are needed in all industries. These include:
  - Information security analysts (often possess cybersecurity skills)
  - Computer and information research scientists
  - Mathematicians
- Compared with other regions like Nashville, Charlotte, and Jacksonville, the megaregion has relatively more healthcare occupations such as registered nurses, personal care aides, and nursing assistants.

Top 20 Occupations by LQ Richmond MSA

SOC	Occupation Description	Empl 2020Q3	Avg Ann Wages	LQ
23-2099	Legal Support Workers, All Other	901	$54,400	4.46
47-2132	Insulation Workers, Mechanical	387	$43,100	3.27
19-3032	Industrial-Organizational Psychologists	14	$103,700	3.08
33-1011	First-Line Supervisors of Correctional Officers	592	$54,000	3.04
33-3031	Fish and Game Wardens	91	$43,400	3.03
15-1212	Information Security Analysts	1,576	$97,500	2.91
53-5031	Ship Engineers	107	$71,200	2.84
15-2021	Mathematicians	36	$106,700	2.84
43-4041	Credit Authorizers, Checkers, and Clerks	298	$44,000	2.75
13-2041	Credit Analysts	787	$94,600	2.53
15-2031	Operations Research Analysts	1,075	$90,900	2.51
43-3011	Bill and Account Collectors	2,143	$42,200	2.18
51-9196	Paper Goods Machine Setters, Operators, and Tenders	918	$47,000	2.16
47-3011	Helpers--Brickmasons, Blockmasons, Stonemasons, and Tile and Marble Setters	204	$32,900	2.10
21-1092	Probation Officers and Correctional Treatment Specialists	755	$44,900	2.07
51-6021	Pressers, Textile, Garment, and Related Materials	288	$20,200	2.03
47-3012	Helpers--Carpenters	279	$33,600	2.03
25-1065	Political Science Teachers, Postsecondary	133	$95,600	2.03
47-3016	Helpers--Roofers	79	$28,900	2.03
25-1064	Geography Teachers, Postsecondary	33	$79,000	1.99

Source: Chmura, JobsEQ®

Top 20 Occupations by LQ Hampton Roads MSA

SOC	Occupation Description	Empl 2020Q3	Avg Ann Wages	LQ
17-2121	Marine Engineers and Naval Architects	1,936	$89,900	32.48
51-4192	Layout Workers, Metal and Plastic	818	$51,900	18.75
53-5031	Ship Engineers	695	$73,300	15.58
49-9096	Riggers	980	$50,500	8.52
17-2161	Nuclear Engineers	681	$119,600	7.55
53-5011	Sailors and Marine Oilers	1,192	$45,200	7.50
15-2021	Mathematicians	90	$99,300	6.05
23-2099	Legal Support Workers, All Other	1,341	$77,200	5.60
53-5021	Captains, Mates, and Pilots of Water Vessels	954	$78,500	5.40
49-2093	Electrical and Electronics Installers and Repairers, Transportation Equipment	250	$63,000	5.35
47-2132	Insulation Workers, Mechanical	663	$50,600	4.72
49-3051	Motorboat Mechanics and Service Technicians	496	$41,800	4.07
19-2099	Physical Scientists, All Other	358	$110,000	3.47
51-2051	Fiberglass Laminators and Fabricators	343	$39,000	3.33
19-3099	Social Scientists and Related Workers, All Other	577	$86,200	3.28
19-3094	Political Scientists	138	$122,900	3.27
17-2021	Agricultural Engineers	26	$97,400	3.18
51-2041	Structural Metal Fabricators and Fitters	1,225	$41,300	3.14
27-1021	Commercial and Industrial Designers	634	$68,700	3.06
53-7041	Hoist and Winch Operators	63	$59,000	3.00

Source: Chmura, JobsEQ®

Top 20 Occupations by LQ: I-64 Innovation Corridor Strengths in Shipbuilding and Cyber

SOC	Occupation Description	Empl 2020Q3	Avg Ann Wages	LQ
17-2121	Marine Engineers and Naval Architects	1,967	$89,900	17.66
51-4192	Layout Workers, Metal and Plastic	833	$51,900	10.22
53-5031	Ship Engineers	804	$73,000	9.65
17-2161	Nuclear Engineers	1,032	$112,400	6.12
23-2099	Legal Support Workers, All Other	2,258	$68,000	5.04
49-9096	Riggers	1,067	$50,700	4.96
15-2021	Mathematicians	129	$101,300	4.63
53-5011	Sailors and Marine Oilers	1,342	$45,000	4.52
47-2132	Insulation Workers, Mechanical	1,051	$47,800	4.01
49-2093	Electrical and Electronics Installers and Repairers, Transportation Equipment	295	$63,600	3.38
53-5021	Captains, Mates, and Pilots of Water Vessels	1,051	$78,200	3.18
19-2099	Physical Scientists, All Other	513	$111,100	2.66
49-3051	Motorboat Mechanics and Service Technicians	596	$42,000	2.61
19-3099	Social Scientists and Related Workers, All Other	851	$84,400	2.59
19-3094	Political Scientists	201	$120,700	2.55
19-3032	Industrial-Organizational Psychologists	26	$104,000	2.54
15-1212	Information Security Analysts	2,968	$97,900	2.47
13-2031	Budget Analysts	1,113	$78,200	2.29
15-1221	Computer and Information Research Scientists	682	$121,900	2.26
33-1011	First-Line Supervisors of Correctional Officers	956	$56,500	2.21

Source: Chmura, JobsEQ®

Top 15 Detailed Occupations (and Percent of Total Employment)

I-64 Innovation Corridor	Nashville	Charlotte	Jacksonville
Cashiers (2.7%)	Retail Salespersons (2.6%)	Retail Salespersons (2.9%)	Customer Service Representatives (3.0%)
Retail Salespersons (2.6%)	Laborers and Freight, Stock, and Material Movers, Hand (2.5%)	Fast Food and Counter Workers (2.6%)	Retail Salespersons (2.9%)
Fast Food and Counter Workers (2.6%)	Customer Service Representatives (2.3%)	Laborers and Freight, Stock, and Material Movers, Hand (2.3%)	Fast Food and Counter Workers (2.7%)
Customer Service Representatives (2.0%)	Registered Nurses (2.2%)	Cashiers (2.3%)	Cashiers (2.4%)
Registered Nurses (2.0%)	Cashiers (2.1%)	Customer Service Representatives (2.3%)	Laborers and Freight, Stock, and Material Movers, Hand (2.3%)
Office Clerks, General (1.9%)	Office Clerks, General (2.0%)	Office Clerks, General (1.9%)	Registered Nurses (2.1%)
Laborers and Freight, Stock, and Material Movers, Hand (1.7%)	Fast Food and Counter Workers (2.0%)	Registered Nurses (1.6%)	Office Clerks, General (2.0%)
Stockers and Order Fillers (1.5%)	Heavy and Tractor-Trailer Truck Drivers (1.8%)	Heavy and Tractor-Trailer Truck Drivers (1.5%)	Waiters and Waitresses (1.7%)
Janitors and Cleaners, Except Maids and Housekeeping Cleaners (1.5%)	Stockers and Order Fillers (1.7%)	Stockers and Order Fillers (1.5%)	Heavy and Tractor-Trailer Truck Drivers (1.6%)
Waiters and Waitresses (1.5%)	Waiters and Waitresses (1.6%)	General and Operations Managers (1.4%)	Stockers and Order Fillers (1.6%)
Personal Care Aides (1.4%)	General and Operations Managers (1.6%)	Waiters and Waitresses (1.4%)	General and Operations Managers (1.6%)
General and Operations Managers (1.4%)	Secretaries and Administrative Assistants, Except Legal, Medical, and Executive (1.5%)	Secretaries and Administrative Assistants, Except Legal, Medical, and Executive (1.3%)	Secretaries and Administrative Assistants, Except Legal, Medical, and Executive (1.4%)
Heavy and Tractor-Trailer Truck Drivers (1.2%)	Team Assemblers (1.3%)	Janitors and Cleaners, Except Maids and Housekeeping Cleaners (1.2%)	Janitors and Cleaners, Except Maids and Housekeeping Cleaners (1.4%)
Nursing Assistants (1.1%)	First-Line Supervisors of Office and Administrative Support Workers (1.3%)	Bookkeeping, Accounting, and Auditing Clerks (1.2%)	First-Line Supervisors of Office and Administrative Support Workers (1.2%)
Secretaries and Administrative Assistants, Except Legal, Medical, and Executive (1.1%)	Janitors and Cleaners, Except Maids and Housekeeping Cleaners (1.3%)	First-Line Supervisors of Office and Administrative Support Workers (1.1%)	Bookkeeping, Accounting, and Auditing Clerks (1.1%)

Source: Chmura, JobsEQ®

Relative to Jacksonville, the Corridor has a lower concentration of laborers and material movers and registered nurses. The Corridor has relatively more healthcare occupations such as personal care aides and nursing assistants.

5

I-64 INNOVATION CORRIDOR TODAY

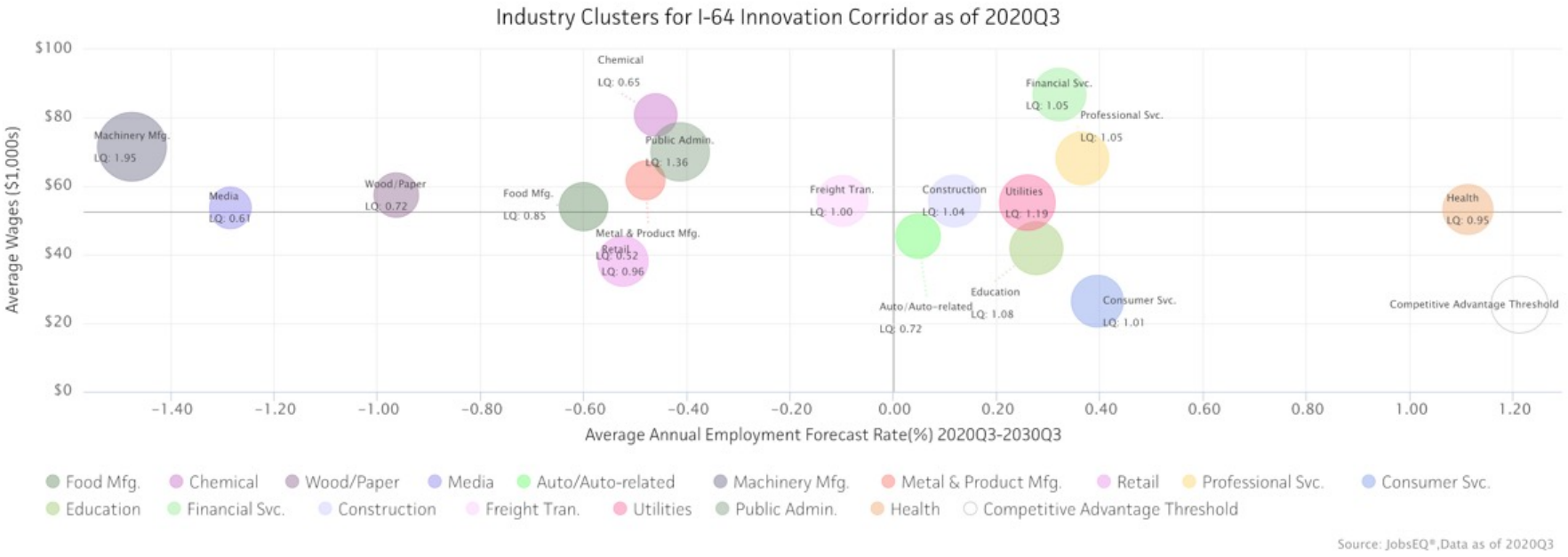
CLUSTERS

KEY TAKEAWAYS

CLUSTERS

- In our megaregion, opportunities may exist in the areas of health, financial, professional services, and IT.
  - Industry Clusters: Health, financial services, professional services
  - Occupation Clusters: IT, health sciences
- Clusters are interconnected in both businesses and suppliers.
- Both the financial and professional services clusters reflect relatively high wages and a strong employment forecast.
- The machinery manufacturing cluster, which contains shipbuilding, has the largest LQ in the Corridor. Although it has one of the highest wages, its forecasted employment is expected to decrease faster than any other cluster in the Corridor.

High growth, high paying industry clusters: Health, Financial Services, Professional Services



Clusters are interconnected businesses and suppliers. For example, agriculture includes crop and animal production as well animal food manufacturing and pesticide manufacturing.

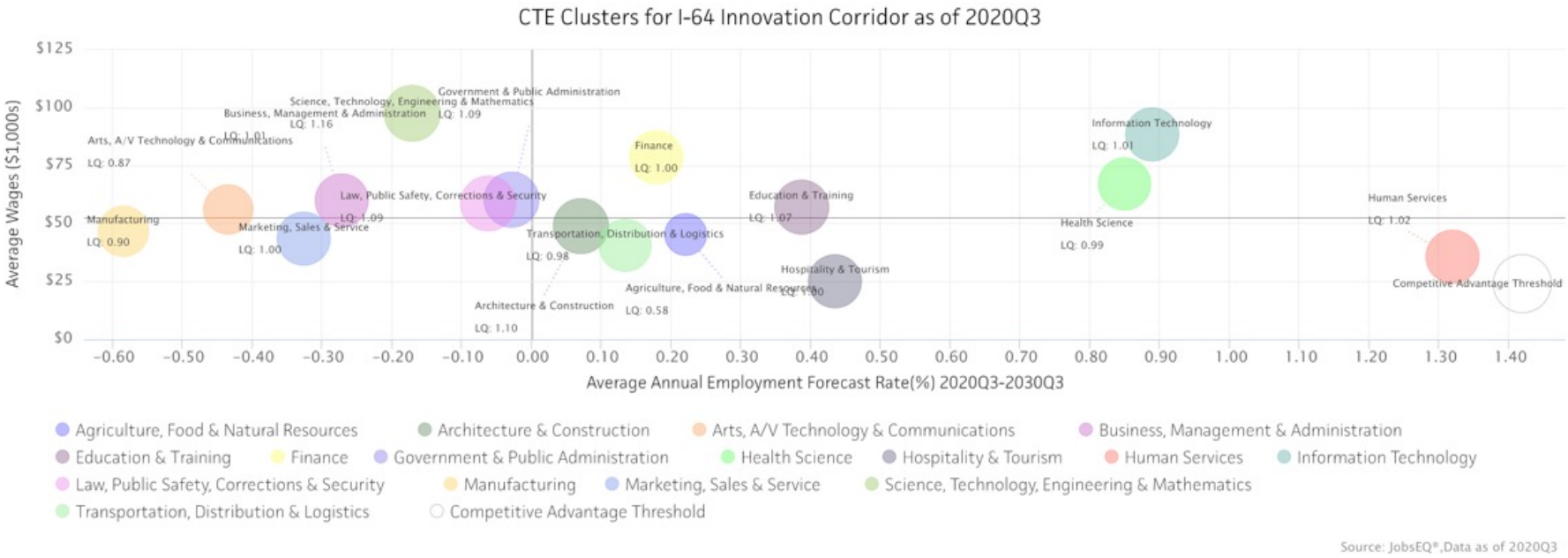
This graph shows average wages on the vertical axis, forecasted employment growth rate over a 10-year period on the horizontal axis, and the location quotient (LQ) of each industry cluster based on the size of the circle with larger circles representing a higher LQ.

Both the financial and professional services clusters are in the upper right quadrant, reflecting their relatively high wages and strong employment forecast.

Healthy regions possess the largest LQs in the upper right quadrant that represents clusters that pay well and that are expected to increase employment at the fastest pace over the next ten years.

The machinery manufacturing cluster, which contains shipbuilding, has the largest LQ in the Corridor. Although it has one of the highest wages it is forecasted employment is expected to decrease faster than any other cluster in the Corridor.

High growth, high-paying occupation clusters: IT, Health Science, Human Services



Similar to industries, occupations can be grouped into clusters. The clusters above are based on the National Career Clusters Framework (https://careertech.org/career-clusters) that organizes occupations for Career Technical Education (CTE) programs, curriculum design, and instruction.

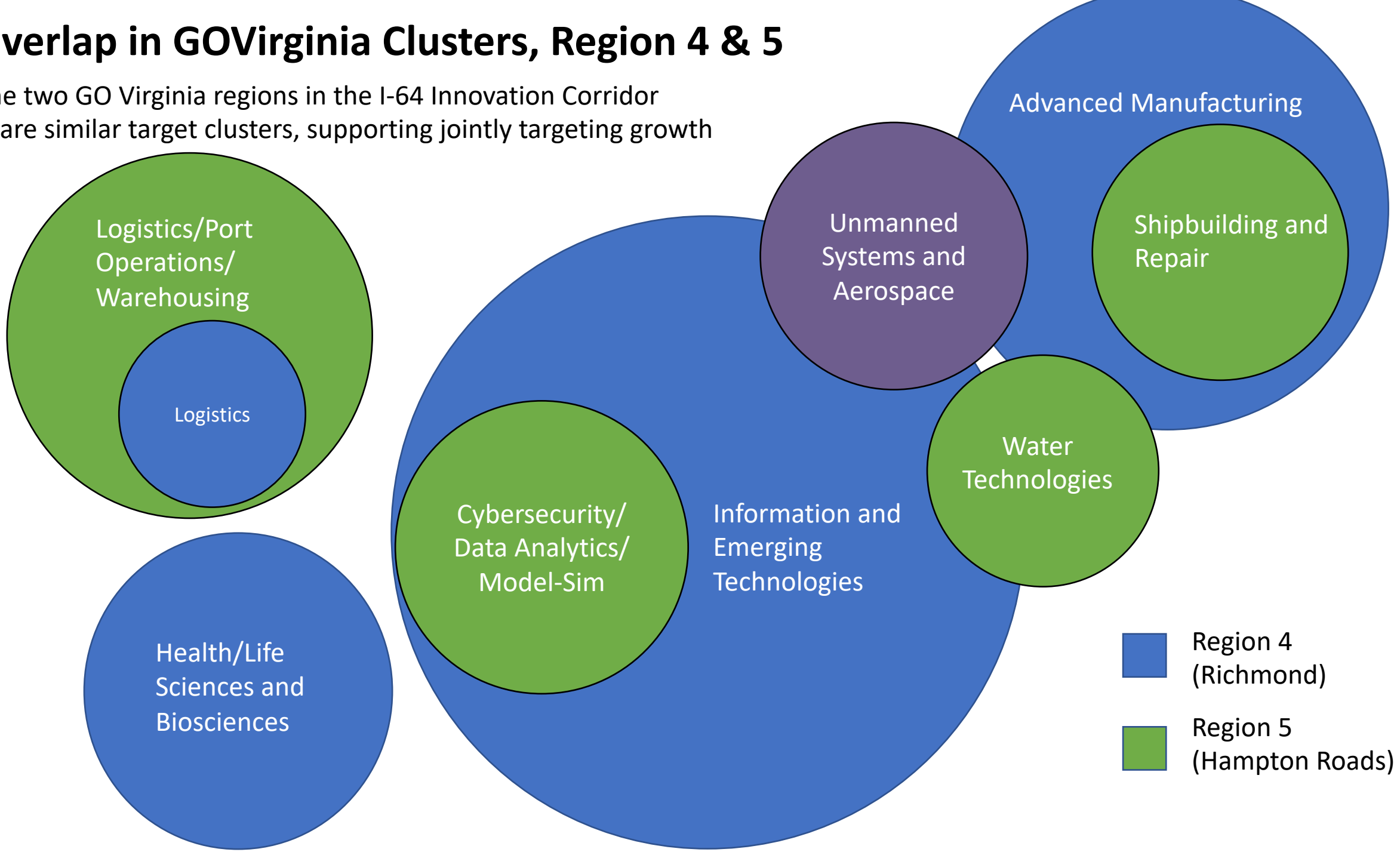
The graph above shows average wages on the vertical axis, forecasted employment growth rate over a 10-year period on the horizontal axis, and the location quotient (LQ) of each occupation cluster based on the size of the circle with larger circles representing a higher LQ.

