GEOFUTURES

The Future of Geospatial is STLMade

A Strategic Roadmap for Advancing the Geospatial and Location Technology Cluster in the St. Louis Region

TECONOMY PARTNERS LLC

GEOFUTURES | EXECUTIVE SUMMARY | JUNE 2020

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Executive Summary

St. Louis is mobilizing around a significant innovation cluster in geospatial technologies and applications, where it can stand out and build competitive advantage at a scale that can impact its broad regional economy and be a driver of transformative, inclusive and equitable growth.

St. Louis has had a prominent place in the history and ongoing activities of geospatial development. Dating back to the Lewis and Clark Expedition, St. Louis has been a gateway for exploration with a legacy of mapping the world around us. With the advent of aerial photography and the demands in WWII for accurate base maps and navigational aids, the science of photographic interpretation and map-making took a major leap forward, and once again St. Louis was at the forefront. Beginning in 1943, with the establishment of the Army's Air Forces Aeronautical Chart Plant, St. Louis has become a leading hub for military map-making and locational analysis, now represented by the National Geospatial-Intelligence Agency (NGA) West headquarters.

Today, this longstanding and strong connection to the NGA has anchored the development of a substantial base of economic activity for St. Louis and a broader eco-system for talent development, research and innovation and entrepreneurial development, that can root and sustain long-term economic competitiveness and growth in geospatial development (see: Snapshot of Baseline Geospatial Activities in St. Louis). With its approximately 3,700 high-paying jobs, NGA is one of the St. Louis region's largest employers. Remarkably, up until 2017, this base of activity in geospatial-related development was largely unrecognized in St. Louis given the mission of NGA as a critical agency for U.S. intelligence.

But it took a catalyzing event to mobilize the St. Louis community to recognize its broader potential in geo-spatial technologies and applications. This event was the competition and decision in 2016 to locate the new $1.7 billion state-of-the-art "Next" NGA West, commonly referred to as "N2W," on a 97-acre site just north of Downtown St. Louis. The headquarters is the largest federal headquarters project in the City of St. Louis.

A Word About the National Geospatial-Intelligence Agency (NGA)

A unique combination of intelligence agency and combat support agency, NGA serves as the world leader in providing timely, relevant, accurate and actionable geospatial-intelligence. By evaluating imagery, maps, charts, multiple layers of foundation data (such as terrain, elevation and gravity) and more, NGA's intelligence specialists help users visualize what is happening at a particular place and time, going beyond describing 'what, where and when' to revealing 'how and why.' NGA's work enables decision-making for policymakers, warfighters, intelligence professionals and first responders.

Source: NGA, approved for public release, 17-466

Now the St. Louis region is coming together as one community to advance geospatial-related development as an innovation cluster for the first time since the renowned Plant and Life Science Roadmap. Under the leadership of Dr. Bill Danforth, John McDonnell and others in the late 1990s, St. Louis pursued a focused cluster strategy that has made the region the global center of excellence for agricultural technology and broader life sciences, and has led to key organizational efforts, such as BioSTL, BioGenerator, Danforth Plant Science Center and Cortex, that have stood the test of time and sustained an increasingly vibrant and growing life sciences cluster. In 2018, The Brookings Institution featured the St. Louis plant and life sciences cluster initiative as one of five best practice examples on the basis of its sustained success in fostering the cluster's growth and development.

A Snapshot of Baseline Geospatial Activities Found in St. Louis

A significant economic base of activity and jobs in the region:

- NGA alone employs directly 3,700 workers in the St. Louis region. With salaries averaging $75,000, this stands well above the region's average annual salaries of $54,000.*
- Through NGA's base of defense contractors and other private industries involved in geospatial technologies and applications, such as surveying, logistics, remote sensing and imaging instruments and locational data analysis, there are more than 6,600 jobs across nearly 350 companies in St. Louis. Combined with the nearly $20 million in university R&D grants in geospatial-related research, this generates a total economic impact reaching 27,000 jobs and nearly $5 billion in economic activity for the St. Louis region.

A driver of broader IT and other STEM skills:

- While the modern geospatial workforce continues to include "traditional" occupations and job titles such as cartographer, surveyor, and geographer, the talent base and skill sets are increasingly oriented within "related" IT and data sciences roles such as systems and software engineers, data analysts and scientists, business analysts and design engineers. Some of the top skill requirements in regional geospatial job postings include information systems, programming in Python, data manipulation, and algorithm development, in addition to knowledge of core geosciences—a clear demand for "hybrid" skill sets.
- Taken all together, this geospatial-related occupational workforce in the St. Louis region is large and has grown rapidly since 2015 (up 11 percent) and outpacing national growth to reach nearly 53,000 employed in key geospatial occupations.
- St. Louis' colleges and universities are growing their educational programming and graduate levels in geospatial-related degree fields, increasing graduate levels by nearly 23 percent from 2015-17, a rate more than double that seen nationally.

An emerging area of research and innovation for St. Louis:

- The region's universities conduct nearly $39 million annually in research involving geospatial-related fields, including nearly $20 million in grants with identified geospatial-specific research, and have generated more than 1,300 geospatial research publications in recent years.
- A wide range of university research centers and initiatives involving geospatial technologies and applications are active.
- There have been 14 VC investment deals involving St. Louis geospatial companies since 2015. Local entrepreneur-support organization Arch Grants, which provides $50,000 equity-free grants and pro bono support services to entrepreneurs who locate early-stage businesses in St. Louis, announced in 2019 that it was awarding five additional grants each year specifically to geospatial startups.
- The St. Louis economic development and geospatial communities are mobilizing to create a platform to activate innovation and entrepreneurship in geospatial technologies and applications.

