APRIL 2026

# RHODE ISLAND'S S&T PLAN AND FRAMEWORK

A 5-Year Investment Strategy to Enhance Competitiveness in Science and Technology and Drive Economic Growth

**Performed For:** Rhode Island Science and Technology Advisory Council
**Performed By:** TEConomy Partners, LLC



TECONOMY PARTNERS LLC

STAC
RI SCIENCE & TECHNOLOGY ADVISORY COUNCIL



TECONOMY
PARTNERS LLC

TEConomy Partners, LLC is a global leader in research, analysis, and strategy for innovation-driven economic development. Today, we're helping nations, states, regions, universities, and industries blueprint their future and translate knowledge into prosperity.

# A SHARED PATH FORWARD FOR RHODE ISLAND'S INNOVATION ECONOMY

The Rhode Island Science and Technology Advisory Council (STAC) presents Rhode Island's Science & Technology Plan and Framework, a five-year strategy to strengthen our innovation economy, grow high-quality jobs, and position the state for long-term resilience.

This Plan arrives at a pivotal moment for Rhode Island. Our State's future prosperity will be shaped not only by the strength of our research institutions or the scale of our industries, but by how effectively we connect discovery to deployment—turning innovation into new products, new companies, and higher-wage jobs. In an economy increasingly defined by speed, specialization, and global competition, states that succeed are those that create a thriving innovation engine.

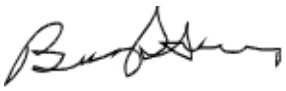
Rhode Island possesses distinctive, place-based advantages: a thriving maritime and defense ecosystem; nationally recognized strengths in ocean science, neuroscience, and aging; world-class research and testing assets; and a compact geography that fosters rapid collaboration across academia, industry, and government. At the same time, we face real challenges: talent and capital constraints, barriers to maximizing research translation, and rising competition for federal research and innovation investment.

This Plan focuses on science and technology areas where Rhode Island can lead, describes pathways to translate research to real economic opportunity, and outlines practical actions to strengthen commercialization, expand shared infrastructure, mobilize capital, and build the talent pipelines needed for future growth. Most importantly, it outlines a framework for a system that makes innovation repeatable, inclusive, and economically meaningful.

This Plan is intended to guide coordinated public- and private-sector action, inform investment decisions, and position Rhode Island to compete successfully for federal programs that increasingly reward statewide alignment and measurable outcomes. Innovation is not just about new technologies. It is about good jobs, stronger industries, resilient communities, and an economy that works for more Rhode Islanders. By aligning our research enterprise with industry and workforce needs, and by meeting the growing expectations for collaboration, Rhode Island can attract new investment and increase the economic benefits of innovation.

Success will depend on productive collaboration among state leadership, educators, businesses, entrepreneurs, workers, and communities. STAC is committed to helping convene this effort and to ensuring our innovation ecosystem is aligned, accessible, and working for all Rhode Islanders.

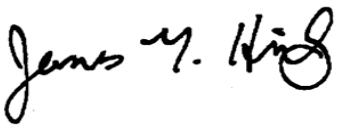
We thank the many Rhode Islanders who contributed their time, insight, and expertise to this effort, and we look forward to working together to turn this strategy into results.



**Bethany Jenkins**
VP, Research
University of Rhode Island
Co-Chair, RI Science &
Technology Advisory Council



**Jill Pipher**
Elisha Benjamin Andrews
Professor of Mathematics
Brown University
Co-Chair, RI Science &
Technology Advisory Council



**Greg Hirth**
VP, Research
Brown University
Incoming Co-Chair, RI Science &
Technology Advisory Council

## Rhode Island's S&T Plan and Framework Steering Committee Members

Jeanine Boyle, Venterra Group

Bob Chatham, Slater Technology Fund | RightHill Ventures Fund

Jaap de Vries, FM

Jason Gomez, Naval Undersea Warfare Center, Newport Division

Greg Hirth, Brown University

Bethany Jenkins, University of Rhode Island

Jim Owens, Nautilus Defense

Jill Pipher, Brown University

Bharat Ramratnam, Brown University Health

Cathy Robinson, Food and Beverage Innovation Consultant

Lara Salamano, Providence Chamber of Commerce

Georgina Sarpong, RI Commerce | Food Strategy

Elin Torrell, University of Rhode Island

Mark Turco, Rhode Island Life Science Hub

Peter Wong, Roger Williams University

Lisa Carnevale, RI Commerce | Innovation RI Science & Technology Advisory Council