The following four clusters in the Corridor are in the upper right quadrant:

- Information technology (0.89 annual average growth rate; $92,100 average wage, 1.01 LQ)
- Health science (0.85 annual average growth rate; $69,100 average wage, 0.99 LQ)
- Education and training (0.36 annual average growth rate; $57,000 average wage, 1.07 LQ)
- Finance (0.17 annual average growth rate; $79,700 average wage, 1.00 LQ)

Overlap in GOVirginia Clusters, Region 4 & 5

The two GO Virginia regions in the I-64 Innovation Corridor share similar target clusters, supporting jointly targeting growth



6

I-64 INNOVATION CORRIDOR TODAY

ALUMNI

KEY TAKEAWAYS
ALUMNI

- The I-64 Innovation Corridor has high output in awards related to jobs in the target clusters, especially measured to the population in the region.
- Particularly relevant programs include biological and physical sciences, network and system administration, automation engineering, engineering technologies, bioinformatics, and pharmaceutical sciences.
- Life Sciences-Related Awards, 2019:
  - Educational institutions award nearly 10,000 related awards, including registered nursing, biology, medicine, and biomedical sciences.
  - Not all graduates may be strongly linked to life sciences careers, such as general biology, biological sciences (a popular major for those considering medical school).
- IT-Related Awards, 2019:
  - Educational institutions award nearly 3,200 related awards, including general computer and information sciences, as well as computer and information systems security/information assurance, which is closely linked to cyber security jobs.
- Transportation, Distribution, and Logistics-Related Awards, 2019:
  - Relative to other industry clusters, fewer jobs in transportation, distribution, and logistics typically require a higher education degree. Educational institutions award nearly 800 related awards, primarily certificates and 2-year awards.

#1 in Awards per 10K Population: Pipeline in Life Sciences, Manufacturing, IT

Program (CIP Codes): Ranking Based on Number of Graduates in I-64 Innovation Corridor)	I-64 Innovation Corridor	Charlotte	Denver	Columbus	Atlanta	Nashville	Jacksonville	Orlando-Tampa	Raleigh	DC
Biology/Biological Sciences, General	3.8	2.0	1.7	2.6	2.4	1.9	1.2	1.6	2.7	2.4
Biological and Physical Sciences	1.9		0.04			0.2		0.01		0.6
Medicine	1.2		0.6	0.8	0.3	1.0		0.5		0.7
Network and System Administration/Administrator	1.1		0.01	0.03	1.0		0.6	0.9		0.1
Mechanical Engineering Related Technologies/Technicians, Other	1.0			0.2						
Chemistry, General	1.0	0.4	0.4	0.7	0.8	0.5	0.3	0.3	0.5	0.3
Medical Office Assistant/Specialist	0.9		0.1	0.04	0.1		0.1	0.3	0.1	0.1
Computer Technology/Computer Systems Technology	0.7				0.03		0.1	0.1		0.05
Physical Sciences	0.6									
Engineering Technologies and Engineering-Related Fields, Other	0.6	0.3		0.02	0.03					0.02
Engineering, Other	0.5			0.3						0.1
Electrical, Electronic and Communications Engineering Technology/Technician	0.5	0.4	0.1	0.2	0.2	0.1	0.0	0.2	0.3	0.2
Radiologic Technology/Science - Radiographer	0.5	0.1	0.3	0.1	0.2	0.1	0.0	0.2	0.5	0.1
Automation Engineer Technology/Technician	0.4							0.02		
Industrial Production Technologies/Technicians, Other	0.3	0.01		0.01	0.03					
Health and Medical Administrative Services, Other	0.3									0.1
Bioinformatics	0.1	0.1			0.1	0.04		0.01	0.03	0.03
Molecular Biochemistry	0.1									0.1
Bioethics/Medical Ethics	0.1			0.02	0.01					
Reproductive Biology	0.1									
Pharmaceutical Sciences	0.04									
Natural Sciences	0.03									
Total - All Programs	142	97	147	164	107	129	114	182	163	169

Source: Chmura, JobsEQ®

Life-Sciences Related Awards

9,736 Awards in 2019

CIP Code	Title	Certificates and 2yr Awards	4yr Awards	Postgraduate Awards	Total Awards
51.3801	Registered Nursing/Registered Nurse	1,425	967	74	2,466
26.0101	Biology/Biological Sciences, General	1	1,141	36	1,178
51.3901	Licensed Practical/Vocational Nurse Training	993	0	0	993
51.0801	Medical/Clinical Assistant	755	0	0	755
30.0101	Biological and Physical Sciences	470	98	10	578
51.1201	Medicine	0	0	358	358
40.0501	Chemistry, General	0	279	33	312
51.0710	Medical Office Assistant/Specialist	289	0	0	289
51.0701	Health/Health Care Administration/Management	0	172	52	224
51.3818	Nursing Practice	0	73	122	195
51.2001	Pharmacy	0	0	183	183
51.0911	Radiologic Technology/Science - Radiographer	123	40	0	163
51.9999	Health Professions and Related Clinical Sciences, Other	0	119	10	129
51.0601	Dental Assisting/Assistant	126	0	0	126
26.9999	Biological and Biomedical Sciences, Other	0	0	111	111
51.0401	Dentistry	0	0	101	101
43.0106	Forensic Science and Technology	28	57	14	99
51.0908	Respiratory Care Therapy/Therapist	89	0	0	89
51.0602	Dental Hygiene/Hygienist	16	65	7	88
26.0102	Biomedical Sciences, General	0	78	5	83
26.1501	Neuroscience	0	76	6	82

Source: Chmura, JobsEQ®

IT-Related Awards

3,198 Awards in 2019

Title	Certificates and 2yr Awards	4yr Awards	Postgraduate Awards	Total Awards
Computer and Information Sciences, General	192	271	94	557
Computer and Information Systems Security/Information Assurance	36	362	101	499
Network and System Administration/Administrator	348	0	0	348
Information Science/Studies	4	215	11	230
Computer Technology/Computer Systems Technology	148	75	0	223
Management Information Systems, General	0	193	0	193
Engineering Technologies and Engineering-Related Fields, Other	0	174	0	174
Electrical, Electronic and Communications Engineering Technology/Technician	163	4	0	167
Computer Science	0	141	6	147
Automation Engineer Technology/Technician	12	119	0	131
Electrical and Electronics Engineering	0	112	6	118
Computer Programming, Specific Applications	0	88	0	88
Computer Engineering, General	0	71	0	71
Web Page, Digital/Multimedia and Information Resources Design	41	11	0	52
Information Technology	31	8	0	39
Industrial Electronics Technology/Technician	38	0	0	38
Management Information Systems and Services, Other	0	29	0	29
Computer Programming/Programmer, General	28	0	0	28

Source: Chmura, JobsEQ®

Transportation, Distribution, & Logistics Awards

782 Awards in 2019

Title	Certificates and 2yr Awards	4yr Awards	Postgraduate Awards	Total Awards
Automobile/Automotive Mechanics Technology/Technician	342	0	0	342
Truck and Bus Driver/Commercial Vehicle Operator and Instructor	115	0	0	115
Diesel Mechanics Technology/Technician	97	0	0	97
Airframe Mechanics and Aircraft Maintenance Technology/Technician	90	0	0	90
Medium/Heavy Vehicle and Truck Technology/Technician	41	0	0	41
Logistics, Materials, and Supply Chain Management	13	0	22	35
Ground Transportation, Other	33	0	0	33
Purchasing, Procurement/Acquisitions and Contracts Management	0	15	0	15
Aviation/Airway Management and Operations	0	11	0	11
Sales, Distribution, and Marketing Operations, General	0	2	0	2
Aeronautics/Aviation/Aerospace Science and Technology, General	1	0	0	1
Aircraft Powerplant Technology/Technician	0	0	0	0
Air Traffic Controller	0	0	0	0
Transportation and Materials Moving, Other	0	0	0	0
Transportation/Mobility Management	0	0	0	0

Source: Chmura, JobsEQ®

7

I-64 INNOVATION CORRIDOR TODAY

TALENT RETENTION & ATTRACTION

KEY TAKEAWAYS

TALENT RETENTION & ATTRACTION

- We have a talent retention challenge. Only 50% of alumni from the region stay or return for work.
- Graduates with a bachelor's degree or higher are more mobile.
- The region is losing potential workers to other cities such as Washington D.C., New York, Atlanta, and Philadelphia.
- Retention varies by industry.
    - The top destinations of graduates are largely the same by program for those with arts-related or business-related awards.
    - 39% of those who earned an award in a life sciences-related program left the region. A high percentage of leaving may be expected for highly-specialized programs such as neuroscience or molecular biology where the Corridor does not have a large enough population or number of employers to need so many graduates.
    - An estimated 43% of those who earned an award in an IT-related program left the region, led by those in engineering programs such as systems engineering or electrical engineering.
    - An estimated 80% of those who earned an award in transportation, distribution, and logistics-related programs left the region, led by those with training for supervisory positions such as transportation management, supply chain, logistics, and logistics management.
- Veterans exit the military with valuable skills and retaining this talent can help fill in-demand jobs.

Brain Drain in the Corridor

We are educating the people who could support our four promising growth categories

- **Transportation, Distribution, & Logistics-Related Programs**
  - 800 awards in 2019
  - 80% left
- **IT-Related Programs:**
  - 3,200 awards in 2019
  - 43% left
- **National Security / Cyber Security**
  - 1,600 awards in 2019
  - 40% left
  - More than half of exiting military stay in Hampton Roads
- **Life Sciences-Related Programs:**
  - 9,700 awards in 2019
  - 39% left

Resumes with Keyword “Veteran” Living in Corridor

Occupation	Total Resumes
Social and Human Service Assistants	135
Human Resources Specialists	98
Customer Service Representatives	88
Network and Computer Systems Administrators	70
Medical Secretaries and Administrative Assistants	69
Medical and Health Services Managers	68
Computer User Support Specialists	68
Secretaries and Administrative Assistants, Except Legal, Medical, and Executive	67
First-Line Supervisors of Office and Administrative Support Workers	58
Security Guards	57
Training and Development Specialists	54
Stockers and Order Fillers	53
Business Operations Specialists, All Other	52
Retail Salespersons	45
Mental Health and Substance Abuse Social Workers	43
Registered Nurses	43
Maintenance and Repair Workers, General	43
First-Line Supervisors of Retail Sales Workers	41
Securities, Commodities, and Financial Services Sales Agents	40
Sales Representatives of Services, Except Advertising, Insurance, Financial Services, and Travel	40

Source: *Chmura’s JobsEQ*® Data reflect an online sample of resumes that have been updated within the six years ending 2020Q4

Alumni Retention: Half from I-64 Innovation Corridor Leave Region, 30% Return

Region	Stayed or Returned	Left
Philadelphia-Camden-Wilmington, PA-NJ-DE-MD MSA	61%	39%
Charlotte-Concord-Gastonia, NC-SC MSA	60%	40%
Atlanta-Sandy Springs-Alpharetta, GA MSA	56%	44%
Jacksonville, FL MSA	54%	46%
Washington-Arlington-Alexandria, DC-VA-MD-WV MSA	53%	47%
Denver-Aurora-Lakewood, CO MSA	53%	47%
Pittsburgh, PA MSA	53%	47%
Nashville-Davidson--Murfreesboro--Franklin, TN MSA	51%	49%
I-64 Innovation Corridor	50%	50%
Columbus, OH MSA	50%	50%
Orlando-Tampa FL Megaregion	48%	52%
Raleigh-Cary, NC MSA	44%	56%

Where do alumni of postsecondary institutions in the I-64 Innovation Corridor reside?

	Associate or Certificate	Bachelor's or Higher	Total
Virginia Beach-Norfolk-Newport News, VA-NC MSA	41.7%	23.6%	29.0%
Richmond, VA MSA	26.2%	21.9%	23.1%
Washington-Arlington-Alexandria, DC-VA-MD-WV MSA	3.6%	17.2%	12.8%
New York-Newark-Jersey City, NY-NJ-PA MSA	0.9%	4.1%	3.1%
Atlanta-Sandy Springs-Alpharetta, GA MSA	1.7%	2.6%	2.3%
Philadelphia-Camden-Wilmington, PA-NJ-DE-MD MSA	0.6%	1.7%	1.3%
Charlotte-Concord-Gastonia, NC-SC MSA	0.9%	1.4%	1.3%
Baltimore-Columbia-Towson, MD MSA	0.6%	1.6%	1.3%
Raleigh-Cary, NC MSA	0.8%	1.3%	1.1%
Miami-Fort Lauderdale-Pompano Beach, FL MSA	0.7%	1.1%	1.0%
Los Angeles-Long Beach-Anaheim, CA MSA	0.4%	1.1%	0.9%
Dallas-Fort Worth-Arlington, TX MSA	0.7%	0.8%	0.8%
Houston-The Woodlands-Sugar Land, TX MSA	0.6%	0.7%	0.7%
Charlottesville, VA MSA	0.4%	0.7%	0.6%
Chicago-Naperville-Elgin, IL-IN-WI MSA	0.3%	0.8%	0.6%
Durham-Chapel Hill, NC MSA	0.4%	0.6%	0.5%
Tampa-St. Petersburg-Clearwater, FL MSA	0.6%	0.5%	0.5%
Orlando-Kissimmee-Sanford, FL MSA	0.5%	0.5%	0.5%
Jacksonville, FL MSA	0.7%	0.4%	0.5%
Roanoke, VA MSA	0.3%	0.5%	0.4%

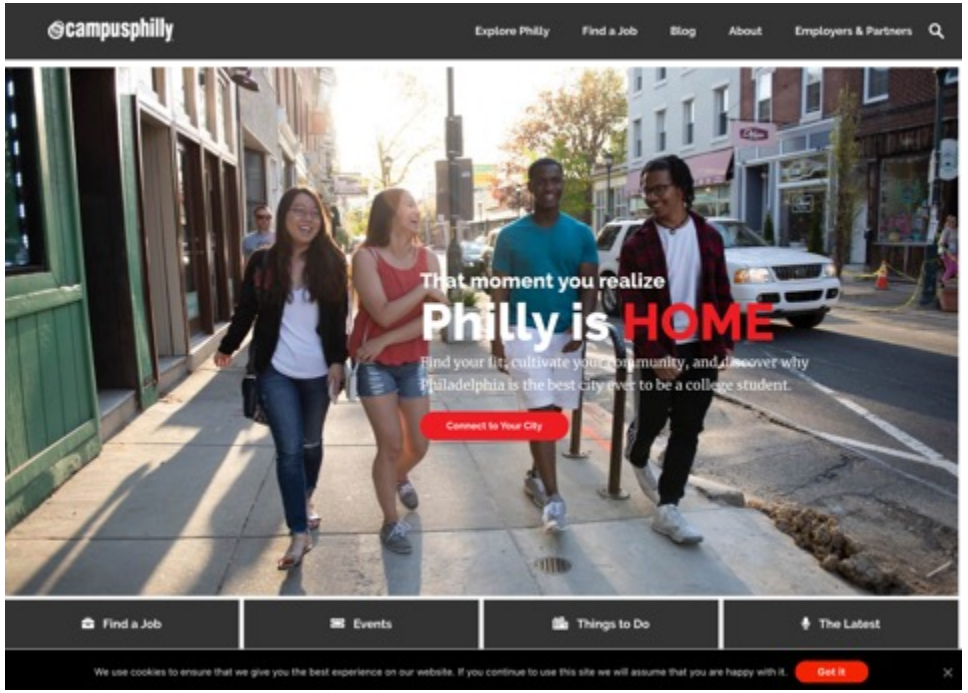
Source: Chmura's JobsEQ®

Data reflect an online sample of resumes that have been updated within the six years ending 2020Q4

What is Philadelphia doing right?

Region	Stayed or Returned	Left
Philadelphia-Camden-Wilmington, PA-NJ-DE-MD MSA	61%	39%
Charlotte-Concord-Gastonia, NC-SC MSA	60%	40%
Atlanta-Sandy Springs-Alpharetta, GA MSA	56%	44%
Jacksonville, FL MSA	54%	46%
Washington-Arlington-Alexandria, DC-VA-MD-WV MSA	53%	47%
Denver-Aurora-Lakewood, CO MSA	53%	47%
Pittsburgh, PA MSA	53%	47%
Nashville-Davidson--Murfreesboro--Franklin, TN MSA	51%	49%
I-64 Innovation Corridor	50%	50%
Columbus, OH MSA	50%	50%
Orlando-Tampa FL Megaregion	48%	52%
Raleigh-Cary, NC MSA	44%	56%

Campus Philly – www.campusphilly.org



Our Impact

Four generations of college students have now attended college in our region since Campus Philly's creation and the impact is everywhere you look:

115%

increase in Philadelphians 25-34 with college degrees between 2000 and 2017. (Last decade Philly actually *lost* 25-34 year olds.)

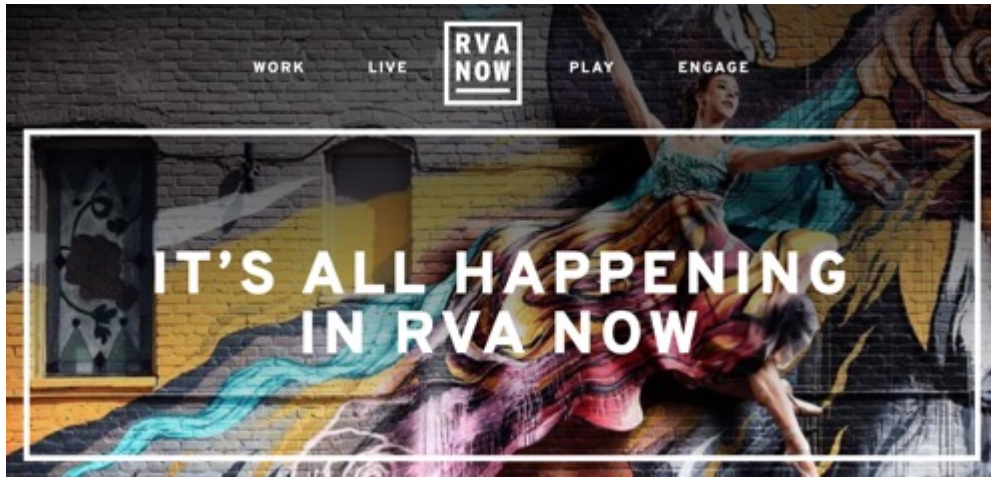
118,500

additional young degree holders (between 25-34) in the Greater Philadelphia region between 2000 and 2017.