**Note: In the City of St. Louis, NGA presently employs 3,150 workers with an average salary of $101,000.*

Defining Geospatial Technologies and Applications in Driving STL GeoFutures in St. Louis

"Geospatial" refers to the collection and processing of data that is associated with location and spatial analysis for better situational awareness and decision-making. For decades, the use of geospatial technologies and applications had limited commercial uses.

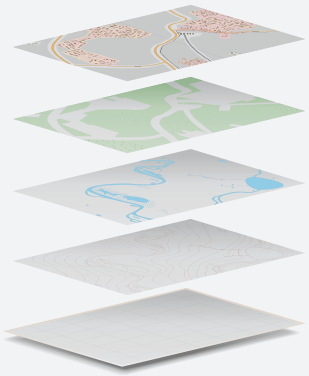
But today, geospatial technologies and applications have been unleashed and are becoming a common fabric in our daily lives. Applications using locational data are now ubiquitous on smart phones, helping people make decisions from how to drive to where to eat, all in real time.

For industry, the 'where' dimension is redefining how businesses operate, with locational data now being a key component in how companies market their products and services, support customers, manage supply chains and ultimately grow their businesses.

Today, the geospatial marketplace involves a rich assortment of technology-based solutions, such as global positioning systems, earth observation, 3D scanning and spatial analytics. Altogether the geospatial market is large and growing fast. The research firm MarketsandMarkets estimates the geospatial market at $239.1 billion in 2019 and growing to $502.6 billion by 2024, a 13.2 percent compound annual growth rate over this five-year period.[1]

Looking to the future, geospatial development is shaping up to be a key enabler of the Fourth Industrial Revolution – in which the merging of physical and digital worlds fundamentally changes the way we live, work and relate to one another. The need for real-time locational data for decision-making and situational awareness will accelerate under the Fourth Industrial Revolution. This will involve cutting-edge technologies such as remote imaging and sensing, smart devices in cyber-physical systems, autonomous systems and Big Data predictive analytics powered by artificial intelligence and machine learning to drive innovations in our daily lives. So, geospatial development is not just a narrow set of technologies and applications, but a fundamental and enabling part of the larger digital transformation taking place in the decades ahead. Given the advanced technology nature of the growing uses of geospatial-related applications, locational data and spatial analysis, we have termed this opportunity for St. Louis as the "STL GeoFutures Initiative."

The term "geospatial" arises from the ability to assemble a range of location-based data into a layered set of maps and other products and applications that integrate boundaries, infrastructure, elevation, geodetic (magnetic and gravimetric), human geography and images



Given the advanced technology nature of the growing uses of geospatial-related applications, locational data and spatial analysis, we have termed this opportunity for St. Louis as the STL GeoFutures Initiative.

1 *MarketsandMarkets, Geospatial Solutions Market by Technology, Solution, End-User, Application and Region – Global Forecast to 2024, see https://www.marketsandmarkets.com/Market-Reports/geospatial-solution-market-206125202.html?gclid=EAIaIQobChMI9KK9h-rM5wIVHYVaBR16ug-MoEAAYASAAEgLhqfD_BwE*

The STL GeoFutures Initiative Efforts Focus on Advancing a Strategic Roadmap

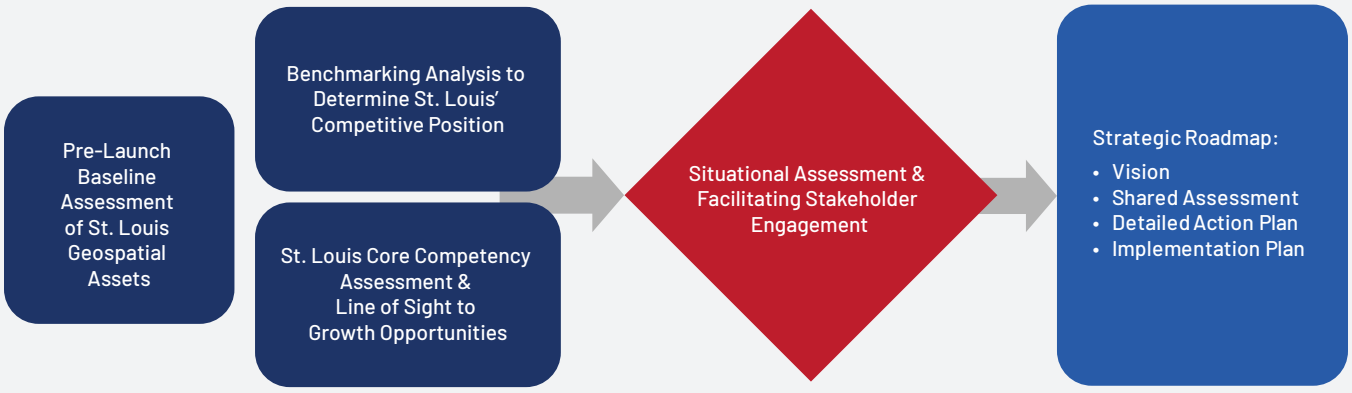
The objective of the STL GeoFutures Initiative is to enable the St. Louis region to realize its full potential as a global center of excellence in geospatial-related development. This requires a Strategic Roadmap that brings a community together around a shared vision of the future and what it will take to get there – including an overall situational assessment for positioning the region for success in geospatial development.

A broad stakeholder Advisory Committee of twenty-nine leaders representing industry, education, community and economic development has come together as one team for St. Louis to guide the development of the Strategic Roadmap. This effort involved five meetings of the STL GeoFutures Initiative Advisory Committee, the input of over 120 companies and organizations involved in geospatial-development and broader economic and community development of the region, as well as the input from six focus group meetings involving 80 participants.