# CONTENTS


**Executive Summary** ..... i

**Introduction** ..... 1
Role of Science and Technology in Driving Economic Growth ..... 1
Role of STAC ..... 3
Purpose of the Rhode Island's S&T Plan and Framework ..... 4

**Identification of Rhode Island's S&T Growth Opportunities** ..... 5

**Maritime & Naval Systems: An Established Opportunity to Grow a New S&T Area** ..... 11
What is Maritime & Naval Systems? ..... 12
Market Outlook and Growth Dynamics ..... 17
Why is this S&T Opportunity Area for Rhode Island? ..... 19
Line-of-Sight Market Applications for Rhode Island ..... 24
What is Still Needed to Realize/Maximize the Opportunity ..... 27

**Life Sciences: An Emerging S&T Growth Opportunity Area** ..... 29
What is Life Sciences? ..... 30
Market Outlook and Growth Dynamics ..... 33
Why is this S&T Opportunity Area for Rhode Island? ..... 34
Line-of-Sight Market Applications for Rhode Island ..... 42
What is Still Needed to Realize/Maximize the Opportunity ..... 45

**Resilience and Risk Management Technologies: An Opportunity to Grow a New S&T Area** ..... 47
What is Resilience and Risk Management Technologies? ..... 48
Market Outlook and Growth Dynamics ..... 50
Why is this S&T Opportunity Area for Rhode Island? ..... 52
Line-of-Sight Market Applications for Rhode Island ..... 56
What is Still Needed to Realize/Maximize the Opportunity ..... 58

**Ag and Food Innovations: An Opportunity to Grow a New S&T Area** ..... 61
What are Ag and Food Innovations? ..... 62
Market Outlook and Growth Dynamics ..... 64
Why is this S&T Opportunity Area for Rhode Island? ..... 67
Line-of-Sight Market Applications for Rhode Island ..... 70
What is Still Needed to Realize/Maximize the Opportunity ..... 73

**Foundational Areas of Cross-Cutting Capability** ..... 75
Advanced Materials ..... 76
Artificial Intelligence and Cyber Applications ..... 77
Industrial Design and Product Development ..... 78
Ocean Sciences and Technology ..... 79

**Rhode Island's S&T Framework** ..... 81
Strategy 1: Strengthen and Support the Maritime and Naval Systems Growth Opportunity ..... 84
Strategy 2: Foster the Continued Development of the Emerging Life Sciences Growth Opportunity ..... 98
Strategy 3: Pursue Resilience and Risk Management Technologies as an Innovation-led Growth Opportunity ..... 106
Strategy 4: Support Ag and Food Innovations as an Innovation-led Growth Opportunity ..... 111
Strategy 5: Catalyze a Robust Innovation Ecosystem to Help Ensure Economic Vitality ..... 120

**Implementation Roadmap** ..... 129

**A Call to Action** ..... 133

# EXECUTIVE SUMMARY

**In an economy increasingly defined by knowledge, speed, and global competition, innovation has emerged as the most reliable engine of sustained growth, high-quality employment, and rising living standards. The states that pull ahead are those that can consistently generate new knowledge and convert it into real-world advantage—new technologies, better solutions to pressing challenges, and stronger industries that can compete in global markets. As scientific discovery accelerates and technology cycles shorten, the margin between leading and lagging places is increasingly determined by how quickly ideas move from concept to capability and from capability to scale.**

The most competitive states, therefore, build innovation ecosystems—not simply research enterprises—that connect institutions, people, and resources into a functioning pipeline from ideation to market impact. These ecosystems link universities, laboratories, and clinical or applied research settings with industry through shared-use facilities, talent pipelines, and collaborative problem-solving that aligns scientific capability with real operational demands. They also supply the "connective tissue" that makes progress repeatable: technology transfer capacity, proof-of-concept funding, prototyping and testing infrastructure, regulatory and reimbursement expertise where relevant, mentorship and entrepreneurship support, and coordinated access to capital across stages—from seed and early validation to growth financing. When this infrastructure is present, innovators can move more seamlessly from discovery to demonstration, from demonstration to commercialization, and from commercialization to scaling across new and existing industries.