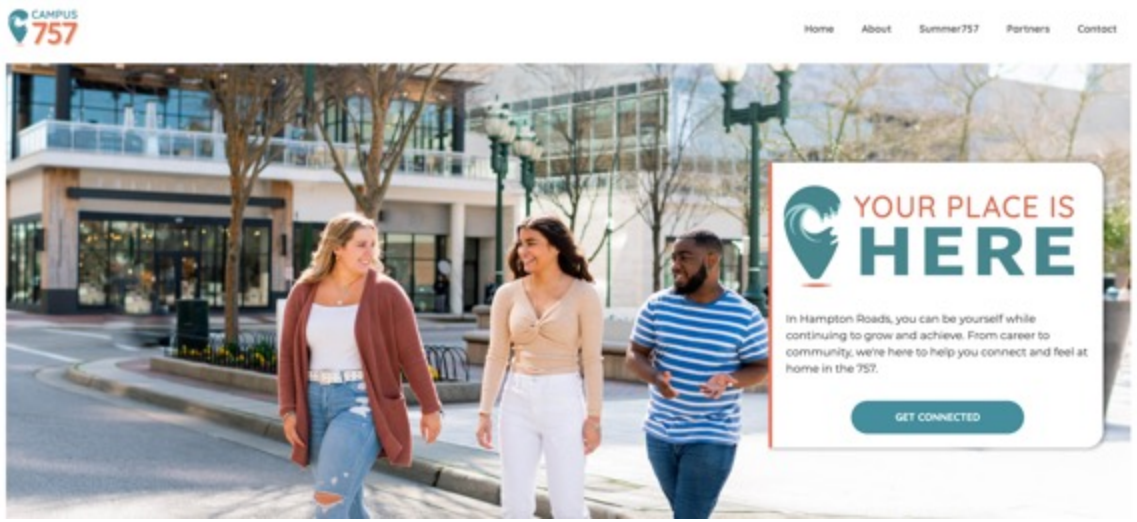
54%

Greater Philadelphia retains 54% of its regional college students (compared to 42% in Boston).

We have just launched two similar programs.



RVA NOW



Campus 757

KEY TAKEAWAYS

TALENT RETENTION & ATTRACTION

- Compared to other regions, we are not attracting talent.
- Remote work trends are still uncertain.

RVA-757 trails other megaregions in net migration.

Note, while DC has experienced strong population growth, net migration is comparatively low.

MSA	Population change, 2010 to 2019	% of growth from Births - Deaths	% of growth from Net Migration
Atlanta-Sandy Springs-Alpharetta, GA rea	733,646	47%	53%
Washington-Arlington-Alexandria, DC-VA-MD-WV	630,799	68%	32%
Orlando-Kissimmee-Sanford, FL	473,748	22%	78%
Denver-Aurora-Lakewood, CO rea	423,631	39%	61%
Charlotte-Concord-Gastonia, NC-SC	392,920	28%	72%
Nashville-Davidson--Murfreesboro--Franklin, TN	288,134	31%	69%
Raleigh-Cary, NC	260,292	30%	70%
Columbus, OH	220,263	49%	51%
Jacksonville, FL	213,920	25%	75%
RVA-757	**160,375**	**73%**	**27%**

Source: https://www.census.gov/data/datasets/time-series/demo/popest/2010s-total-metro-and-micro-statistical-areas.html

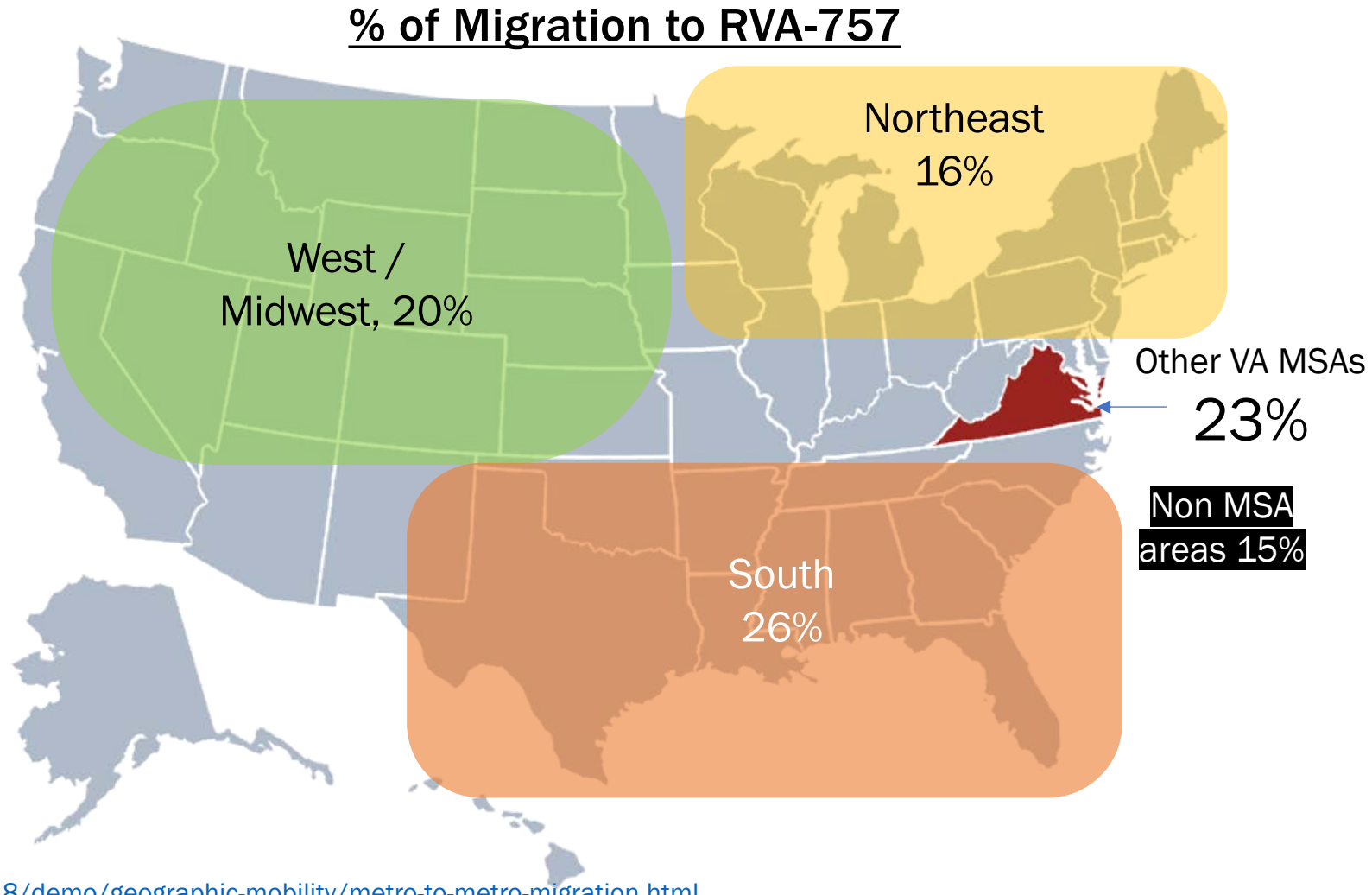
757 specifically appears to have a big challenge with net migration.

MSA	Population change, 2010 to 2019	% of growth from Births - Deaths	% of growth from Net Migration
Atlanta-Sandy Springs-Alpharetta, GA rea	733,646	47%	53%
Washington-Arlington-Alexandria, DC-VA-MD-WV	630,799	68%	32%
Orlando-Kissimmee-Sanford, FL	473,748	22%	78%
Denver-Aurora-Lakewood, CO rea	423,631	39%	61%
Charlotte-Concord-Gastonia, NC-SC	392,920	28%	72%
Nashville-Davidson--Murfreesboro--Franklin, TN	288,134	31%	69%
Raleigh-Cary, NC	260,292	30%	70%
Columbus, OH	220,263	49%	51%
Jacksonville, FL	213,920	25%	75%
RVA-757	**160,375**	**73%**	**27%**
Richmond, VA	**105,429**	**37%**	**63%**
Virginia Beach-Norfolk-Newport News, VA-NC	**54,946**	**142%**	**-42%**

Source: https://www.census.gov/data/datasets/time-series/demo/popest/2010s-total-metro-and-micro-statistical-areas.html

Nearly two-thirds of RVA-757 migration comes from the top 25 MSAs, with over a quarter from the South and another quarter from other MSAs in the state.

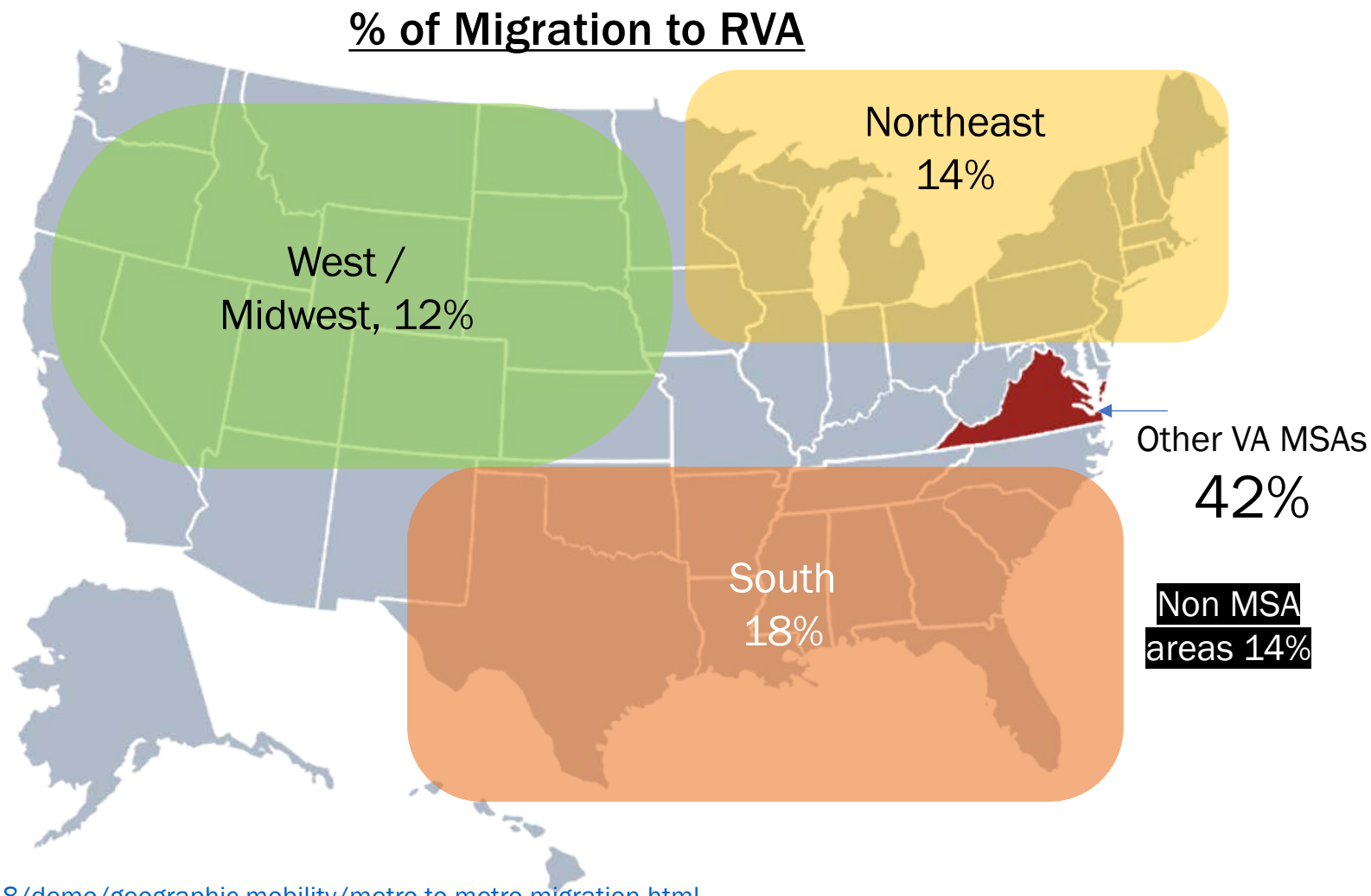
MSA	Migration to RVA-757	% of Tot. migration	Cumul. % migration
Washington-Arlington-Alexandria, DC-VA-MD-WV	21,474	15%	15%
Outside Metro Area but within U.S. or PR	20,958	15%	30%
New York-Newark-Jersey City, NY-NJ-PA	7,177	5%	35%
Chicago-Naperville-Elgin, IL-IN-WI	3,213	2%	38%
San Diego-Carlsbad, CA	3,018	2%	40%
Charlottesville, VA	2,964	2%	42%
Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	2,926	2%	44%
Lynchburg, VA	2,149	2%	46%
Jacksonville, FL	2,137	2%	47%
Baltimore-Columbia-Towson, MD	2,067	1%	49%
Charleston-North Charleston, SC	1,897	1%	50%
Los Angeles-Long Beach-Anaheim, CA	1,764	1%	51%
Atlanta-Sandy Springs-Roswell, GA	1,726	1%	52%
Roanoke, VA	1,671	1%	54%
Dallas-Fort Worth-Arlington, TX	1,400	1%	55%
Miami-Fort Lauderdale-West Palm Beach, FL	1,375	1%	56%
Tampa-St. Petersburg-Clearwater, FL	1,282	1%	57%
Blacksburg-Christiansburg-Radford, VA	1,269	1%	57%
Urban Honolulu, HI	1,252	1%	58%
Charlotte-Concord-Gastonia, NC-SC	1,129	1%	59%
San Antonio-New Braunfels, TX	1,089	1%	60%
Providence-Warwick, RI-MA	1,003	1%	61%
Pensacola-Ferry Pass-Brent, FL	961	1%	61%
Staunton-Waynesboro, VA	961	1%	62%
Harrisonburg, VA	953	1%	63%



Source: US Census https://www.census.gov/data/tables/2018/demo/geographic-mobility/metro-to-metro-migration.html

Three-fourths of RVA migration comes from the top 25 MSAs, with over two-in-five from other MSAs in the state, and nearly one-in-five from the South.

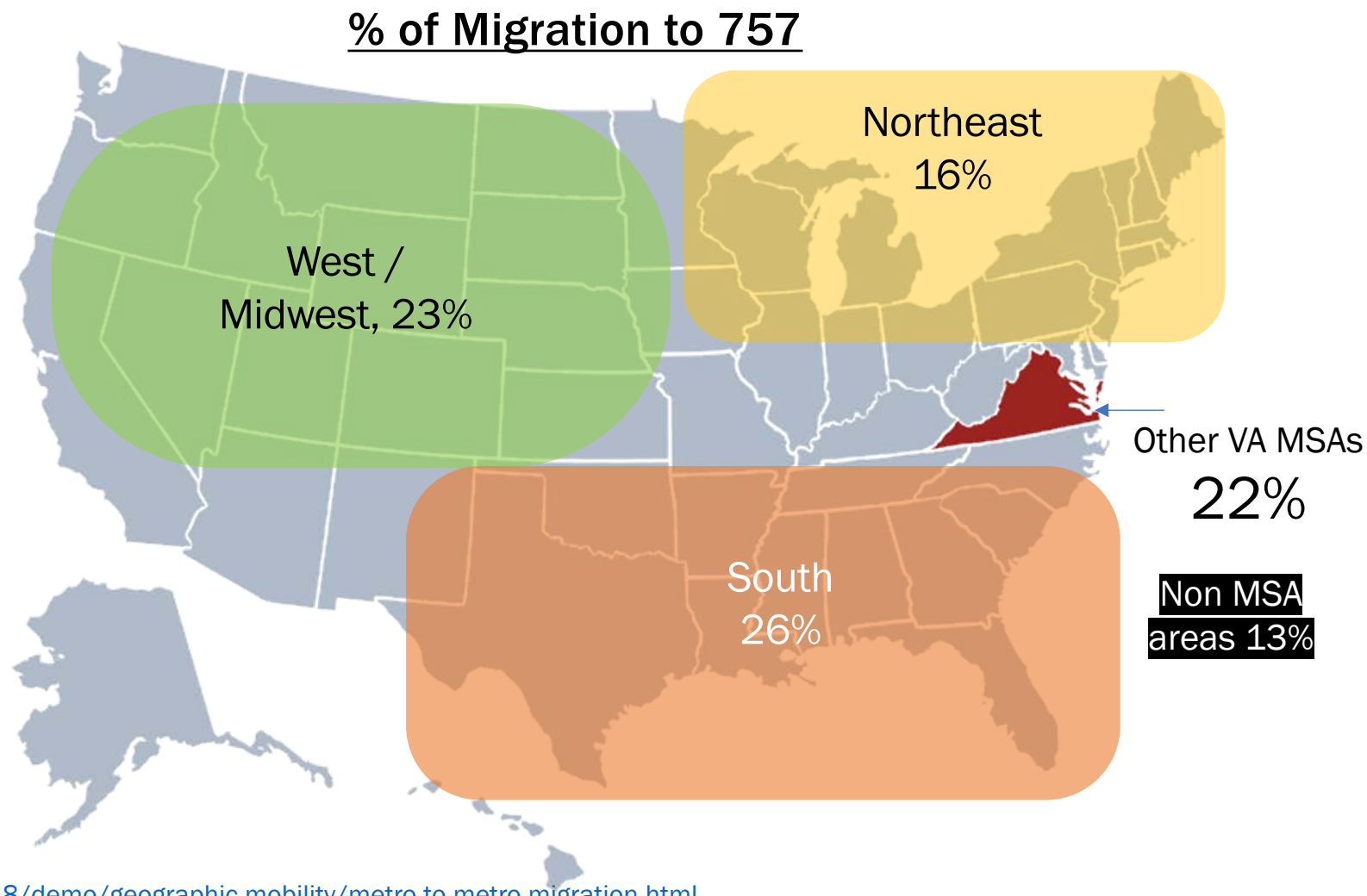
MSA	Migration to RVA	% of Tot. migration	Cumul. % migration
Washington-Arlington-Alexandria, DC-VA-MD-WV	10,602	19%	19%
Outside Metro Area but within U.S. or PR	8,144	14%	33%
Virginia Beach-Norfolk-Newport News, VA-NC	7,361	13%	46%
New York-Newark-Jersey City, NY-NJ-PA	3,118	6%	52%
Charlottesville, VA	1,650	3%	55%
Lynchburg, VA	1,173	2%	57%
Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	1,009	2%	58%
Baltimore-Columbia-Towson, MD	888	2%	60%
Blacksburg-Christiansburg-Radford, VA	850	2%	61%
Roanoke, VA	849	2%	63%
Los Angeles-Long Beach-Anaheim, CA	658	1%	64%
Atlanta-Sandy Springs-Roswell, GA	637	1%	65%
Killeen-Temple, TX	613	1%	66%
Chicago-Naperville-Elgin, IL-IN-WI	571	1%	67%
Harrisonburg, VA	515	1%	68%
Miami-Fort Lauderdale-West Palm Beach, FL	508	1%	69%
Staunton-Waynesboro, VA	504	1%	70%
Seattle-Tacoma-Bellevue, WA	440	1%	71%
Charlotte-Concord-Gastonia, NC-SC	412	1%	72%
Greensboro-High Point, NC	394	1%	72%
Raleigh, NC	369	1%	73%
Boston-Cambridge-Newton, MA-NH	365	1%	74%
Jacksonville, FL	355	1%	74%
Kansas City, MO-KS	350	1%	75%
Dallas-Fort Worth-Arlington, TX	334	1%	75%



Source: US Census https://www.census.gov/data/tables/2018/demo/geographic-mobility/metro-to-metro-migration.html

Nearly two-thirds of 757 migration comes from the top 25 MSAs, with over a quarter from the South and just over a fifth from other MSAs in the state.