The culmination of this extensive and deliberate process of analysis, outreach and discussions is a Strategic Roadmap to provide the framework for the St. Louis region to realize its potential in geospatial development. The key elements of this Roadmap set out below in Figure ES-1 include:

- A shared vision of success to serve as the mission statement for the STL GeoFutures Initiative with near-term and longer-term objectives on how to reach this vision.
- A game plan of specific strategic priorities and actions that is comprehensive and tailored to the situational assessment found in the St. Louis region of opportunities to be realized and areas of improvement that need to be addressed, in concert with ongoing activities and existing resources as well as informed by best practices in innovation cluster development.
- An implementation plan that measures up in its governance, organizational approach and activities to build upon the STL GeoFutures Initiative process and offer a catalytic and sustainable means to steer, invest, convene, and engage for future success.

FIGURE ES-1: OVERVIEW OF STEPS IN STRATEGIC PLANNING EFFORT FOR STL GEOFUTURES



Strategic Vision and Objectives of the STL GeoFutures Initiative: Building Upon an Analysis of the St. Louis Region's Competitive Position and Line-of-Sight to Growth Opportunities

The vision that emerged for the STL GeoFutures Initiative is **BOLD** in its ambition and focus. Underpinning this vision are two key observations that the stakeholders strongly embraced:

1. The STL GeoFutures Initiative is ideally situated to be a driver for equitable and inclusive regional growth. The Initiative offers a means to engage disinvested people and places, particularly Black residents, in employment, ownership and broader community wealth generation. It can also improve the fundamental preconditions shaping the ability of people and places to participate in economic growth using the technologies and tools of geospatial development to address population health, transportation access, and crime and safety, among other socioeconomic challenges, through inclusive, community-led Smart Cities initiatives.

   Today, despite the significant activities in geospatial development found in the St. Louis region, equitable and inclusive growth is not being realized. St. Louis' geospatial workforce, its university degree programs, and its entrepreneurial community far from reflect the region's diverse population of residents:

   - In workforce, African-Americans are just 9 percent of the geospatial-related workforce, roughly half the level of total employment in the region.
   - In talent generation, just 6 percent of the graduates in geospatial-related degree programs are African-American.
   - In entrepreneurship, African-Americans comprise only 3 percent of self-employed individuals in geospatial industries.

These findings have been reinforced consistently in discussions with community leaders and geospatial industry stakeholders during this Roadmap effort.

Vision for STL GeoFutures Initiative

Build upon the St. Louis region's substantial assets and deep connections to geospatial development for national security to further transformative, equitable and inclusive growth as a global center of excellence for advanced technology applications of locational data in leading industry sectors and community services.

2. The STL GeoFutures Initiative offers a distinctive competitive advantage for St. Louis to fully participate and take a leadership role in the Fourth Industrial Revolution. The merging of digital and physical worlds, by leveraging the cutting-edge technologies used in location-based data and applications, such as remote imaging and sensing, smart devices in cyber-physical systems, autonomous systems and Big Data predictive analytics powered by artificial intelligence and machine learning.

By building upon St. Louis' current assets and competitive advantages, this vision is also REALISTIC. Like any cluster initiative, it is important for the STL GeoFutures Initiative to have a line-of-sight to growth opportunities where the St. Louis region has a comparative advantage.

Several key findings emerge that suggest how St. Louis is best-positioned to compete in geospatial development and advance growth opportunities. These findings are based on comprehensive assessments of the national innovation landscape of geospatial innovation and overall technology competencies found in St. Louis, plus a competitive benchmarking analysis with five other leading geospatial regions. These analyses reveal:

- **St. Louis stands out in the size, concentration, and growth of its geospatial and broader tech talent base compared with the nation and other regions.** The region employs nearly 53,000 in geospatial-related occupations, with the bulk of these workers in key

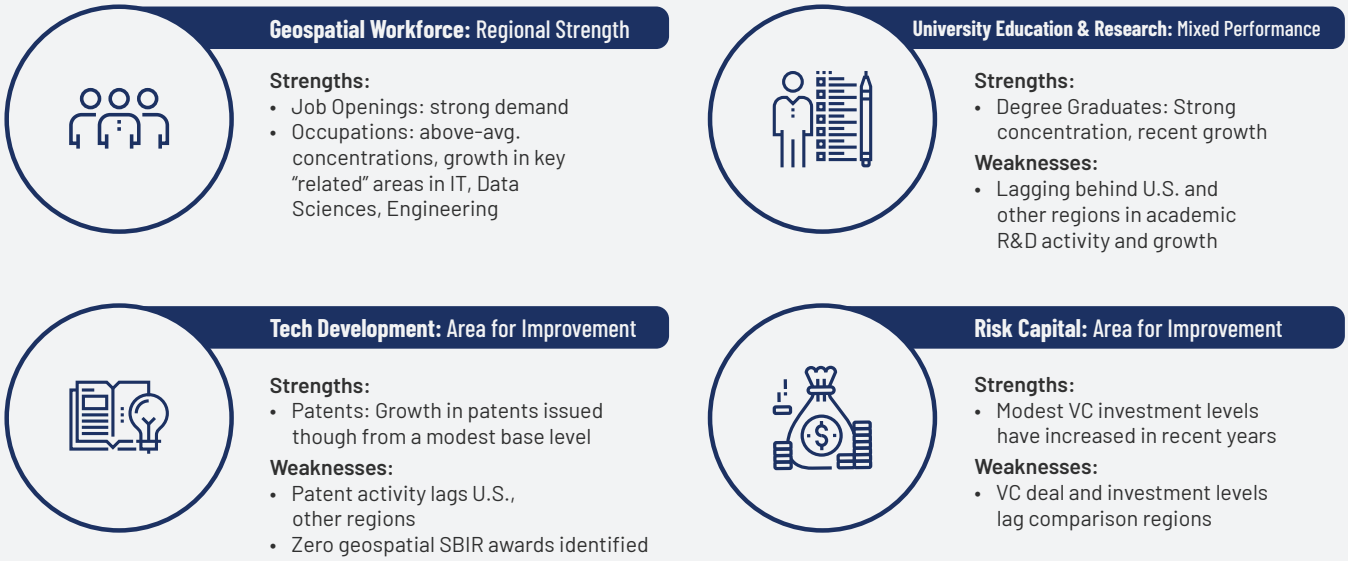
areas in IT, data sciences, and electrical engineering. In these critical "related" job and skill areas, the region is 15 percent more concentrated relative to the national average and has grown at a double-digit pace, outpacing national growth since 2015.