MSA	Migration to 757	% of Tot. migration	Cumul. % migration
Outside Metro Area but within U.S. or PR	12,814	13%	13%
Washington-Arlington-Alexandria, DC-VA-MD-WV	10,872	11%	24%
Richmond, VA	6,225	6%	31%
New York-Newark-Jersey City, NY-NJ-PA	4,059	4%	35%
San Diego-Carlsbad, CA	2,742	3%	38%
Chicago-Naperville-Elgin, IL-IN-WI	2,642	3%	41%
Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	1,917	2%	43%
Jacksonville, FL	1,782	2%	44%
Charleston-North Charleston, SC	1,660	2%	46%
Charlottesville, VA	1,314	1%	47%
Baltimore-Columbia-Towson, MD	1,179	1%	49%
Los Angeles-Long Beach-Anaheim, CA	1,106	1%	50%
Atlanta-Sandy Springs-Roswell, GA	1,089	1%	51%
Dallas-Fort Worth-Arlington, TX	1,066	1%	52%
Tampa-St. Petersburg-Clearwater, FL	1,057	1%	53%
Lynchburg, VA	976	1%	54%
Urban Honolulu, HI	954	1%	55%
Pensacola-Ferry Pass-Brent, FL	939	1%	56%
Providence-Warwick, RI-MA	882	1%	57%
Miami-Fort Lauderdale-West Palm Beach, FL	867	1%	58%
Roanoke, VA	822	1%	59%
San Antonio-New Braunfels, TX	816	1%	60%
Charlotte-Concord-Gastonia, NC-SC	717	1%	60%
Las Vegas-Henderson-Paradise, NV	653	1%	61%
Albany-Schenectady-Troy, NY	649	1%	62%



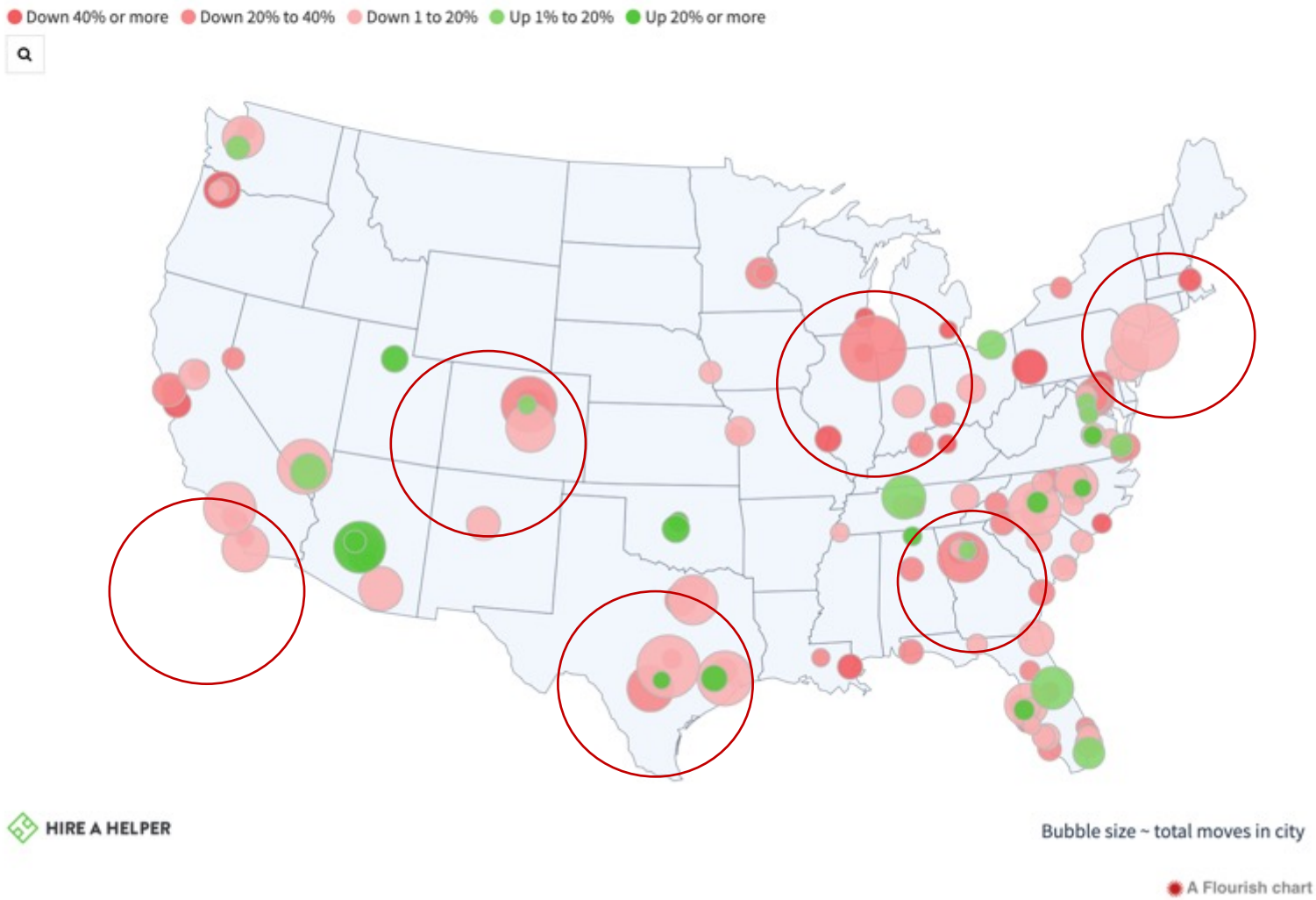
Source: US Census https://www.census.gov/data/tables/2018/demo/geographic-mobility/metro-to-metro-migration.html

CHANGE IN NET MIGRATION

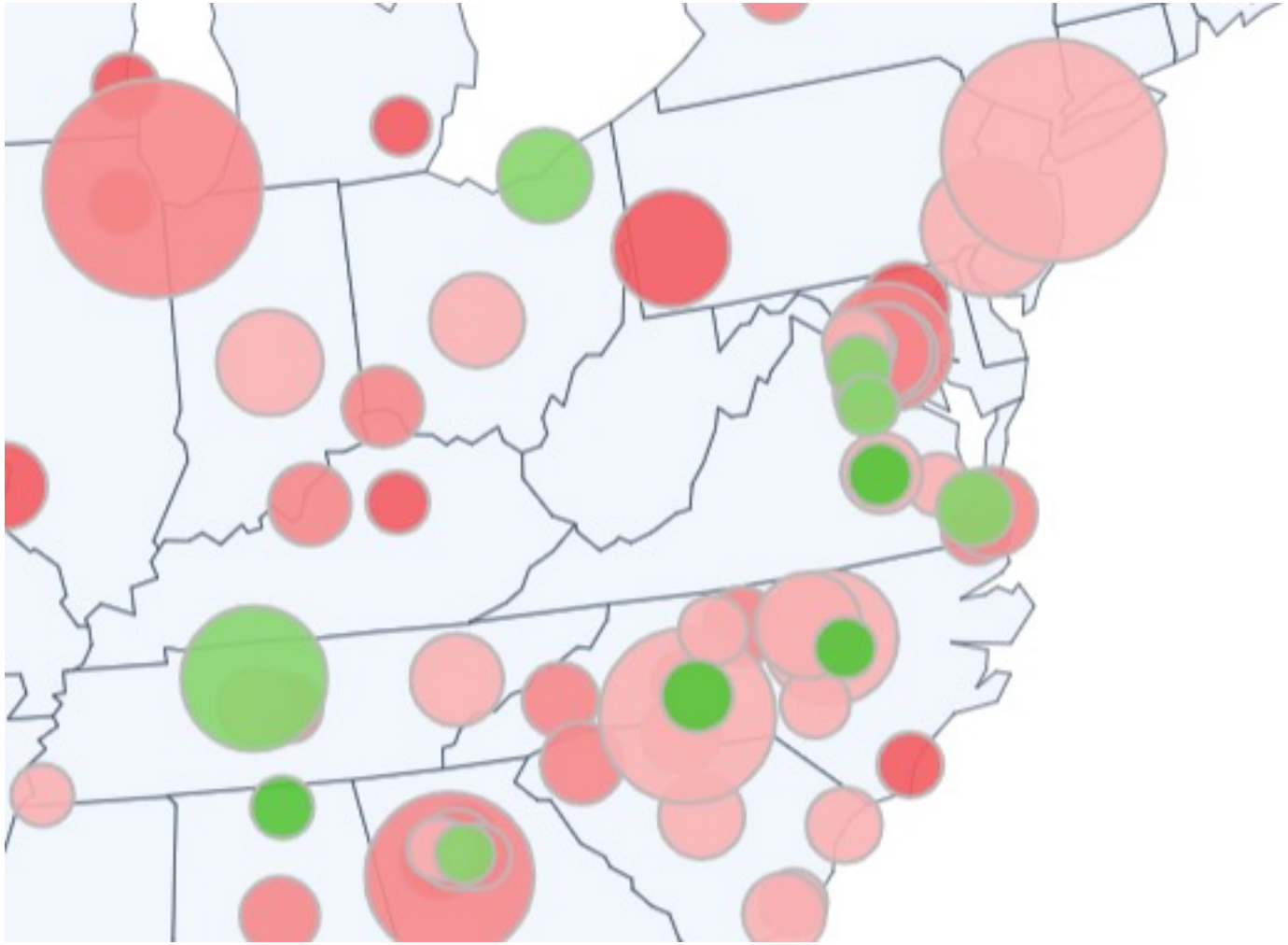
Top Move In/Outs by State | Top Move In/Outs by City | Hard Hit Cities

Staying Put Under COVID?

Explore the map to see how COVID affected moving in different cities



CHANGE IN NET MIGRATION



Reality – COVID-19 is affecting where tech people move.

Where Tech Workers Are Moving: New LinkedIn Data vs. the Narrative

The Austin surge that wasn't. Plus booming Seattle, miraculous Madison, and sluggish San Francisco.

Alex Kantrowitz 3 days ago · 6 min read •

Seattle, Washington. Photo: Abbie Parr/Stringer

The story crumbles when placed next to new LinkedIn data showing where tech workers are actually moving in 2020. The key beneficiaries of this year's tech migration are less buzzy cities like Madison, Wisconsin; Richmond, Virginia; and Sacramento, California. These places don't get much play in the news, but they're attracting tech talent at significantly higher rates than they were last year. Austin, conversely, is gaining tech workers more slowly.

The new LinkedIn data, which *Big Technology* is first publishing here, examines several hundred thousand tech workers in the U.S. It breaks down the ratio at which they're moving into a city vs. moving out, something LinkedIn calls the inflow/outflow ratio. The data ranges from April to October, comparing 2020 with 2019. It encompasses the core months people left their cities due to the pandemic.

Source: https://bigtechnology.substack.com/p/where-tech-workers-are-moving-new#:~:text=That%20tech%20workers%20and%20executives,years%20due%20to%20the%20pandemic.

Working Remotely – Increasingly Offered in Ads, But Still Only About 1 in 4 or Less of All Ads

Top Occupations with Remote Work Jobs Ads					
SOC	**Occupation**	**Jan/Feb 2021**	**Jan/Feb 2020**	**Growth Rate in Remote**	**% of All Ads (Jan/Feb 2021)**
15-1252.00	Software Developers	29,428	8,519	245%	26%
43-4051.00	Customer Service Representatives	17,877	4,070	339%	19%
15-1232.00	Computer User Support Specialists	16,271	12,101	34%	22%
41-3091.00	Sales Representatives of Services, Except Advertising, Insurance, Financial Services, and Travel	15,802	11,143	42%	15%
13-1111.00	Management Analysts	11,662	3,489	234%	16%
11-2021.00	Marketing Managers	10,581	2,764	283%	19%
15-1244.00	Network and Computer Systems Administrators	8,821	5,518	60%	18%
15-1299.08	Computer Systems Engineers/Architects	7,693	3,421	125%	23%

Source: Chmura & JobsEQ

The Great Migration is a Covid-related Myth

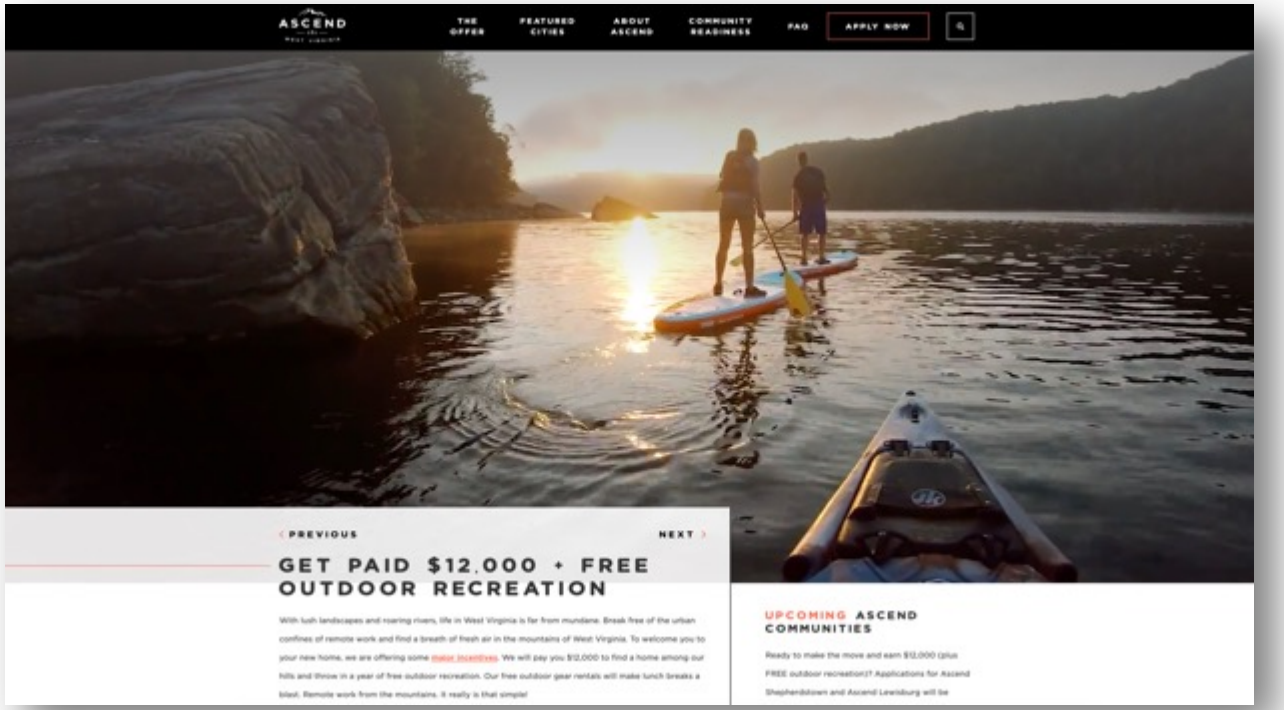
- There have only been pockets of increased migration from some of America's largest cities to smaller regions during the COVID pandemic.
- The proportion of people who moved over the past year fell to its lowest level in the 73 years that it has been tracked.
- We are still in a decades-long U.S. migration decline.
- Aging population, ability to telework, and Millennials' relatively more challenging economic health are all conspiring to keep people in place.
- However, America is seeing an increase in **people who moved out-of-state** – 4.3 million people in 2019-2020.
- Richmond region and parts of Hampton Roads are beneficiaries as net migration is increasing.

Source: November 2021 - U.S. Census Current Population Survey Annual Social and Economic Supplement

OUR COMPETITION IS FIERCE

Some Localities Are Aggressively Recruiting Workers

West Va. Remote Work Program Offers $12,000 Cash, Free Outdoor Recreation, and More



Cash: $12,000 in cash with no strings attached. The funds can be used to assist with moving and living expenses or explore new passions and hobbies in West Virginia.

Free Outdoor Recreation: One year of free outdoor recreation to fully explore 2,032 miles of whitewater, 4,000 rock climbing routes, 1.5 million acres of public lands, 1,500 miles of public trails and America's newest national park: New River Gorge Park and Preserve. The package is valued at more than $2,500 and encourages a healthy work-life balance filled with hiking, ATV-ing, ziplining, rafting, rock climbing, golfing, skiing, and more.

Free coworking space: A break free from the ordinary with access to inspiring spaces in the heart of thriving mountain towns. Here, remote workers will have modern amenities to stay connected and access to more than $1,200 in free outdoor gear rentals for use with family and friends.

Professional advancement: The ability to earn remote work certifications through West Virginia University and access to John Chambers College of Business and Economics' entrepreneurship ecosystem.

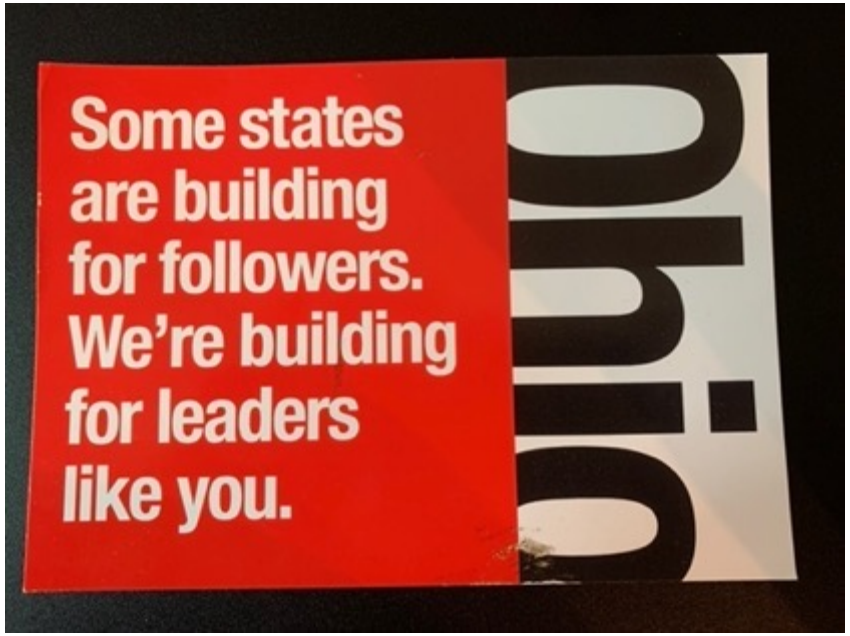
Networking: The chance to be a guest at a variety of exclusive events to connect entrepreneurs with state business leaders and guided excursions to experience West Virginia's abundant outdoor recreation assets.
The full relocation package is valued at more than $20,000 and can be viewed at www.AscendWV.com.