- **In specific geospatial efforts relating to innovation, such academic research, patent innovations and venture-backed startups, the St. Louis area has modest levels of activity that lags leading benchmark regions**. So, innovation in specific geospatial technologies today is not a competitive advantage for St. Louis.

- **Still the St. Louis region does possess identified strengths in advanced computing and data sciences across all of its patent, publications and venture capital activities that could be leveraged towards advanced geospatial technology applications.** Specifically, there is a distinct network of IT and analytics patent innovations in St. Louis that is focused on authentication and validation of financial transactions and is closely linked with digital health, imaging analysis and location tracking systems. Plus, publications activity reveals a critical mass of activities in enabling technologies of data sciences, imaging, remote sensing, computer sciences and associated hardware that could be leveraged towards geospatial applications. Similarly, the technology verticals associated with venture capital activity in the St. Louis region also emphasize advanced computing and data sciences technologies.

This suggests that the St. Louis region is best positioned to focus on the ability of its talent base to adopt and integrate the latest advances in computing and data sciences into geospatial applications that enhance the value of locational data for decision-making and situational awareness to ensure our nation's security, grow businesses and address community needs. It is well understood by market researchers of geospatial development that one path to realizing the future value of geospatial technologies and applications is closely connected to specific industries and their applications of advanced technology.

FIGURE ES-2: SUMMARY COMPETITIVE POSITION OF ST. LOUIS IN KEY ECOSYSTEM ELEMENTS BASED ON BENCHMARKING



Source: TEConomy Partners' analysis.
Note: Five benchmark regions that St. Louis was compared with include: Greater Denver, Greater Los Angeles, Philadelphia metro, Silicon Valley and Washington, DC metro.

Four specific leading industry sectors in St. Louis were identified as being closely aligned with the use of locational data and geospatial technologies for their competitive advantage, including:

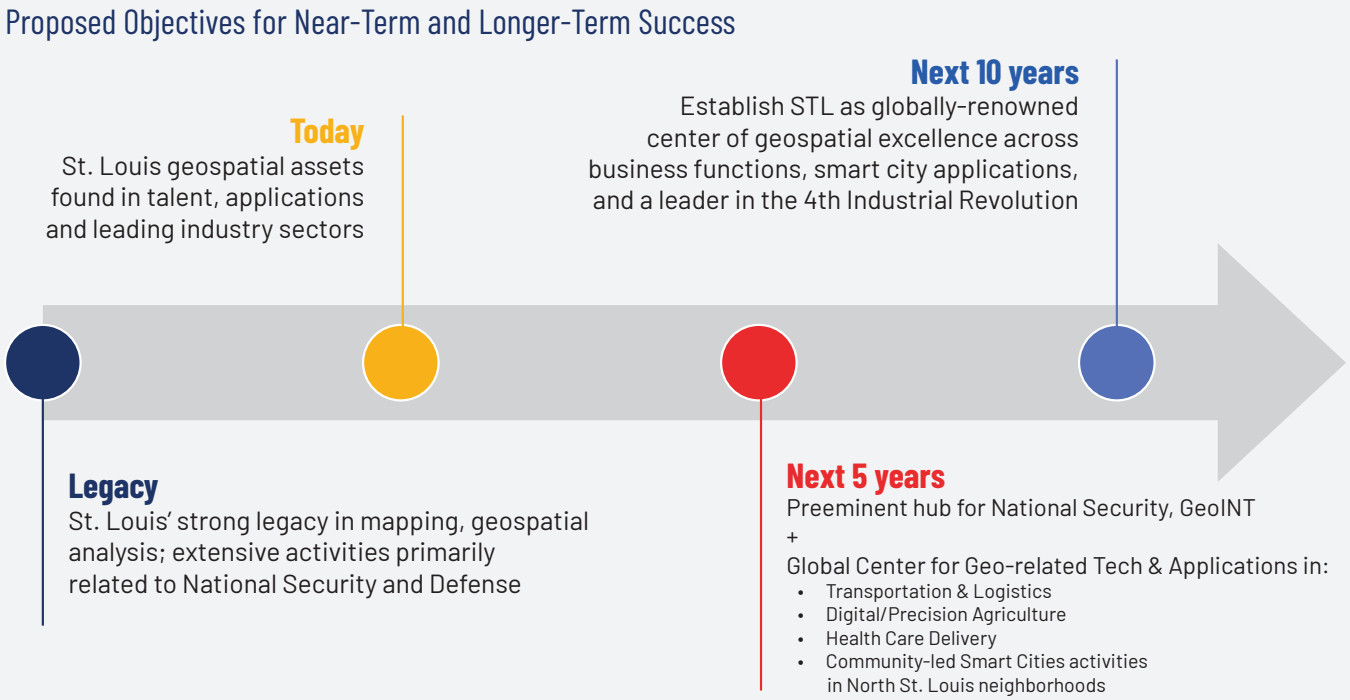
- National Security
- Digital/Precision Agriculture
- Transportation & Logistics
- Health Care Delivery

FIGURE ES-3: SUMMARY OF LIKELY GROWTH OPPORTUNITIES ALIGNING LEADING INDUSTRY SECTORS IN ST. LOUIS WITH DEMAND FOR LOCATIONAL TECH APPLICATIONS

The specific near-term objective of the STL GeoFutures Initiative is to focus St. Louis as the global thought leader in geospatial applications, building on its leading industries and community priorities. Over the next five years, St. Louis needs to consolidate its position and become the preeminent hub for national security applications of geospatial intelligence, while also building upon its base of industry strengths in areas such transportation and logistics, digital/precision agriculture and healthcare delivery to leverage its computing and data sciences technology strengths for advanced locational applications. This requires a broad engagement across industries and communities in St. Louis on the value of locational data and market-driven innovations involving location tech applications complemented by a focus on inclusive and equitable growth in talent pipelines and workforce development, and entrepreneurial business development.

In the longer term, through the nexus of industry-university-government-community engagement around locational tech applications, St. Louis will stand out as a global thought leader and have a strong standing across artificial intelligence/machine learning, cyber-physical systems/IoT, and autonomy, among other critical technologies. This will raise the region's overall capacities and assets to fully participate as a leading hub in the Fourth Industrial Revolution.

FIGURE ES-4: DEPICTION OF DEVELOPMENT ROADMAP FOR THE STL GEOFUTURES INITIATIVE INVOLVING NEAR-TERM AND LONGER-TERM OBJECTIVES



RECOMMENDED STRATEGIC PRIORITIES AND APPROACHES FOR INVESTMENT TO ENHANCE STL GEOFUTURES

This vision and objectives for the STL GeoFutures Initiative identified opportunities and strengths to build upon, as well as gaps to address in the capacities of the St. Louis region to compete for geospatial development as a global center for advanced technology applications for locational data.

The Strategic Roadmap calls for five strategic priorities to be addressed, involving three signature initiatives and several collaborative program activities, as depicted below.

Of particular importance are the three signature initiatives, which represent broad activities that are expected to be most impactful for advancing the St. Louis region, including:

- **STL GeoFutures Coalition:** Serve as the lead initiative and umbrella for all STL GeoFutures activities as a catalytic steering, investing, convening and leadership development organization to oversee the Roadmap implementation and ensure a sustained commitment to racial equity and inclusive growth across all Roadmap activities.

- **STL GeoFutures Talent Initiative:** Support and deepen ongoing K-16 and adult workforce geospatial-related technical education provider efforts, with a particular focus on under-represented communities, particulary Black communities.

- **STL GeoFutures Innovation Collaborative:** Address the opportunity and challenge to "establish STL as a leader in advanced technology applications of locational data" that can drive national security, commercial and community innovation, commercialization and entrepreneurship.

Table ES-1 sets out the details for each of the signature initiatives, including objectives,

FIGURE ES-5: OVERVIEW OF STRATEGIC PRIORITY AREAS, SIGNATURE INITIATIVES AND COLLABORATIVE PROGRAM ACTIVITIES FOR STL GEOFUTURES INITIATIVE ROADMAP

associated strategic priority, activities, governance and operations.

The collaborative program activities are more targeted to address specific opportunities and gaps that need to be advanced with the broader St. Louis community, including:

- **Establishing an entrepreneurial program for Black tech professionals, with an emphasis on locational tech applications.** The STL GeoFutures Initiative should focus on cultivating relationships with Black professional associations of IT and engineering professionals to provide entrepreneurial services to their members, as well as other under-represented tech professionals. These efforts should leverage the presence of existing entrepreneurial development activities, such as WEPOWER's Elevate/Elevar accelerator, BDPA, and future directions by the St. Louis Equity in Entrepreneurship Collective. Best practices suggest the importance of offering a formal programming approach that helps Black professionals consider the option of starting their own businesses, including training and coaching in customer discovery and business concept development.

- **Creating an affiliated matching fund for geospatial venture investments.** Discussions with stakeholders identified that St. Louis is still emerging in tech-based startups, but that the entrepreneurial ecosystem is maturing. Rather than a new direction, stakeholders suggested it would be better to provide a means to facilitate and enhance the ability of existing venture funding sources to syndicate with capital from outside the region in providing scale-up funding for geospatial-related startups. An efficient and sustainable approach will be to focus on qualifying St. Louis geospatial companies for matching investments that can be used to leverage funding from other sources of capital, including from outside of St. Louis. For emerging St. Louis geospatial startups, the critical time would be as they seek their Series A round of investments and, in essence, would offer an incentive to share the risk with formal venture capital funders. It also has the advantage of allowing the market to determine valuation and terms and have the STL GeoFutures Initiative simply act as a "silent" co-investor.

- **Supporting a community-led effort to form a neighborhood development entity in North St. Louis where the new NGA West headquarters is to be located.** In concert with the continued efforts of Project Connect and in alignment with the soon-to-be-released City's Equitable Growth Framework, STL GeoFutures Coalition should support community-led neighborhood development efforts in North St. Louis. The focus of this support should be to advance social innovations to drive improved quality of life through Smart City applications as well as broader community wealth building activities[2] to grow incomes and assets of neighborhood residents by enhancing their skills, access to quality jobs, entrepreneurship and home ownership.