Ohio's Economic Development Effort's Focus on Recruiting Talent

Videos Pushed through Social Media

https://www.youtube.com/watch?v=THjIxSsPyiY

Postcard Mailers



Topic 3:

Future of Work

1. Workforce Composition
2. Job Types
3. Work Skills and Training
4. Work Arrangements
5. Workplace Locations
6. Work Culture
7. I-64 Corridor Wildcards

I-64 INNOVATION CORRIDOR

RVA757 connects

FUTURE OF WORK

WORKFORCE COMPOSITION

Future of Work: Workforce Composition

TREND	DESCRIPTION
GROWING NUMBER OF WORKERS IN THE I-64 INNOVATION CORRIDOR	The vast majority (80%) of Virginia's population and job growth over the next 10 years is projected to occur in the "Golden Crescent," the corridor that runs from D.C. through Northern Virginia, Richmond, Williamsburg, and Hampton Roads. (Source: https://www.virginiadot.org/Projects/vtransNew/resources/VSTP_%20by_Chapter/Chap2_ChangesPopEmpTravel.pdf) In 2020, the combined workforce in the I-64 Innovation Corridor (Richmond MSA and Hampton Roads MSA) was 1.4 million people. The U.S. Census forecast for annual employment growth over the next 10 years is 0.2%. While positive, annual growth rates in competitive regions are much higher by comparison (Raleigh 1.6%; Nashville 1.5%; Denver 1.4%). (Source: Chmura Economics & Analytics)
RELATIVELY FEWER WORKERS IN AMERICA'S OVERALL GROWING POPULATION	The U.S. Population is projected to grow by 9% from 2021 to 2030. The available labor force is projected to increase by only 5%. The age wave (see below) and decreasing labor participation rate will continue to support a tight labor market over the next ten years. The labor participation rate has been falling. It was 67.3% in 2000 and is 63.4% today. This equals 6.6 million potential workers missing from the labor force. By a rough calculation, those 6.6 million workers could boost our economy by nearly $400 billion. The data shows the main reason for the declining labor force participation rate lies with men aged 25 to 54. The number of "inactive" men, neither working nor seeking to work, has grown sharply over the decades. (Source: https://www.investors.com/news/labor-force-participation-rate-low/)
GROWING WORKFORCE DIVERSITY	U.S. Census statistics project that the nation will become minority White in 2045. The transition is the result of increasing birth rates and net international migration of nonwhites. For youth under age 18 – Gen Z, the post-millennial population – minorities are already the majority. (Source: https://www.brookings.edu/blog/the-avenue/2018/03/14/the-us-will-become-minority-white-in-2045-census-projects/)

Future of Work: Workforce Composition

TREND	DESCRIPTION
RELATIVELY MORE OLDER WORKERS Booming 55+ segment	Virginia currently has 8.7 million residents and will experience an 8% increase by 2030. By 2030, 55% of the population growth will be driven by 65+. This age wave is the result of decreasing birth rates and growing life expectancy. Consequently, a relatively larger portion of the workforce will be comprised of older cohorts. (Source: U.S. Census projections, updated July 2019 by the Weldon Cooper Center for Public Service, Demographics & Workforce Group, www.coopercenter.org/demographics, University of Virginia.) The supply of workers 55 and older is projected to almost double by 2030. With overall population growth far outpacing working age population growth, competition for younger workers has already begun to intensify. (Source: https://www.bls.gov/emp/images/lf_aging.png) Older Boomer workers will leave and create loss of institutional know-how. Many employers are considering ways to develop job-share and other career extenders to alleviate loss of knowledge. Considerations and accommodations for older workers will increase such as brighter lighting, larger type, brighter colors (not dark blue), safety, etc.
RELATIVELY FEWER YOUNGER WORKERS Stagnant 18-54	Conversely, a relatively smaller portion of the workforce will be comprised of younger cohorts. The importance of attracting and retaining younger workers will increase. This starts with retaining people who receive degrees from educational institutions in the I-64 Innovation Corridor. Half of these “alumni” (50%) leave the region. In comparison, Philadelphia (39%) and Charlotte (40%) have a lower “brain drain” challenge. (Source: JobsEQ® by Chmura)

Future of Work: Workforce Composition

TREND	DESCRIPTION
GROWING NUMBER AND MAKEUP OF WOMEN IN THE WORKFORCE	According to the Bureau of Labor Statistics, in 2019 women reached the point where they held 50.04% of American jobs, excluding farm workers and the self-employed. However, wages still differed from men. Women who worked full time in wage and salary jobs had median weekly earnings of $821, which represented 82 percent of men's median weekly earnings. COVID-19 hit women workers much harder than men. According to the U.S. Bureau of Labor Statistics, there were 2.2 million fewer women in the labor force in October 2020 than there were in October 2019. The term "she-cession" is being used to describe this situation.
INCREASING REPRESENTATION OF MINORITY GROUPS IN LEADERSHIP ROLES	The increase in workforce diversity has finally begun to increase diversity in the C-Suite as well. In 2019, 59% of directors added to S&P 500 boards were women or were men belonging to a racial or ethnic minority group. But there is still long way to go. In fact, only 1% of Fortune 500 CEOs are made up of black, indigenous, and other people of color (BIOPC). (Source: Harvard Business Review)
MULTI-GENERATIONAL	In the decade ahead, organizations will need to manage as many as five generations in the workforce. According to a study by PwC, only eight percent of organizations include age as a part of their DE&I strategies.

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FUTURE OF WORK

JOB TYPES

Future of Work: Job Types

TREND	DESCRIPTION
KNOWLEDGE VS. MANUAL	Two opposite skillsets will be in high demand tomorrow. While robots and AI will replace some workers, knowledge workers will continue to be in high demand. Just as important, many hands-on tasks will be in high demand such as caregiving and construction. (Source: Pew Research)
STEM JOBS	Science, technology, engineering, and mathematics (STEM) occupations are projected to grow over two times faster than the total for all occupations in the next decade. The U.S. Bureau of Labor Statistics (BLS) 2019–29 employment projections show that occupations in the STEM field are expected to grow 8 percent by 2029, compared with 3.7 percent for all occupations. STEM jobs are critical in the four key industries that can help build the I-64 Innovation Corridor's future economy: • Transportation, Distribution, & Logistics-Related Programs • Data Centers/Digital Network • Pharmaceutical Manufacturing and Life Sciences • National Security/Cyber Security

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FUTURE OF WORK

WORK SKILLS AND TRAINING

Future of Work: Work Skills and Training

Trend	Description
UPSKILLING AND RESKILLING WILL BE MAINSTREAM	Technology-driven automation and artificial intelligence (AI) will automate routine tasks across every industry. Up to one-third of the jobs today may be fully automated by 2030. Displaced workers will transition to higher skill-level jobs through workforce training and development designed to upskill and reskill competent and experienced workers. (Source: McKinsey)
INCREASING DEMAND FOR TRAINING PARTNERS	The "Readiness Gap" is real and will continue to grow. Most CEOs do not feel they are ready. More and more organizations will become active partners and co-investors with workforce training, using development organizations and educational institutions to help reskill and upskill their workers. According to Deloitte's 2020 Global Human Capital Trends Study (https://www2.deloitte.com/us/en/insights/focus/human-capital-trends/2020/reskilling-the-workforce-to-be-resilient.html); • 53% of CEOs say between half and all their workforce will need to change their skills and capabilities in the next three years. • 74% say reskilling the workforce is important or very important for their success over the next 12–18 months. • But only 10% say they are very ready to address this trend.
SELF-LEARNING WILL MAKE UPSKILLING AND RESKILLING TRAINING EFFICIENT AND PART OF EVERYDAY WORK LIFE	Millennials and Generation Z (Gen Zs) will make up the majority of the workforce by 2030. These two generations are the most educated cohorts in history. (Source: Forrester) Both generations are digital natives, having little or no memory of the world before smartphones. Having grown up with YouTube and Instagram, younger generations' preferred mode of learning slants toward the visual and videos. They are comfortable teaching themselves using digital tools, apps, and online resources. The availability of education-enhanced technology and generational comfort in using it will make large-scale upskilling and reskilling easier and more efficient and perhaps even part of everyday life on the job.

FUTURE OF WORK

WORK ARRANGEMENTS

Future of Work: Work Arrangements

TREND	DESCRIPTION
FLEXIBLE WORK	The COVID-19 experience will tighten the labor market, accelerating all types of flexible work arrangements from job share to part-time to freelance. COVID-19 has proven that remote work works. More and more people will expect and will be given flexible working arrangements. In an increasingly tight labor market, this growing expectation will become a "must offer" benefit on par with vacation time and a 401(k). Employers and employees will view work across a spectrum of work arrangements. These include: an organization's full or part-time employees, joint venture employees (shared job arrangements), managed service providers, contractors, gig workers, freelance, and crowd sourcing. (Source: Deloitte analysis) Companies will embrace formal hybrid working arrangements that work best for their unique situations and their employee recruitment and retention efforts.
GROWING APPRECIATION AND USE OF APPRENTICESHIPS	New education models are emerging where students earn a high school diploma, an industry-recognized associate degree, and gain relevant work experience in a growing field. The Ford Foundation, P-Tech Schools, and Nashville Academies are leading examples. CareerWise is how Colorado is scaling the deployment of apprenticeships: www.careerwisecolorado.org/en/

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FUTURE OF WORK

WORKPLACE LOCATIONS

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Future of Work: Workplace Locations

TREND	DESCRIPTION
DISTRIBUTED WORKFORCE	COVID has accelerated the practice and appreciation of teleworking. Consequently, “work” for many workers and employers is no longer tied to place. Prior to COVID, experts projected that by 2030, 50% of the U.S. workforce would be distributed, including use of some forms of teleworking. The latest estimates indicate we will reach 50% by 2025. (https://www.apollotechnical.com/statistics-on-remote-workers/)
GROWING NUMBER OF REMOTE WORKERS	A growing number of cities and states are offering incentives to attract “remote workers. (https://www.bobvila.com/slideshow/13-u-s-cities-incentivizing-remote-workers-to-relocate-578931)

6

FUTURE OF WORK

WORK CULTURE

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Future of Work: Work Culture

TREND	DESCRIPTION
TAKE CARE	COVID-19 is a health crisis. We are seeing, hearing, and watching this healthcare story unfold all around us 24-7. Social isolation, lack of exercise, and financial uncertainty are creating higher levels of mental and physical stress in all of us. In addition, the crisis has helped to increase awareness of the health disparities affecting minority populations.
VALUE ALL	The COVID-19 virus affects everyone — young, old, rich, poor, black, white. In addition, society has a newfound appreciation for frontline essential workers, as well as what they are being paid. The events and protests related to the social justice BLM movement have advanced our understanding beyond economic inequities and health disparities. There is no longer a neutral zone. Anti-racism attitudes and practices will increase. There will be an increasing appreciation of and support for equity and social justice policies and initiatives.
GO TEAM	The COVID-19 crisis has reinforced the spirit and power of teamwork — "we are all in this together." Corporate advertising continues to mirror this through "stronger together" messaging. This social sentiment is reinforcing the expectation that companies must do more than make a profit, they must contribute to community stakeholders, too. Greater investments will be made in new supportive pathways to help ensure everyone thrives.
HYPER-CONNECT	People are driven by a deep-seated personal need to belong. This includes belonging to a family, peer group, team, organization, and community. Social isolation, economic and health-related uncertainty and vulnerability, and civil unrest are fueling this primary need for personal connections. Similarly, the uncertainty of a post-COVID world is driving the need for more corporate connections and networks.
PURPOSE	Joni Mitchell's refrain, "You don't know what you've got 'til it's gone," has never been more poignant, especially when it comes to our beloved local assets like our favorite restaurants, local artists, and unique recreational venues and spaces. Authenticity — the real deal — will become more recognized and cherished. After COVID-19, we will value our most authentic corporate and community-minded people, experts, events, and places even more.

7

FUTURE OF WORK

I-64 CORRIDOR WILDCARDS

Future of Work: I-64 Corridor Wildcards

TREND	DESCRIPTION
MORE SCIENTISTS Jefferson Lab's Supercomputer as Magnet for PhDs	Jefferson Lab is working with the Department of Energy to establish a world-leading computational facility located at Jefferson Lab. FY22 Department of Energy Budget Request to Congress states: "In FY 2022, ASCR will design a state-of-the-art Scientific High Performance Data Facility focused on the unique challenges and opportunities for data-intensive applications workflows and near real-time computing needed to support the explosion of scientific computation (SC) / scientific data that will serve as the anchor for the Integrated Computational and Data Infrastructure Initiative… to provide geographic diversity and operational resiliency, this facility will be located on the East Coast."
MORE TECH WORKERS I-64 Corridor Global Internet Hub as a Magnet for Tech Talent	The I-64 Innovation Corridor megaregion is on its way to becoming a global internet hub. The subsea fiber optic cables in Virginia Beach, the Network Access Point (NAP) in Henrico County, and the growing number of data centers in between are just the most visible signs of this eventuality. The full story is how our megaregion has most, if not all, of the factors of success that have created many of today's global internet hubs. Reaching this designation over time is more than just an accolade. There are significant tangible community and business benefits of being a global internet hub, the least of which are faster, more reliable internet, improved STEM education, growing tech talent pool, and increased economic opportunities. As data management and access become increasingly important, a growing number of industries, not just tech companies, will prioritize locating in global internet hubs to effectively compete in the future.

Topic 4:

Future Scenarios

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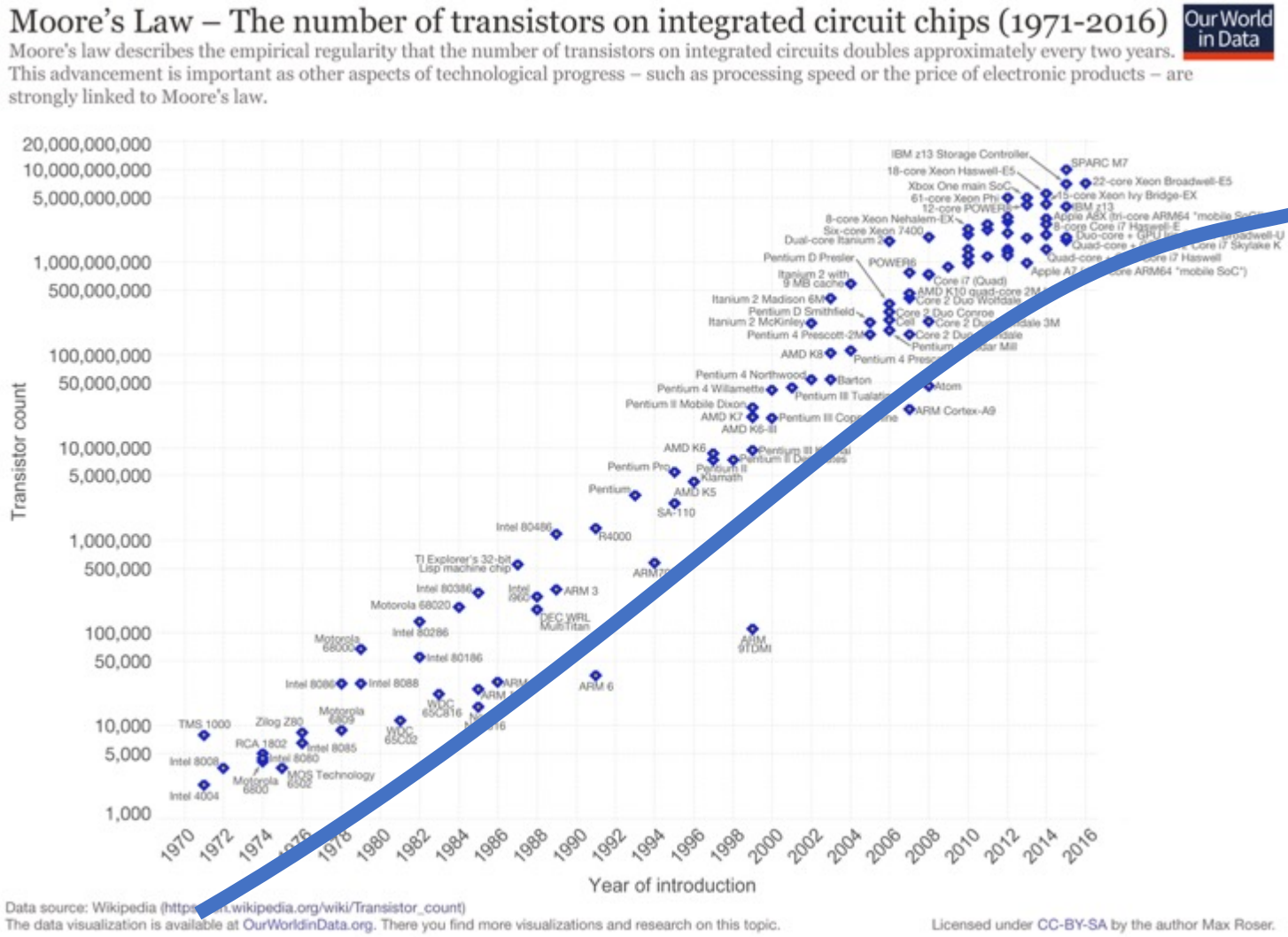
I-64 INNOVATION CORRIDOR

2030: Boom or Bust?

For 50 Years Processing Power Has Improved Linearly – Soon It Will Improve Exponentially