2 *Bruce Katz, Ross Baird and Daniel Palmer in their white paper "Towards a New System of Community Wealth" issued on October 27, 2019 by Drexel University Nowak Metro Finance Lab with BluePrint Local and Accelerator for America define community wealth as "a broad-based effort to build equity for low-income residents of disadvantaged communities with the aims to: 1) Grow the individual incomes and assets of neighborhood residents by equipping them with marketable skills and enabling full or partial ownership of homes, commercial properties and businesses; 2) Grow the collective assets of neighborhood residents by endowing locally-run organizations with the ability to create, capture and deploy value for local priorities and purposes; 3) Improve the access to private capital that has high standards, fair terms, a long-term commitment to the neighborhood and reasonable expectations around returns and impact; and 4) Enhance inclusion by bringing fairness and transparency to neighborhood revitalization so that community voices are heard and respected and trust is restored, and local residents have the opportunity to participate in wealth that is created." See https://drexel.edu/nowak-lab/publications/reports/community-wealth/ for more details.*

TABLE ES-1: DETAILS OF THE DESIGN OF THE SIGNATURE INITIATIVES RECOMMENDED FOR THE STL GEOFUTURES ROADMAP

	STL GeoFutures Coalition	STL GeoFutures Talent Initiative	STL GeoFutures Innovation Collaborative
Associated Strategic Priority	Brand and position St. Louis as a global thought leader in geospatial-related development Lead Implementation for STL GeoFutures Roadmap	Scale up talent and workforce development to meet geospatial industry demand	Raise innovation capacity for advanced geospatial technology applications for leading industry and community development drivers Support for acceleration of entrepreneurship and availability of risk capital
Objective	Serve as a catalytic steering, investing, convening and leadership development organization to raise funding and oversee the Roadmap's implementation and ensure a sustained commitment to racial equity and inclusive growth across all Roadmap activities	Support and deepen ongoing K-16 and adult workforce geospatial-related technical education provider efforts targeted to under-represented communities	Address the opportunity and challenge to "establish STL as a leader in advanced technology applications of locational data" that can drive national security, commercial and community innovation, commercialization and entrepreneurship
Activities	Oversee and monitor the Roadmap's implementation, measures of success and future needs for advancing geospatial-related development Convening leadership from across industry, universities, government, and disinvested communities, and pursuing collaborations for public-private and multi-sector partnerships Serving as an investor and "wholesale" contracting organization that seeks to scale-up and enhance ongoing efforts and engage organizations to undertake additional needed program activities Position St. Louis as a global thought leader in geospatial development through: branding and marketing activities, coordinated with broader regional economic development efforts; networking and leadership development; and conference development and sponsorship Establish a capacity for career connections that aggregates industry needs and requirements, offers a job posting board and facilitates matching interns and recent graduates with employers	Strategic investor and coordinator of geospatial-related education and training efforts Play a key liaison role, consistently monitoring industry supply-demand conditions for talent and translating industry needs to academia as an interface with the regional SLAWG group, as well as with NGA and with USGIF K-12 and Workforce Development – • Grant-making function dedicated toward supporting and deepening ongoing geospatial STEAM programs, as well as overseeing efforts to pilot and advance new ones. • Technical assistance and funding support to targeted school districts Post-Secondary – • Support curriculum development • Scholarships and internships for disinvested students Adult Learners – • Target veterans, people with some college and the underemployed through integrated short-term training and placement services	Engage industry, university and community partners to focus on targeted industry and community drivers for advancing geo-related applications Identify market-driven applications development needs through customer engagement, workshops, conferences, and white paper development Offer competitive commercialization grants for early-stage geospatial-related tech startup ventures that includes funding for proof-of-concept projects and for free or discounted space, with follow-on funding available for successful startups through a matching venture capital investment fund Support matching grants for applied R&D projects with industry to partner with universities and emerging IT startups Provide university research enhancement funding in emerging technology areas, such as quantum computing, cyber-physical systems and autonomous systems Support Site Minders at universities and research institutions to tap expertise First customer program Demonstration and testing center

	STL GeoFutures Coalition	STL GeoFutures Talent Initiative	STL GeoFutures Innovation Collaborative
Governance	Seek broad representation from leaders of geospatial-related industry, universities, government, economic and workforce development and civic organizations and community-based racial equity and inclusion organizations	The STL GeoFutures Coalition would oversee the STL GeoFutures Talent Initiative including approving funding	Independent non-profit organization; industry-led board, with representation of university VPRs, federal labs and research organizations
Operations	Involve staff with capabilities in strategic planning, communications and marketing, and management of contracts with a network of providers. Based on other cluster hub organizations likely to require 10-12 staff positions	The STL GeoFutures Coalition would budget, staff and oversee the grant-making function	Involve entrepreneurs-in-residence to lead effort; require technical staff to oversee demo/testing center