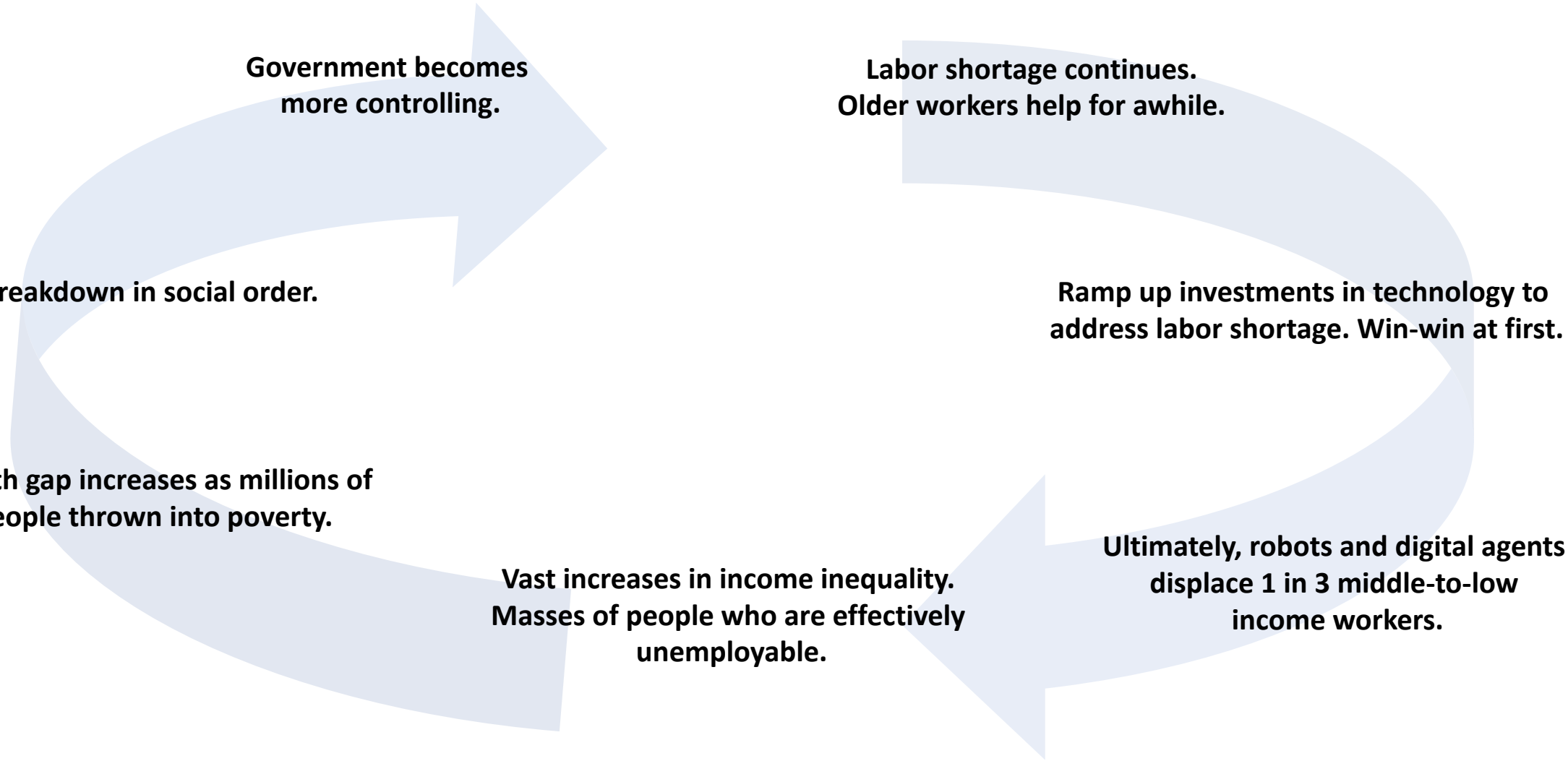


Tech Singularity

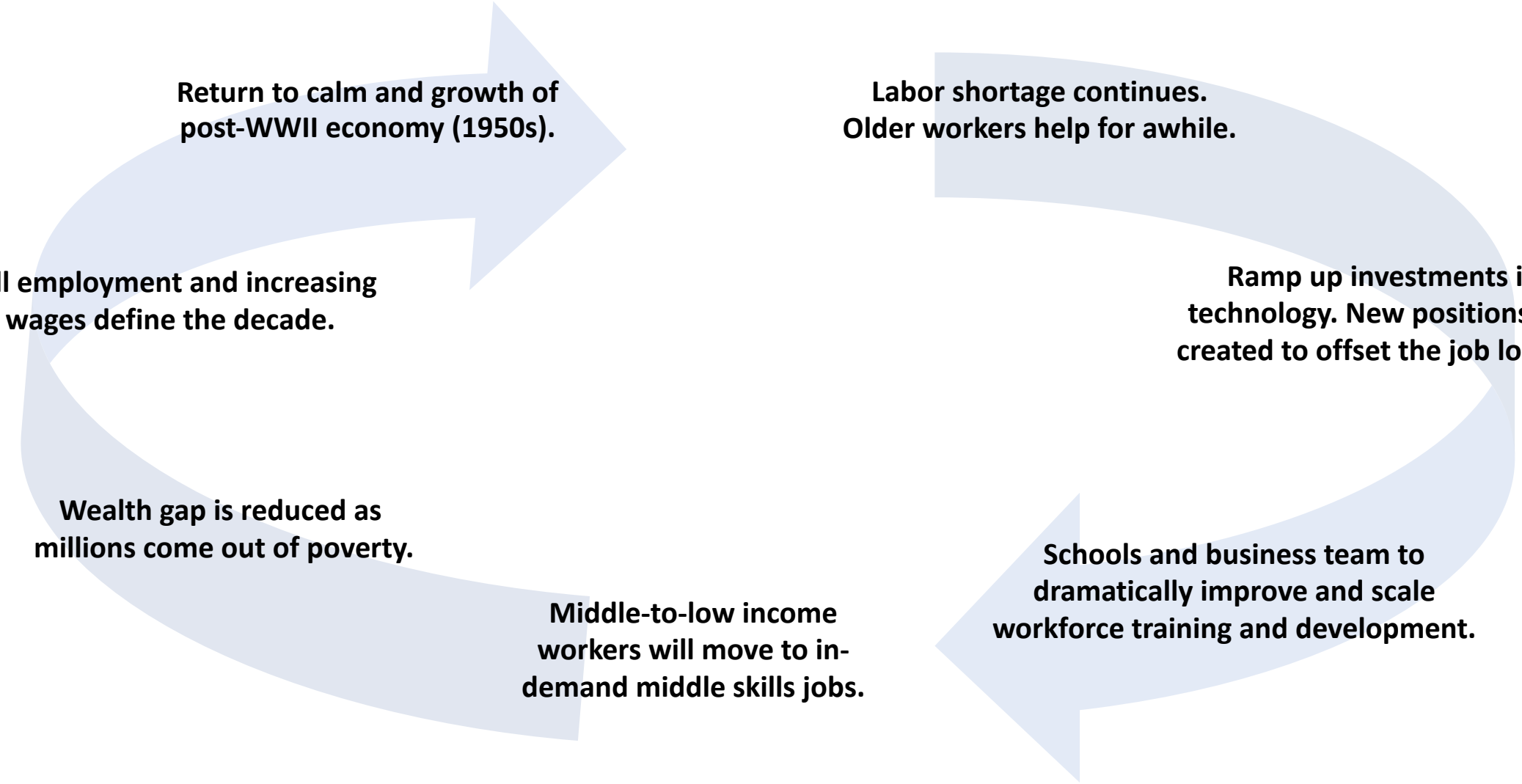
20?? – Quantum Computing Achieved

2018 - Hyper-specialized CPUs

Scenario 1: Large-scale Disruption



Scenario 2: Stable and Equitable Growth



"SHOW OF HANDS"

Bad Times or Good Times

Scenario 1

Large Scale Disruption

Scenario 2

Stable & Equitable Growth

What Do Business Thought Leaders Predict?

Bain & Company

McKinsey

Oxford

OEDC

Bruegel

Pew Research

Bain & Company's Prediction

*"By 2030, automation may eliminate **20% to 25%** of current jobs, hitting middle- to low-income workers the hardest. This could trigger **economic disruption far greater than we have experienced over the past 60 years**."*

McKinsey's Prediction

"30% of 'work activities' could be automated by 2030 *- up to 375 million workers worldwide could be affected by emerging technologies."*

Source: McKinsey Jobs Lost, Jobs Gained Report

Oxford University's Prediction

*"**47%** of U.S. workers have a high probability of seeing their jobs automated over the next 20 years."*

Organization for Economic Cooperation and Development's (OECD) Prediction

*"**46%** of jobs at risk. Using task-related data from 32 OECD countries, OECD estimates that **14%** of jobs are highly automatable and another **32% of jobs have a significant risk of automation.**"*

Bruegel's Prediction

*"**54%** of EU jobs are at risk to automation. Job losses are likely to be significant and **people should prepare for large-scale disruption and social breakdown**."*

Bruegel is a European think tank specializing in economics.

Pew Research's Expert Survey Findings

*"Half **(48%)** **of 1,896 experts** interviewed on emerging technologies envision a future in which **robots and digital agents will displaced significant numbers of both blue- and white-collar workers, enough to cause social breakdown.**"*

1 IN 3

THE AVERAGE JOB IMPACT PREDICTION

We Believe These Thought Leaders Are Being …

Bain & Company
McKinsey
Oxford
OECD
Bruegel
Pew Research

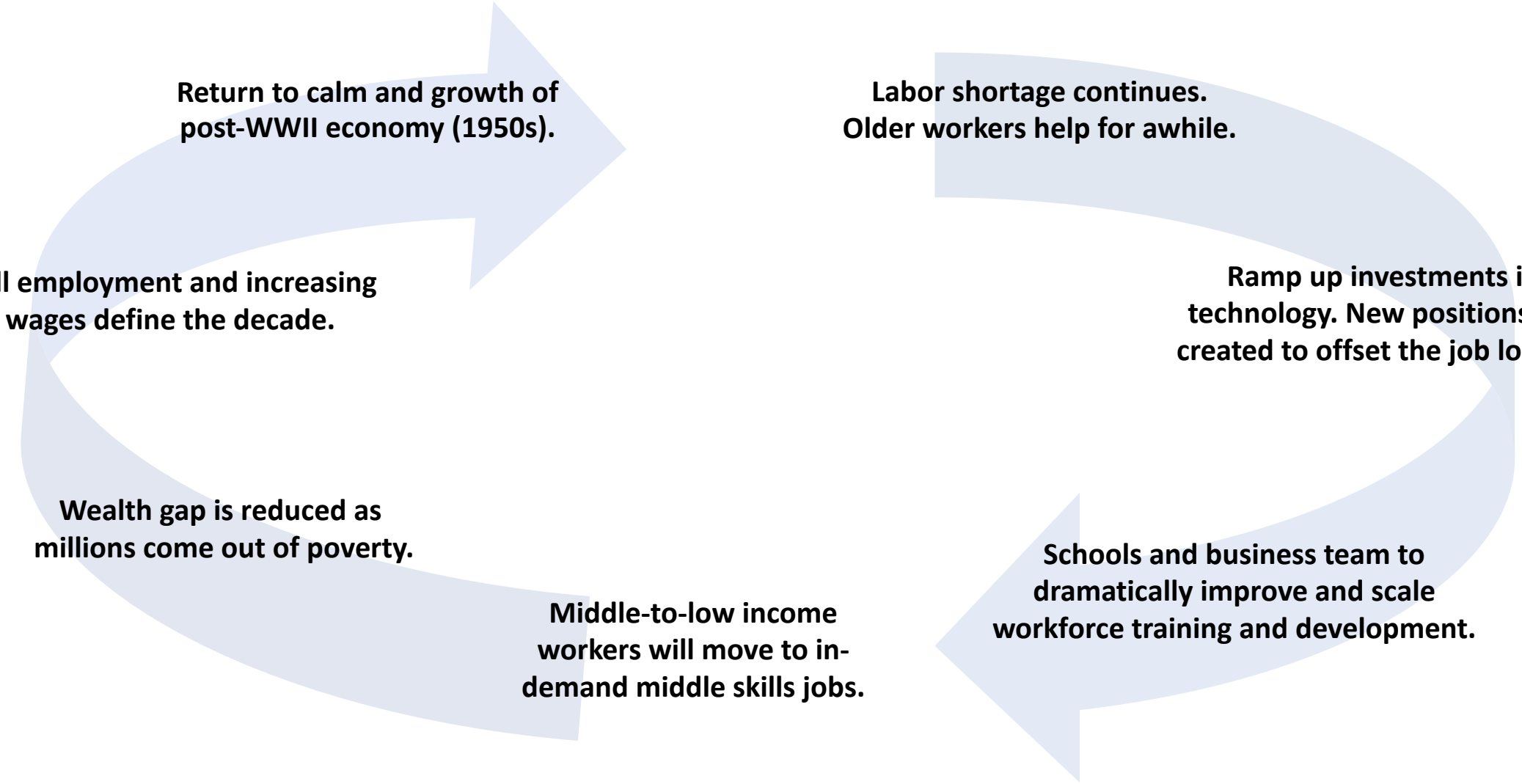
Too Rational

Scenario 2: Stable and Equitable Growth

CONDITIONS ARE LINING UP FOR MAJOR SOCIETAL SHIFT

(The New Age of Aquarius?)

Scenario 2: Stable and Equitable Growth



Why we (SIR) believe scenario #2 is more likely . . .

New Generations:

The Change Agents

Workforce Training:

Reskilling Becomes the Norm

New Educational Models:

Business Partners' Increasing Role in Talent Development

Gender Shift:

Women Leading the Way

Topic 5:

Desired State – Transformational Growth

1. Grow 21st Century job Opportunities – Four Key Growth Clusters
2. Retain Talent
3. Advance Business Infrastructure – Become a Global Internet Hub.

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I-64 INNOVATION CORRIDOR

TRANSFORMATIONAL GROWTH

JOB #1:
We must grow 21st century job opportunities.

KEY TAKEAWAYS

OPPORTUNITY CLUSTERS

- After reviewing the industry and occupation data, the research council identified four industry groups as the primary growth opportunity clusters for the I-64 Innovation Corridor:
  - Life Sciences/Pharmaceutical Manufacturing
  - Transportation and Logistics/Supply chain
  - Data centers/Digital Network
  - National security/Cyber Security

Both Regions' Economic Development Efforts are Focused on these Opportunities:

RVA TARGET INDUSTRIES

- Corporate Services
- Information Technology
- Finance & Insurance
- BioScience
- Advanced Manufacturing
- Supply Chain
- Food & Beverage

757 TARGET INDUSTRIES

- Advanced Manufacturing
- Business & Shared Services
- Distribution & Logistics
- Food & Beverage Processing
- Information Technology
- Offshore Wind

The Regional Economic Development Agencies in both RVA and the 757 are Targeting these Clusters

INFORMATION TECHNOLOGY

HEALTHCARE AND LIFE SCIENCES

Life Sciences/
Pharmaceutical Manufacturing

Life Sciences/Pharmaceutical Manufacturing

- The life sciences/pharmaceutical manufacturing cluster can be broken up into several smaller groups of industries. The Corridor has a high concentration of employment in research; testing and development, including blood and organ banks; and research and development in nanotechnology.
- Pharmaceuticals is a smaller but growing concentration of employment in the region. Additional areas that may expand along with growth in the Corridor's existing strengths could include medical devices manufacturing and distribution.
- There has been significant growth recently, reflecting the Corridor's strengths in this area. Some of the growth may be influenced by policies that were implemented during the COVID-19 pandemic to bring some pharmaceutical manufacturing back the U.S.
- JobsEQ forecasts growth of an additional 1,800 jobs in this cluster by 2030, increasing the concentration of regional employment in this cluster and raising the LQ from 0.79 to 0.87.
- With expected growth of 11.4% over 10 years, employment is expected to expand rapidly in the Corridor in this cluster. Expected growth outpaces Philadelphia, Atlanta, Jacksonville, Washington D.C., Pittsburgh, and Columbus.

Source: JobsEQ®

Life Sciences/Pharmaceutical Manufacturing Definition

		I-64 Innovation Corridor		
NAICS	Industry	Empl 2020Q4	Avg Ann Wages	LQ
	Research, Testing, and Development			
621991	Blood and Organ Banks	1,521	$49,043	2.04
541713	Research and Development in Nanotechnology	449	$98,107	1.76
541715	Research and Development in the Physical, Engineering, and Life Sciences (except Nanotechnology and Biotechnology)	5,602	$114,042	1.23
621511	Medical Laboratories	2,324	$65,568	1.14
	Pharmaceuticals			
325411	Medicinal and Botanical Manufacturing	76	$96,244	0.23
325412	Pharmaceutical Preparation Manufacturing	752	$111,177	0.37
325413	In-Vitro Diagnostic Substance Manufacturing	2	$86,381	0.01
325414	Biological Product (except Diagnostic) Manufacturing	13	$73,563	0.04
	Medical Devices			
333314	Optical Instrument and Lens Manufacturing	14	$86,978	0.07
334510	Electromedical and Electrotherapeutic Apparatus Manufacturing	33	$53,414	0.05
334516	Analytical Laboratory Instrument Manufacturing	21	$105,338	0.06
334517	Irradiation Apparatus Manufacturing	48	$69,568	0.35
339112	Surgical and Medical Instrument Manufacturing	118	$83,327	0.09
339114	Dental Equipment and Supplies Manufacturing	5	$45,355	0.03
339115	Ophthalmic Goods Manufacturing	80	$65,436	0.36
339116	Dental Laboratories	309	$45,393	0.77
	Life Sciences-Related Distribution			
493120	Refrigerated Warehousing and Storage	530	$46,585	0.82
488310	Port and Harbor Operations	898	$69,572	8.24
484230	Specialized Freight (except Used Goods) Trucking, Long-Distance	971	$57,004	0.75
493120	Refrigerated Warehousing and Storage	530	$46,585	0.82
488310	Port and Harbor Operations	898	$69,572	8.24
	Total	**16,485**	**$86,007**	**0.79**

$45,355-$114,042

Current Size and LQ Indicate Emerging Opportunity

	Current Employment (2020Q4)	Location Quotient
Richmond, VA MSA	7,626	0.81
Virginia Beach-Norfolk-Newport News, VA-NC MSA	8,833	0.79
I-64 Innovation Corridor	**16,485**	**0.79**

Source: JobsEQ®

Major Companies and Recent Announcements

Phlow™

+350 jobs

Aditxt Immune Health

+300 jobs

CIVICA

+186 jobs

GRENOVA Rethinking Laboratory Waste

+200 jobs

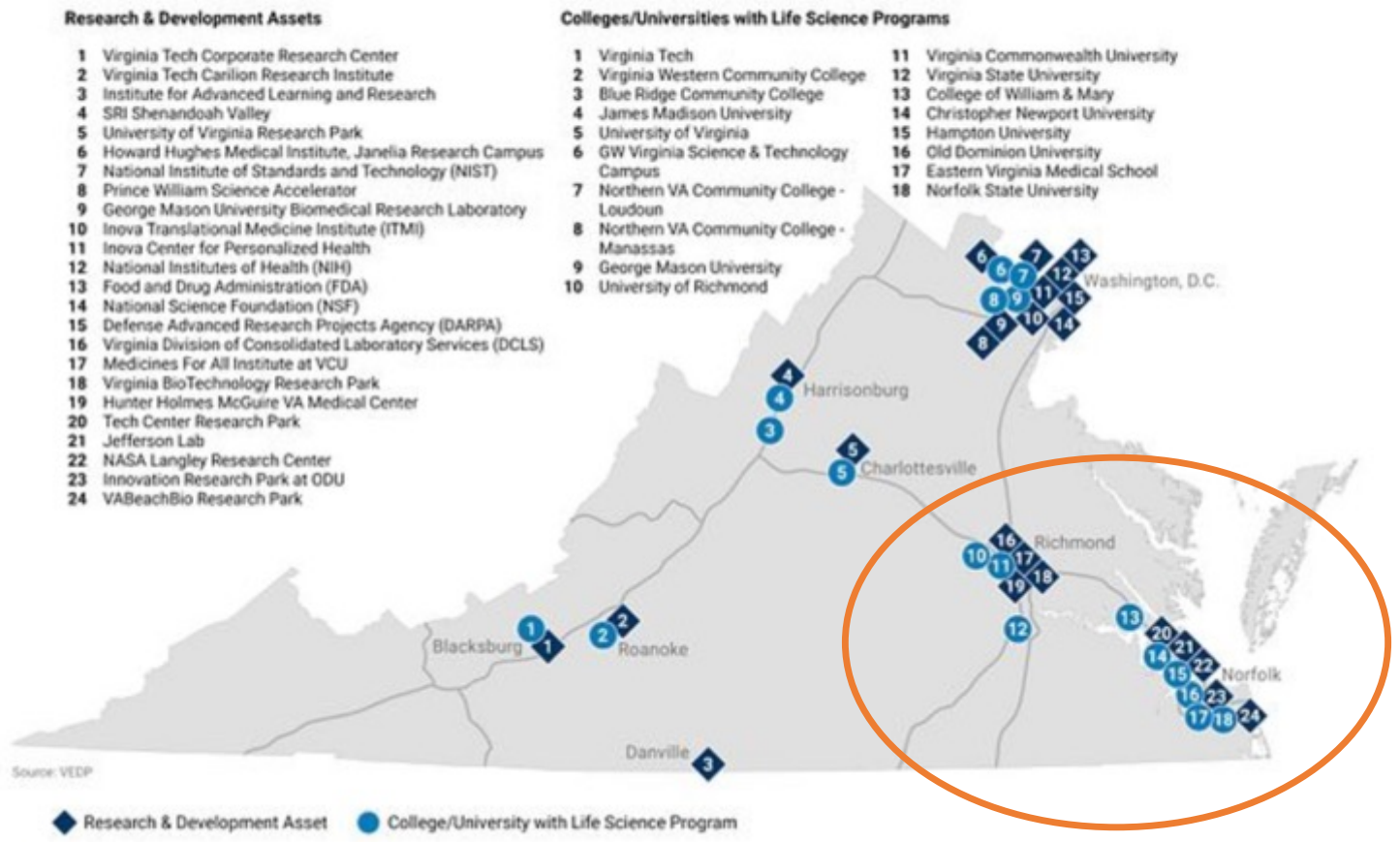
AMPAC™ FINE CHEMICALS

+156 jobs

Virginia is home to more than 1,451 biomedical and life science companies.