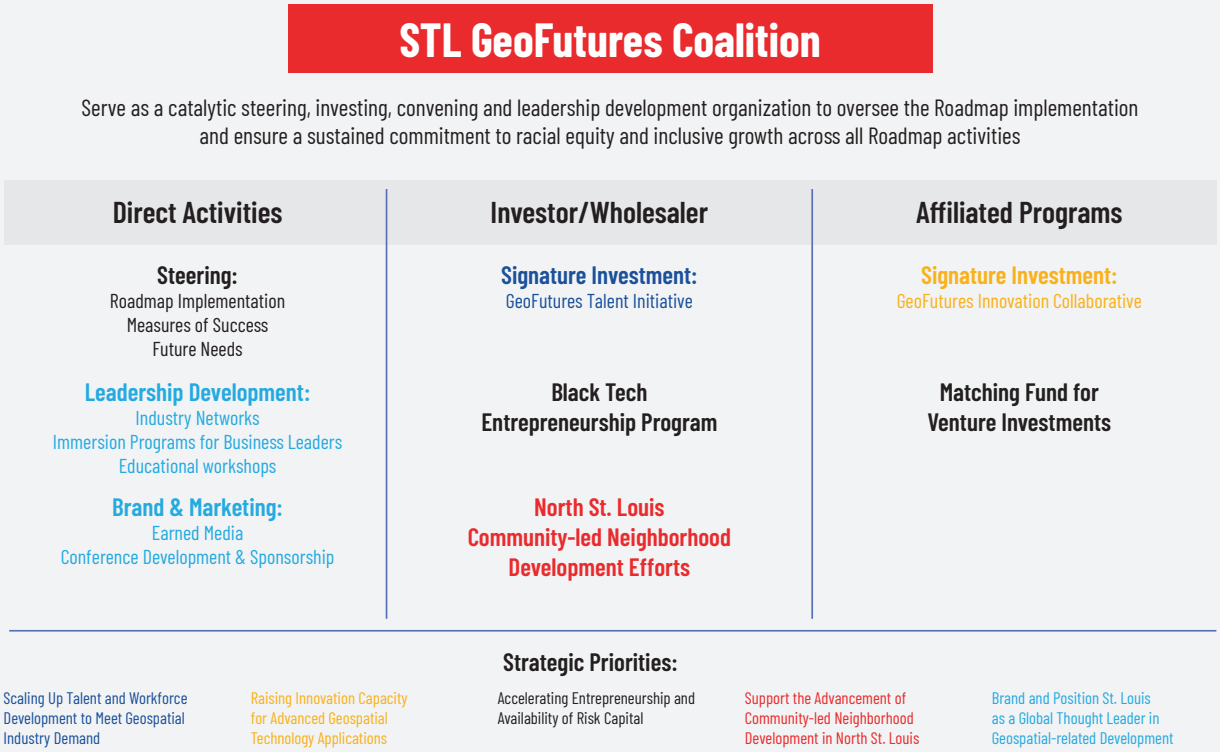
The final element of the Strategic Roadmap is an implementation approach that is able to institutionalize broad community stakeholder engagement and collaboration building upon the mobilization achieved in the STL GeoFutures Initiative. In particular, the action plan set out in the Roadmap is beyond the scope of any individual institution, so collaboration is key to success. Yet, it is well understood that collaboration among organizations, each with its own mission and activities, is not a natural phenomenon, but one that needs to be intentional and can only be maintained through careful attention to broad-based facilitation and engagement.

At the same time, the shared vision and action plan for the STL GeoFutures Initiative in its implementation must embrace and not displace the substantial efforts already underway to support geospatial development in St. Louis by individual institutions and organizations. Unlike the situation faced 20 years ago when the Plant and Life Sciences Roadmap was conceived, there is a far more advanced set of development resources in place which the STL GeoFutures Initiative can tap and, most importantly, are already seeking to seize upon the opportunity for geospatial development.

To lead the implementation, it is recommended that the STL GeoFutures Coalition serve as the "cluster hub" for geospatial development in St. Louis. It would largely function as a steering and investing organization that engages and convenes the full community and seeks to enhance and leverage the capacities of existing and emerging resources and organizations to accomplish the vision of the Strategic Roadmap with strong emphasis on accountability in achieving results that are inclusive and equitable. Still, the STL GeoFutures Coalition would play a direct role in a number of critical functions beyond steering and investing. This includes being the lead on the strategic priority to brand and position St. Louis as a global thought leader in geospatial development, as well as having a role in supporting career connections across industry, educational institutions, workforce training providers, students and job seekers.

Figure ES-6 sets out the different roles that the STL GeoFutures Coalition would play across strategic priorities and actions. Beyond the direct activities of the Coalition, it would be an investor that solicits and contracts for services from education and workforce providers for the STL GeoFutures Talent Initiative, industry associations and entrepreneurial development groups for the Entrepreneurship Program for Black Tech Professionals and North St. Louis neighborhood organizations for community wealth creation and Smart City applications to benefit local residents. The STL GeoFutures Coalition will also help establish and fund the STL GeoFutures Innovation Collaborative as an industry-led organization as well as seek private sector management for the Matching Fund for Venture Investments in geospatial-related companies, so these are considered more affiliated though separately operated activities of the Coalition.

FIGURE ES-6: OVERVIEW OF THE IMPLEMENTATION OF STRATEGIC PRIORITIES AND ACTIONS UNDER THE STL GEOFUTURES COALITION



One of the most important roles of the STL GeoFutures Coalition, as indicated above, will be to oversee and monitor the Strategic Roadmap implementation, which includes identifying and tracking performance across measures of success.

For the STL GeoFutures Initiative's Strategic Roadmap, it will be of particular importance to track who actually benefits from the signature initiatives and other actions undertaken. This needs to be considered from both a focus on outputs or who is participating in receiving services from program activities, as well as on outcomes or what are the results across population groups. Table ES-2 sets out specific output and outcome measures across the five strategic priorities to help think through overall performance measurement for the STL GeoFutures Roadmap.

TABLE ES-2: RECOMMENDED PERFORMANCE MEASURES FOR TRACKING SUCCESS OF THE STL GEOFUTURES ROADMAP ACROSS STRATEGIC PRIORITIES