Together, Stronger

How do we all help support the growth of this future industry?



Projected Size and LQ 2030, Adding 1,883 Jobs in the Corridor

	Cluster Employment 2030	Total Employment 2030	Location Quotient 2030
Richmond, VA MSA	9,293	677,700	0.94
Virginia Beach-Norfolk-Newport News, VA-NC MSA	9,052	760,915	0.82
I-64 Innovation Corridor	**18,369**	**1,457,363**	**0.87**

Source: JobsEQ®

Pharmaceutical Manufacturing & Life Sciences

	I-64 Innovation Corridor	Richmond	Hampton Roads	Philadelphia	Charlotte	Atlanta	Jacksonville	Washington, DC	Denver	Pittsburgh	Nashville	Columbus	Orlando-Tampa	Raleigh
Current Cluster Empl	16,485	7,626	8,833	55,752	13,451	32,563	8,161	45,188	23,895	20,994	12,209	18,291	35,144	14,592
Current LQ	0.79	0.81	0.79	1.37	0.73	0.80	0.78	0.97	1.06	1.31	0.82	1.18	0.92	1.53
LQ 2030	0.87	0.94	0.82	1.36	0.73	0.80	0.75	0.95	1.04	1.33	0.83	1.15	0.92	1.53

If we do nothing our LQ will increase, yet we will trail growth in cities like Raleigh, Philadelphia, and Pittsburgh.

To reach an LQ of 1.00, we need to focus on retaining our talent and retaining or attracting businesses to the megaregion that need 2,800 new workers to support their operations.

Source: JobsEQ®

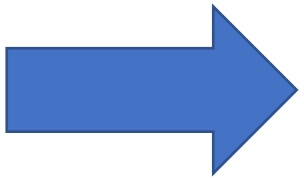
What is needed?

	2030 If We Do Nothing		To achieve an LQ of 1.0	What is needed to reach The top LQ range	
	Cluster Employment 2030	LQ	Employment needed	LQ (Avg of top 3 LQs)	Employment needed
Richmond, VA MSA	9,293	0.94			
Virginia Beach-Norfolk-Newport News, VA-NC MSA	9,052	0.82			
I-64 Innovation Corridor	**18,369**	**0.87**	**2,800**	**1.4**	**11,642**

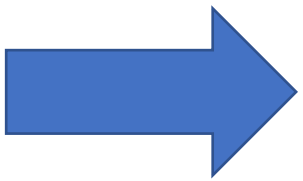
Source: JobsEQ®

In other words…

If we **do nothing** by 2030, we'll have an **LQ of 0.87** and **18,369 employed** in the industry cluster.



If we add and additional **2,800 employees,** we'll reach an **LQ of 1.0**



If we add an additional **11,642 employees,** we'll reach the top tier with an **LQ of 1.4**

Source: JobsEQ®

Transportation & Logistics/ Supply Chain

Transportation & Logistics/Supply Chain

- In the industries which make up the transportation and logistics/supply chain cluster, the Corridor has a high concentration in support activities for water transportation and deep sea, located primarily in the Hampton Roads MSA around the Port.
- Additional industries with high LQs include warehousing and storage, support activities for road transportation, and freight transportation arrangement, reflecting the logistics expertise within the Corridor and connectivity between I-64 and I-95.
- With an LQ above 1, the I-64 Innovation Corridor has a greater concentration of employment in this cluster compared to the nation. The Richmond MSA has about 1,000 more workers employed in this cluster than the Hampton Roads MSA, but that represents a larger share of employment in Richmond and thus has a larger LQ.
- Fort Lee, which is in Prince George County (Richmond MSA), is not included in this cluster. However, with the Army Logistics University located at the installation, it could be considered part of this cluster. If the 5,000 civilians and almost 3,800 military personnel were added to the cluster, it would increase from 52,804 to 61,604 and the LQ would increase from 1.05 to 1.23.
- Over the next 10 years, employment in this cluster is expected to grow, particularly in the Richmond MSA where the cluster's LQ is expected to reach 1.25, typically considered a competitive advantage for a region. The LQ in the Corridor is expected to reach 1.10 in the baseline forecast.
- With an expected growth rate of 6.5% over the next 10 years, employment is expected to expand in this cluster in the Corridor, faster than in Washington D.C. or Pittsburgh, but slower than in the other peer regions.

Transportation & Logistics/Supply Chain Definition

		I-64 Innovation Corridor		
NAICS	Industry	Empl 2020Q4	Avg Ann Wages	LQ
4931	Warehousing and Storage	16,921	$46,392	1.21
4841	General Freight Trucking	8,601	$51,331	0.76
4921	Couriers and Express Delivery Services	7,697	$39,773	0.92
4842	Specialized Freight Trucking	4,201	$46,118	0.95
4885	Freight Transportation Arrangement	3,008	$59,918	1.23
4883	Support Activities for Water Transportation	2,984	$82,512	3.33
5619	Other Support Services	2,411	$38,470	0.76
541614	Process, Physical Distribution, and Logistics Consulting Services	2,305	$69,760	1.69
4884	Support Activities for Road Transportation	1,596	$43,032	1.25
4821	Rail Transportation	1,330	$86,820	0.92
4831	Deep Sea, Coastal, and Great Lakes Water Transportation	1,192	$186,389	3.36
4889	Other Support Activities for Transportation	195	$45,210	0.55
4832	Inland Water Transportation	159	$82,242	0.65
4862	Pipeline Transportation of Natural Gas	138	$143,951	0.46
4882	Support Activities for Rail Transportation	51	$44,020	0.15
4869	Other Pipeline Transportation	15	$133,874	0.19
	Total	**52,804**	**$54,138**	**1.05**
	Total with Fort Lee	**61,604**		**1.23**
			$38,470-$186,389	

Current Size and LQ indicates Solid Cluster for the Corridor

	Current Employment (2020Q4)	Location Quotient
Richmond, VA MSA	26,799	1.18
Virginia Beach-Norfolk-Newport News, VA-NC MSA	25,722	0.96
I-64 Innovation Corridor	**52,804**	**1.05**

Source: JobsEQ®

Recent Announcements

WERNER ENTERPRISES

+37 Jobs (March 2020)

amazon

+ 1,000 Jobs (April 2021)

OUR PEOPLE MAKE THE DIFFERENCE

KATOEN NATIE

+35 Jobs
(April 2021)

CMA CGM

+415 Jobs (February 2021)

ALSTOM

$197,229 Investment (October 2020)

Projected Size and LQ 2030, Adding 3,420 Jobs in the Corridor

	Cluster Employment 2030	Total Employment 2030	Location Quotient 2030
Richmond, VA MSA	29,744	677,545	1.25
Virginia Beach-Norfolk-Newport News, VA-NC MSA	26,221	761,365	0.98
I-64 Innovation Corridor	**56,224**	**1,457,658**	**1.10**

Source: JobsEQ®

Transportation and Logistics/Supply Chain

	I-64 Innovation Corridor	Richmond	Hampton Roads	Philadelphia	Charlotte	Atlanta	Jacksonville	Washington, DC	Denver	Pittsburgh	Nashville	Columbus	Orlando-Tampa	Raleigh
Current Cluster Empl	52,804	26,799	25,722	100,634	54,609	126,182	43,684	57,905	51,800	33,594	57,518	71,602	66,257	15,778
Current LQ	1.05	1.18	0.96	1.03	1.23	1.29	1.74	0.51	0.96	0.87	1.60	1.91	0.72	0.69
LQ 2030	1.10	1.25	0.98	1.03	1.23	1.29	1.71	0.52	1.00	0.87	1.64	1.95	0.72	0.69

To reach a competitive advantage LQ of 1.25, we need to focus on retaining our talent and retaining or attracting businesses to the megaregion that need 6,250 new workers to support their operations.

Source: JobsEQ®

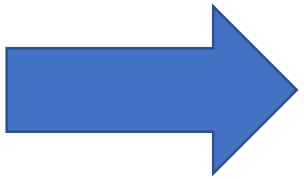
What is needed?

	2030 If We Do Nothing		To achieve an LQ of 1.25	What is needed to reach the top LQ range	
	Cluster Employment 2030	LQ	Employment needed	LQ (Avg of top 3 LQs)	Employment needed
Richmond, VA MSA	29,744	1.25			
Virginia Beach-Norfolk-Newport News, VA-NC MSA	26,221	0.98			
I-64 Innovation Corridor	**56,224**	**1.10**	**6,250**	**1.77**	**36,302**

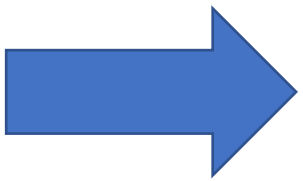
Source: JobsEQ®

In other words…

If we **do nothing** by 2030, we'll have an **LQ of 1.10** and **56,224 employed** in the industry cluster.



If we add and additional **6,250 employees,** we'll reach an **LQ of 1.25**



If we add an additional **36,302 employees,** we'll reach the top tier with an **LQ of 1.77**

Source: JobsEQ®

Data Centers/
Digital Network

Data Centers/Digital Networks

- Data processing, hosting, and related services is the code typically used for data centers. Wired and wireless telecommunications carriers capture the digital network connecting the Corridor, including the transatlantic cables anchored in Virginia Beach.
- The LQ for this cluster is below 1, indicating a lower share of employment in the Corridor compared to the national mix, but jobs in the cluster are high paying.
- Employment is around 3,400 in both MSAs, but this cluster accounts for a greater share of employment in Richmond, so it has a higher LQ.
- Over the next 10 years, Chmura's JobsEQ projects employment to decline in the cluster, driven primarily by expected declines in wired and wireless telecommunications carriers.
- With a declining growth rate, the Corridor trails expected growth rates in this cluster in peer regions such as Nashville, Raleigh, and Denver.
- The opportunities presented by the digital network capacity and demand for data centers may not be realized in the Corridor without coordinated action.

Source: JobsEQ®

Data Centers/Digital Network Definition

		I-64 Innovation Corridor		
NAICS	Industry	Empl 2020Q4	Avg Ann Wages	LQ
5182	Data Processing, Hosting, and Related Services	2,344	$60,176	0.64
5173	Wired and Wireless Telecommunications Carriers	4,474	$76,502	0.77
	Total	**6,817**	**$70,889**	**0.72**

Source: JobsEQ®

Current Size and LQ, Data Centers/Digital Network

	Current Employment (2020Q4)	Location Quotient
Richmond, VA MSA	3,419	0.80
Virginia Beach-Norfolk-Newport News, VA-NC MSA	3,336	0.66
I-64 Innovation Corridor	**6,817**	**0.72**

Source: JobsEQ®

Recent Announcements

QTS Quality Technology Services

Investment: $425 Million (October 2020)

facebook

+250 Jobs
(September 2018, starting 2021)

PointOne

+60 Jobs
(October 2018, starting 2021)

DIGITALFORTRESS

+120 Jobs (October 2018, starting 2021)

Projected Size and LQ 2030, Data Centers/ Digital Network

	Cluster Employment 2030	Total Employment 2030	Location Quotient 2030
Richmond, VA MSA	3,412	676,508	0.84
Virginia Beach-Norfolk-Newport News, VA-NC MSA	3,236	760,915	0.71
I-64 Innovation Corridor	**6,635**	**1,456,171**	**0.76**

Source: JobsEQ®

Data Centers/Digital Networks

	I-64 Innovation Corridor	Richmond	Hampton Roads	Philadelphia	Charlotte	Atlanta	Jacksonville	Washington, DC	Denver	Pittsburgh	Nashville	Columbus	Orlando-Tampa	Raleigh
Current Cluster Empl	6,817	3,419	3,336	22,716	11,332	39,644	5,043	29,065	29,646	6,225	7,594	7,044	25,111	7,272
Current LQ	0.72	0.80	0.66	1.23	1.35	2.16	1.07	1.37	2.91	0.86	1.13	1.00	1.45	1.68
LQ 2030	0.76	0.84	0.71	1.16	1.35	2.15	1.07	1.41	2.93	0.82	1.18	0.99	1.42	1.68

To reach an LQ of 1.00, matching the national share of employment in this industry, we need to focus on retaining our talent and/or attracting businesses to the megaregion that need 2,090 new workers to support their retaining operations.

Source: JobsEQ®

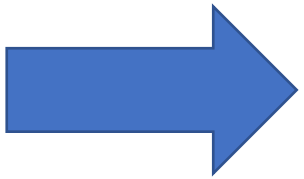
What is needed?

	2030 If We Do Nothing		To achieve an LQ of 1.0	What is needed to reach the top LQ range	
	Cluster Employment 2030	LQ	Employment needed	LQ (Avg of top 3 LQs)	Employment needed
Richmond, VA MSA	3,412	0.84			
Virginia Beach-Norfolk-Newport News, VA-NC MSA	3,236	0.71			
I-64 Innovation Corridor	**6,635**	**0.76**	**2,090**	**2.25**	**13,204**

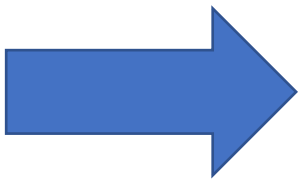
Source: JobsEQ®

In other words…

If we **do nothing** by 2030, we'll have an **LQ of 0.76** and **6,635 employed** in the industry cluster.



If we add and additional **2,090 employees,** we'll reach an **LQ of 1.0**



If we add an additional **13,204 employees,** we'll reach the top tier with an **LQ of 2.25**

Source: JobsEQ®

National Security/ Cyber Security

National Security/Cyber Security

- As with many information and technology jobs, cyber security workers are employed in a variety of industries. This cluster definition is defined as the combination of the national security and international affairs industry and two cyber security occupations.
- "National Security" includes security jobs in the Armed Forces, including the National Guard, primarily engaged in national security and related activities.
- The industry and two occupations all have high LQs, indicating a much greater share of employment in the Corridor compared to the nation. The industry and two occupations also pay high wages on average.
- The combined national security/cyber security cluster has an LQ of 3.63 in the Corridor, reflecting high concentrations in both the Hampton Roads MSA (5.04) and Richmond MSA (2.02).
- Chmura's JobsEQ projects employment and LQ declines in this cluster over the next 10 years in the Hampton Roads MSA, driving employment and LQ declines in the Corridor as a whole.
- Among peer regions, only Philadelphia and Pittsburgh also show projected employment declines in this cluster. However, the Corridor is still expected to have the highest LQ among all peer regions except Washington, D.C.

Source: JobsEQ®

National Security/Cyber Security Definition

		I-64 Innovation Corridor		
NAICS	**Industry**	**Empl 2020Q4**	**Avg Ann Wages**	**LQ**
9281	National Security and International Affairs	30,632	$89,562	5.24
SOC	**Occupation**			
15-1244	Network and Computer Systems Administrators	4,322	$85,500	1.27
15-1212	Information Security Analysts	2,941	$98,000	2.45

Source: JobsEQ®

Current Size and LQ, National Security/Cyber Security

	Current Employment (2020Q4)	Location Quotient
Richmond, VA MSA	9,516	2.02
Virginia Beach-Norfolk-Newport News, VA-NC MSA	28,202	5.04
I-64 Innovation Corridor	**37,895**	**3.63**

Source: JobsEQ®

Recent Announcements

+250 Jobs (January 2019)

Projected Size and LQ 2030, National Security/Cyber Security

	Cluster Employment 2030	Total Employment 2030	Location Quotient 2030
Richmond, VA MSA	9,912	676,508	2.02
Virginia Beach-Norfolk-Newport News, VA-NC MSA	26,062	760,915	4.73
I-64 Innovation Corridor	**36,139**	**1,456,171**	**3.43**

Source: JobsEQ®

National Security/Cyber Security

	I-64 Innovation Corridor	Richmond	Hampton Roads	Philadelphia	Charlotte	Atlanta	Jacksonville	Washington, DC	Denver	Pittsburgh	Nashville	Columbus	Orlando-Tampa	Raleigh
Current Cluster Empl	37,895	9,516	28,202	20,620	5,908	12,691	9,673	100,126	11,815	4,953	3,893	10,839	13,683	3,859
Current LQ	3.63	2.02	5.04	1.02	0.64	0.63	1.85	4.28	1.05	0.62	0.52	1.39	0.72	0.81
LQ 2030	3.43	2.02	4.73	0.98	0.69	0.66	1.77	4.20	1.09	0.63	0.55	1.35	0.73	0.87

Source: JobsEQ®

What is needed

This is to maintain the current LQ, as it is projected to drop to 3.43

	2030 If We Do Nothing		To achieve an LQ of 3.63	What is needed to reach the top LQ range	
	Cluster Employment 2030	LQ	Employment needed	LQ (Avg of top 3 LQs)	Employment needed
Richmond, VA MSA	9,912	2.02			
Virginia Beach-Norfolk-Newport News, VA-NC MSA	26,062	4.73			
I-64 Innovation Corridor	**36,139**	**3.43**	**2,168**	**4.20**	**8,372**

By doing nothing we will lose 1,756 employees and drop our LQ by 0.2 in the next decade.

Source: JobsEQ®

In other words…

If we **do nothing** by 2030, we'll have an **LQ of 3.43** and **36,139 employed** in the industry cluster.

By doing nothing we will lose 1,756 employees and drop our LQ by 0.2 in the next decade.

An additional **2,168 employees** are needed to maintain an **LQ of 3.63**

This is to simply to maintain our current LQ.

If we add an additional **8,372 employees,** we'll reach the top tier with an **LQ of 4.20**

Source: JobsEQ®

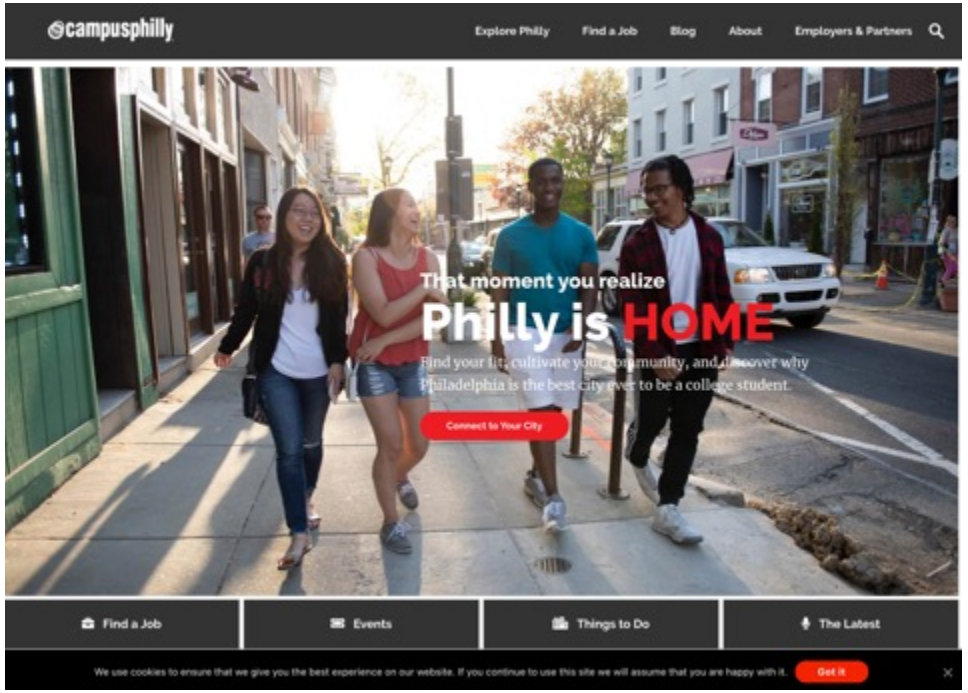
TRANSFORMATIONAL GROWTH

JOB #2:
We must retain our talent.