Strategic Priority	Output Measures	Outcome Measures
Scale Up Talent and Workforce Development to Meet Geospatial Industry Demand	• Number of participants in educational and training programs supported tracked by race, ethnicity, gender and place of residence	• Certifications and Degrees Awarded by race, ethnicity, gender and place of residence • Job placements of participants by race, ethnicity, gender and place of residence
Raise Innovation Capacity for Advanced Geospatial Technology Applications for Leading Industry and Community Development Drivers	• Faculty recruited by race, ethnicity, gender and place of residence • Number of companies participating in applied research/innovation project efforts • Recipients of proof-of-concept funding by race, ethnicity, gender and place of residence • Number of participants in activities, such as hack-a-thons, student design projects, community Smart City pilots, etc. by race, ethnicity, gender and place of residence	• Research funding generated by faculty recruited by race, ethnicity and gender • Leveraged funding from federal and private sources, such as SBIR/STTR awards and follow-on angel, seed and formal venture capital, generated from proof-of-concept projects tracking entrepreneurs by race, ethnicity, gender and place of residence • New products advanced, including patents awarded, sales generated • New geospatial-related companies formed tracking entrepreneurs by race, ethnicity, gender and place of residence
Accelerate Entrepreneurship and Availability of Risk Capital	• Participants in entrepreneurship programs supported by race, ethnicity, gender and place of residence • Companies invested in tracking entrepreneurs by race, ethnicity, gender and place of residence	• New geospatial-related companies formed tracking entrepreneurs by race, ethnicity, gender and place of residence • Leveraged funding generated in geospatial-related companies tracking entrepreneurs by race, ethnicity, gender and place of residence
Community-led Neighborhood Development in North St. Louis	• Number of North St. Louis residents participating in community wealth building projects (job training, entrepreneurship and home ownership) by race, ethnicity, gender • Number of North St. Louis residents participating in Smart City applications	• New businesses launched through community wealth building tracking jobs generated and sales generated • New home ownership by North St. Louis residents • North St. Louis residents in job training hired for jobs in field of training
Brand and Position St. Louis as a Global Thought Leader in Geospatial-related Development	• Number of conferences, workshops, industry network events • Participants in leadership development programs and industry networking by race, ethnicity, gender and place of residence	• National stories on STL GeoFutures • Out of state participants in conferences and workshops held in St. Louis

Beyond the performance measures of specific program activities across each strategic priority, it will be important to track on an annual basis the overall position of St. Louis in geospatial development. This would involve replicating the benchmarking analysis as well as tracking racial and ethnic participation in all geospatial-related activities in degrees, jobs and self-employment on at least a biennial if not annual basis.

Across the breadth of the innovation ecosystem, the specific benchmark measures to be tracked include:

Geospatial Workforce
- Job openings
- Occupational employment by race, ethnicity and gender

Geospatial-related University Education & Research
- Degree graduates
- R&D expenditures

Geospatial Tech Development
- Patents
- SBIR/STTR awards

Geospatial Entrepreneurial Development and Risk Capital
- Self-employment in geospatial-related industries by race, ethnicity and gender
- Number of new early-stage venture capital-backed startups (pre-seed, angel investor and seed) by race, ethnicity and gender of founders
- Venture Capital investments by race, ethnicity and gender of founders
- Follow-on investments after early-stage funding by race, ethnicity and gender of founders

This comprehensive approach to performance measurement will enable the STL GeoFutures Coalition to effectively demonstrate how geospatial development is advancing and the effectiveness of its program activities aligned with the focus on inclusive and equitable growth. It will also allow the STL GeoFutures Coalition to become a leading source of intelligence on geospatial development around the nation.

Looking Ahead

St. Louis has had a long and rich history with geospatial development, but never an intentional one focused on making it a regional innovation and growth driver. This Strategic Roadmap set out by the STL GeoFutures Initiative represents the first time St. Louis has put in place a framework to link, align and enhance the capabilities of the St. Louis region's innovation ecosystem to fully realize the transformative, inclusive and equitable growth driver that geospatial development represents for the region. But it will take patience to put all of the pieces in place to initiate and advance the recommended signature initiatives and focused action steps to bring this Strategic Roadmap fully to life.

In the weeks ahead, the imperative is to institutionalize the strong level of community engagement and collaboration into a formal STL GeoFutures Coalition to serve as the cluster hub for geospatial development. Through the Coalition, it is expected that St. Louis can mobilize and sustain the public and private support and engagement to use this Strategic Roadmap as the framework for implementation.

This Strategic Roadmap represents a critical starting point. As investments are made and the recommended signature initiatives and focus program activities implemented, this Strategic Roadmap will need to be refined as an operating plan for progress by the Coalition. It is an effort worthy of the journey ahead.

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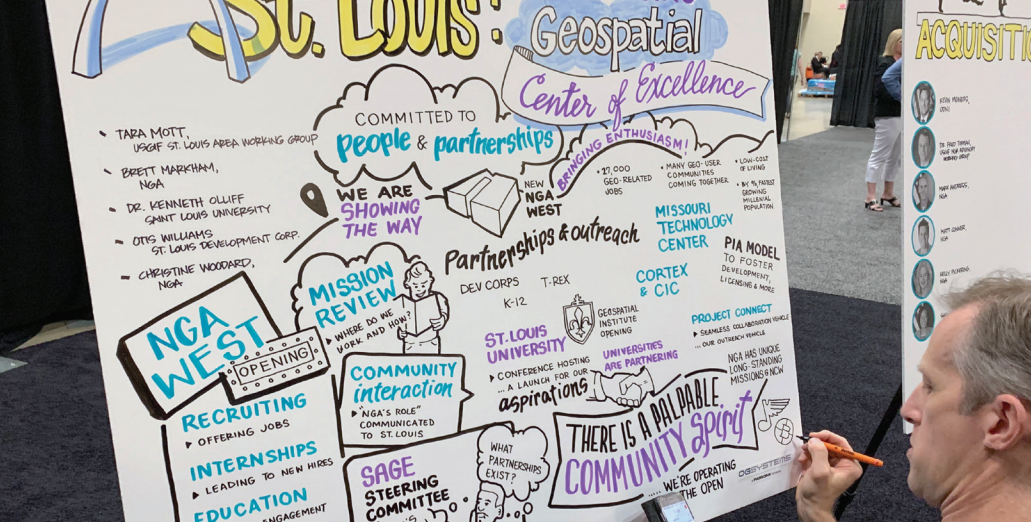
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