What is Philadelphia doing right?

Region	Stayed or Returned	Left
Philadelphia-Camden-Wilmington, PA-NJ-DE-MD MSA	61%	39%
Charlotte-Concord-Gastonia, NC-SC MSA	60%	40%
Atlanta-Sandy Springs-Alpharetta, GA MSA	56%	44%
Jacksonville, FL MSA	54%	46%
Washington-Arlington-Alexandria, DC-VA-MD-WV MSA	53%	47%
Denver-Aurora-Lakewood, CO MSA	53%	47%
Pittsburgh, PA MSA	53%	47%
Nashville-Davidson--Murfreesboro--Franklin, TN MSA	51%	49%
I-64 Innovation Corridor	50%	50%
Columbus, OH MSA	50%	50%
Orlando-Tampa FL Megaregion	48%	52%
Raleigh-Cary, NC MSA	44%	56%

Campus Philly – www.campusphilly.org



Our Impact

Four generations of college students have now attended college in our region since Campus Philly's creation and the impact is everywhere you look:

115%

increase in Philadelphians 25-34 with college degrees between 2000 and 2017. (Last decade Philly actually *lost* 25-34 year olds.)

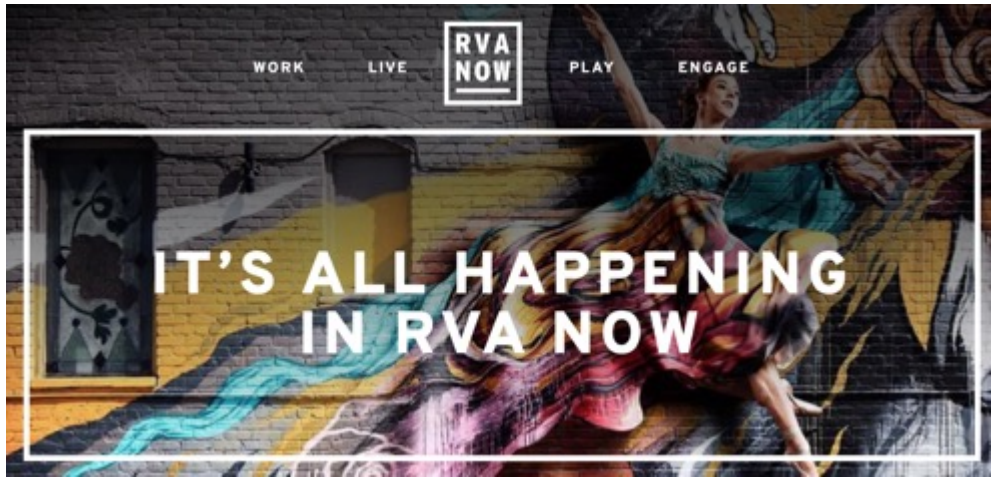
118,500

additional young degree holders (between 25-34) in the Greater Philadelphia region between 2000 and 2017.

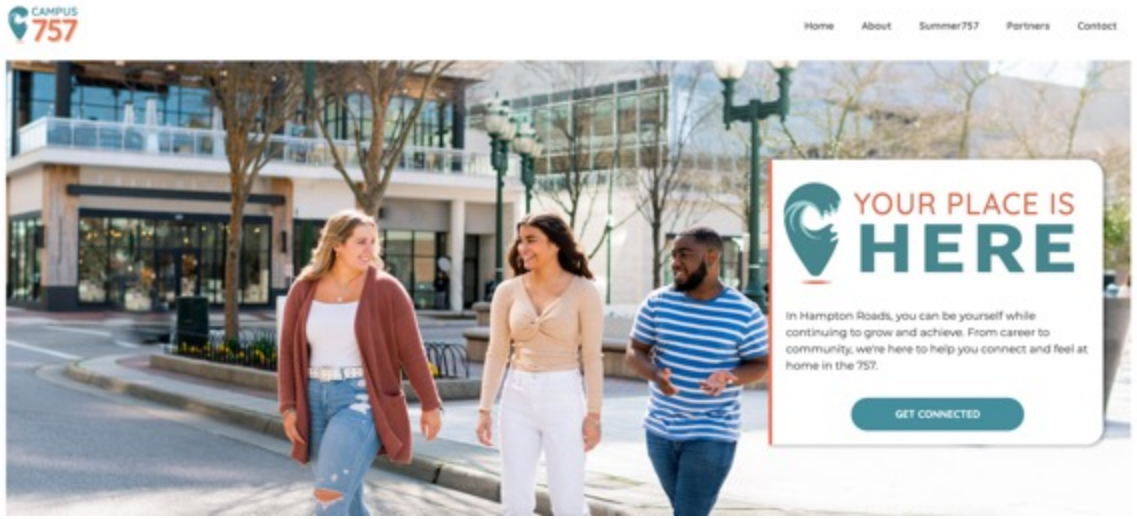
54%

Greater Philadelphia retains 54% of its regional college students (compared to 42% in Boston).

We have just launched two similar programs.



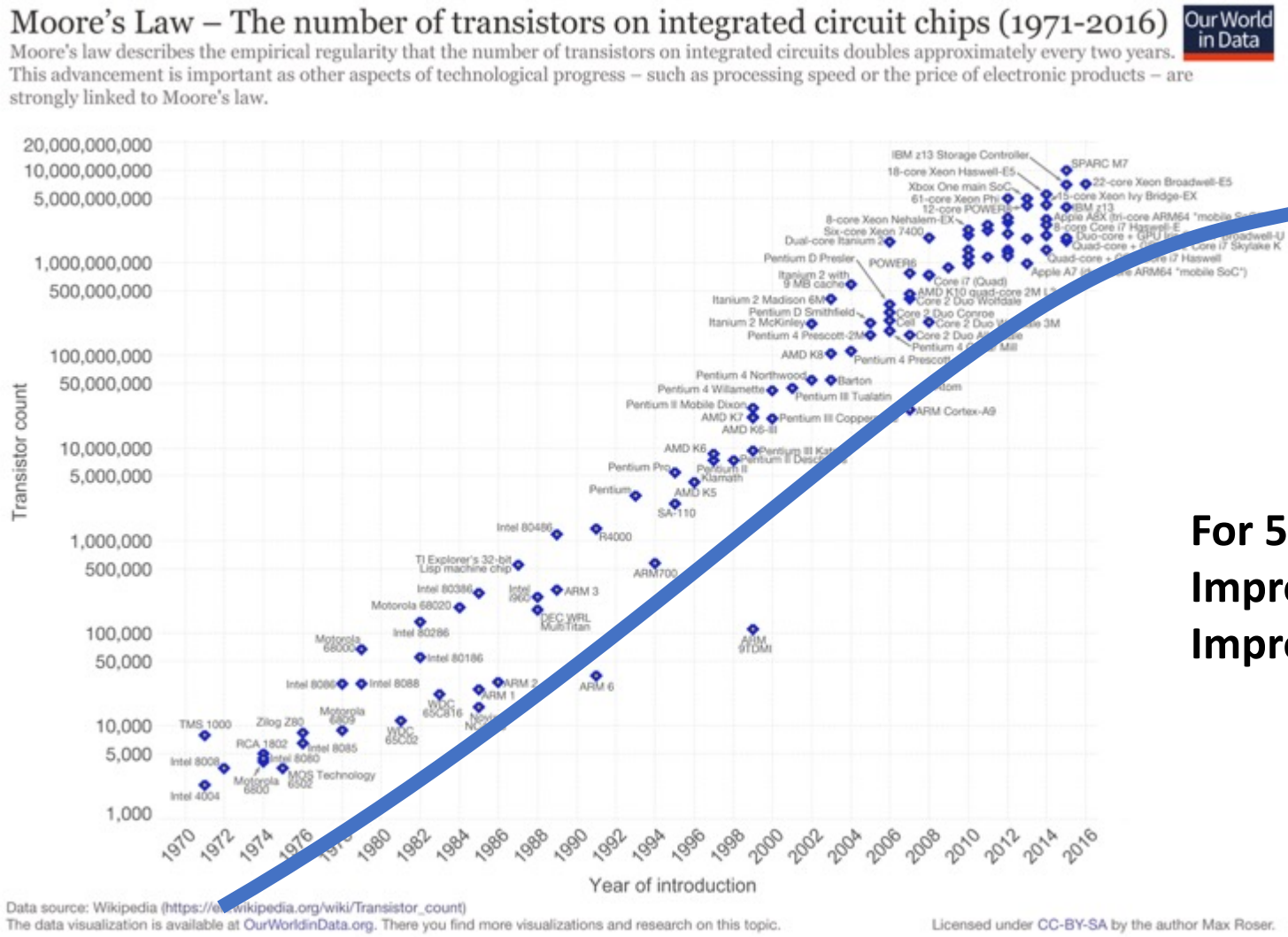
RVA NOW



Campus 757

JOB #3:
Advance Business Infrastructure – Become a Global Internet Hub.

Tech Explosion



Tech Singularity

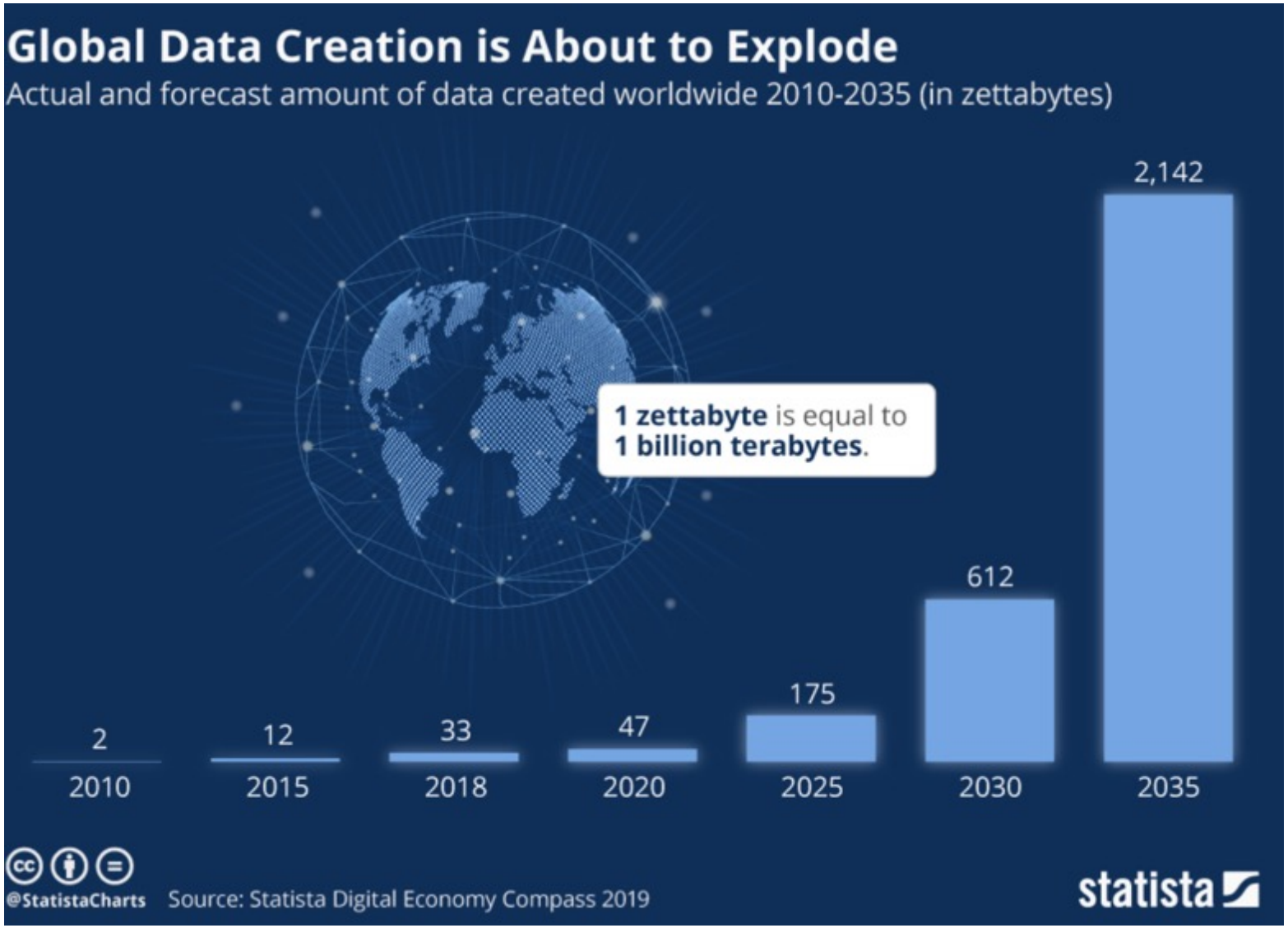
20?? – Quantum Computing Achieved

2018 - Hyper-specialized CPUs

For 50 Years Processing Power Has Improved Linearly – Soon It Will Improve Exponentially

Data Explosion

(and data security)



RVA757 Connects' Draft Concept Paper:

Becoming a Global Internet Hub

5 Things to Know

I-64 INNOVATION CORRIDOR

BECOMING A GLOBAL INTERNET HUB

September 13, 2021

The I-64 Innovation Corridor – an 8,000-square-mile megaregion that runs from Richmond to Hampton Roads – is well on its way to becoming a full-fledged global internet hub.

This white paper details what a global internet hub is, why the distinction is important, the factors that make a region a global hub, how the I-64 Innovation Corridor is becoming one, the benefits a global internet hub offers businesses and entire communities, and why time is of the essence in realizing this promise for the I-64 Innovation Corridor.

This paper is made possible through RVA757 Connects, a 501(c)(3) organization dedicated to improving the economic success and quality of life for everyone in the Richmond (RVA) and Hampton Roads (757) regions. We are an inclusive, mutually supportive network of leaders representing business, higher education, and community stakeholders. We identify, support, and advance major opportunities, initiatives, and projects that will benefit both the RVA and 757 regions for generations to come. Advancing the awareness of and support for the I-64 Innovation Corridor in becoming a global internet hub is one of our organization's priorities. In fact, we believe this cause has the potential to transform our megaregion.

Global Internet Hubs

The best way to understand global internet hubs, or any internet hub city for that matter, is to see them as the concentrated hot spots, or nodes, on a world map of the internet.

The internet ecosystem is a collaborative "business model," a hyper-competitive set of interlocking partnerships that create and support a global network. These partnerships operate on local, country, and international levels. Continual rapid innovation, security, trust, and ability to scale are essential competencies to successfully operate in this system. While there are regulatory issues that come into play, in general, technology deployment and associated growth is limited by talent and adjacent enabling capabilities much more than regulations.

The notion of supply and demand is abstract, as much of the industry fills the growing network capacity as fast as it is built. With the ecosystem in a perpetual state of expansion, the concept of creative replacement is everywhere, and COVID-19 has increased the slope of the growth curve even more. In this industry, one doesn't compete, but rather collaborates and grows with the system.

Internet hubs are physical locations where carrier networks, content delivery networks (CDNs), social networks, cloud services, hosting, gaming, and IT service providers choose to *co-locate and interconnect*, usually within a massive data center (called internet exchange point or IXP) or within several data centers in the same metropolitan region via a cross connection.

1. There are many Internet hubs.

Internet hubs are physical locations that appeal to:

- Carrier networks
- Content delivery networks (CDNs)
- Social networks
- Cloud services
- Hosting
- Gaming
- IT service providers

These firms choose to co-locate and interconnect in a market. They do so in massive data center (called Internet exchange point or **IXP**) or within several data centers in the same region.

2. Internet hubs deliver many advantages.

Business Advantages

- Faster and more reliable service
- Lower costs
- Competitive advantage to conduct business at the speed of light
- Edge computing
- Larger tech talent pool

Community Advantages

- Municipal / County budget funding
- Increased access to high-speed Internet
- Improved public safety, transportation, and flooding/SLR services
- Enhanced educational opportunities
- Improved healthcare
- Increased work-from-home opportunities
- Service to underserved neighborhoods
- Enhanced locational appeal for remote workers

Future-proofing the Community:

Help a community remain relevant in the future with next gen capabilities.

Every “next generation” of technology adds new functionality, capacity, and performance, often by an order of magnitude.

In this industry, a generation is one to three years.

The leading-edge hubs and users will have digital resources, tools, and capabilities that are not widely accessed to others – real-time massive data acquisition / analytics, use of augmented intelligence and creation of new, highly beneficial knowledge.

All of this will drive the winning companies and organizations of tomorrow…and future economic growth and prosperity.

3. Super large hubs become known as and are officially designated as a *Global Internet Hub*.

Currently, the top ten Global Internet Hubs (as ranked by TeleGeography), based on international capacity, are:

1. Frankfurt, Germany
2. London, United Kingdom
3. Amsterdam, Netherlands
4. Paris, France
5. Singapore, Singapore
6. Hong Kong, China
7. Stockholm, Sweden
8. Miami, United States
9. Marseille, France
10. Los Angeles, California

Notably, eight out of the top ten Global Internet Hubs have direct access to subsea cables.

4. Becoming a Global Internet Hub doesn't happen by accident. The industry has identified ten key factors of success.

Criteria for Success

1. Access to international deep-sea cables
2. Data centers
3. Robust network of local fiber optic cables
4. Inexpensive power and/or access to renewable sources of energy
5. Inexpensive land
6. Low risk of natural disaster
7. Proximity to large populations
8. Tech-savvy workforce
9. Economic incentives
10. Enlightened Leaders

5. I-64 Innovation Corridor is becoming a Global Internet Hub

Key Assets

Network Access Point (NAP)

Where data center, subsea fiber and terrestrial networks converge

Facebook
(Hyperscale)
$4B investment
2M+ sq. ft.
160MW

QTS Richmond
(Wholesale)
1.4M sq. ft.
World's 4th largest

Four Deep-sea Cables

FACEBOOK
Google
TELXIUS
Microsoft

Key Positioning

We are not trying to become or replace Ashburn in Loudoun County, where an estimated 70% of the world's Internet traffic passes.

The I-64 Innovation Corridor's internet strategy is to become the center for the fastest and most diverse and resilient Internet traffic to Europe, South America, and Africa.

Our transformational opportunity to build the backbone of a 21st century economy.

- **Phase 1: Networks, like deep sea cables, attract data centers.** As the data center hub grows and increases in importance, more networks establish themselves in the area. This growth leads to even more inter-connected networks – an Internet ecosystem.

- **Phase 2: A vibrant, growing Internet ecosystem attracts tech talent**, particularly related to applications development and commercialization.

- **Phase 3: Companies are attracted to the growing pool of tech talent and major "exchange point" hubs,** realizing the benefits of hyper-connectivity, digital speed, massive real-time data acquisition, and access to computing capabilities such as ML (machine learning) and AI (artificial intelligence).

- **Phase 4: Success fuels momentum.** More talent and companies are attracted to the region. Existing companies expand. New companies are started – all supporting the companies and jobs of tomorrow.

Thank You!


RVA757
connects


GO
VIRGINIA
VIRGINIA INITIATIVE FOR
GROWTH &
OPPORTUNITY
IN EACH REGION