When these elements align, R&D investment becomes a multiplier rather than a cost center. It attracts external funding and partners, expands specialized employment, and generates intellectual property that can anchor new enterprise formation. It also strengthens existing industries by enabling technology-based solutions to persistent problems—improving processes, reducing costs, raising quality, accelerating time-to-market, and enabling product innovation. Over time, these effects compound: commercialization contributes to new business creation and diversification, while productivity gains increase competitiveness and help firms retain and grow higher-wage jobs. The result is a broader base of exports and income generation, stronger local and state tax revenues, and a more sustainable economic trajectory.

**Ocean State Accelerates** is Rhode Island's blueprint for the future. It serves as the State's 2023-2028 Comprehensive Economic Development Strategy (CEDS) and Long-Term Economic Development Vision and Policy and continues the RI2030 vision with robust data analytics and invaluable insights from a diverse array of public, private, and institutional stakeholders. This S&T Plan recognizes Ocean State Accelerates and the RI 2030 Plan and builds upon these initiatives with comprehensive strategies for driving innovation in Rhode Island.



In a global economy where knowledge and innovation increasingly determine competitiveness, Rhode Island's future prosperity will hinge on how effectively it converts scientific and technological strengths into new products, new companies, and higher-value growth across existing industries. The Ocean State's advantages are distinctly place-based: a compact geography that enables fast collaboration; 400 miles of coastline that anchors a modern blue economy; deep-water ports that connect the state to trade and naval defense; and a dense network of assets—including thirteen institutions of higher education, a significant naval presence, and a growing, connected health care system—that continuously attract talent and expand research capacity. These characteristics make Rhode Island not only a center of specialized expertise, but also a living laboratory where domains can intersect, share infrastructure, and move quickly from idea to impact.

## Purpose of the Rhode Island's S&T Plan and Framework

Against this backdrop, the Rhode Island Science and Technology Advisory Council (STAC) commissioned this Science and Technology (S&T) Strategy, a natural extension of its mission and responsibilities. STAC is the State's cross-sector leadership body for science, technology, and innovation—established by executive order in 2005 and codified in statute in 2006—and is charged with ensuring that Rhode Island's research and technology development translate into stronger economic outcomes, including commercialization, innovation-driven business growth, and job creation. STAC assists state leadership by advancing programs and policies that increase R&D, encourage entrepreneurship through technology transfer, and enable innovation by strengthening the conditions needed to compete in world markets.

This S&T Plan provides an evidence-based framework to align research assets with industry needs, identify gaps that slow commercialization, coordinate investments across the innovation ecosystem, and position Rhode Island to remain competitive for key federal research and capacity-building opportunities. TEConomy Partners LLC, a global leader in research, analysis and strategy for innovation-driven economic development, was engaged to lead the assessment in close collaboration with STAC and its stakeholders.



Through quantitative analysis and extensive stakeholder engagement—nearly 200 Rhode Islanders across business, academia, and government contributed insights through interviews, small-group discussions, and surveys—this report examines how Rhode Island can convert research strengths into market impact, identify ecosystem gaps that slow translation, and implement targeted strategies that accelerate innovation-driven prosperity over the long term. It focuses on the practical requirements of a high-performing innovation continuum—where discovery is connected to deployment—and on the coordinated public–private actions needed to strengthen the institutions, networks, and investment mechanisms that make innovation not episodic, but systematic.

Rhode Island's opportunity is to unify its science and technology identity while deliberately strengthening the continuum that moves concepts into viable products, new markets, and scaled enterprises. Through coordinated actions to increase connectivity and communication, enhance enabling infrastructure, and simplify commercialization and translation, Rhode Island can leverage its unique assets to build a vibrant, flexible, and more inclusive innovation economy—one that grows high-quality jobs, expands economic resilience, and sustains the Ocean State's long-term competitiveness.

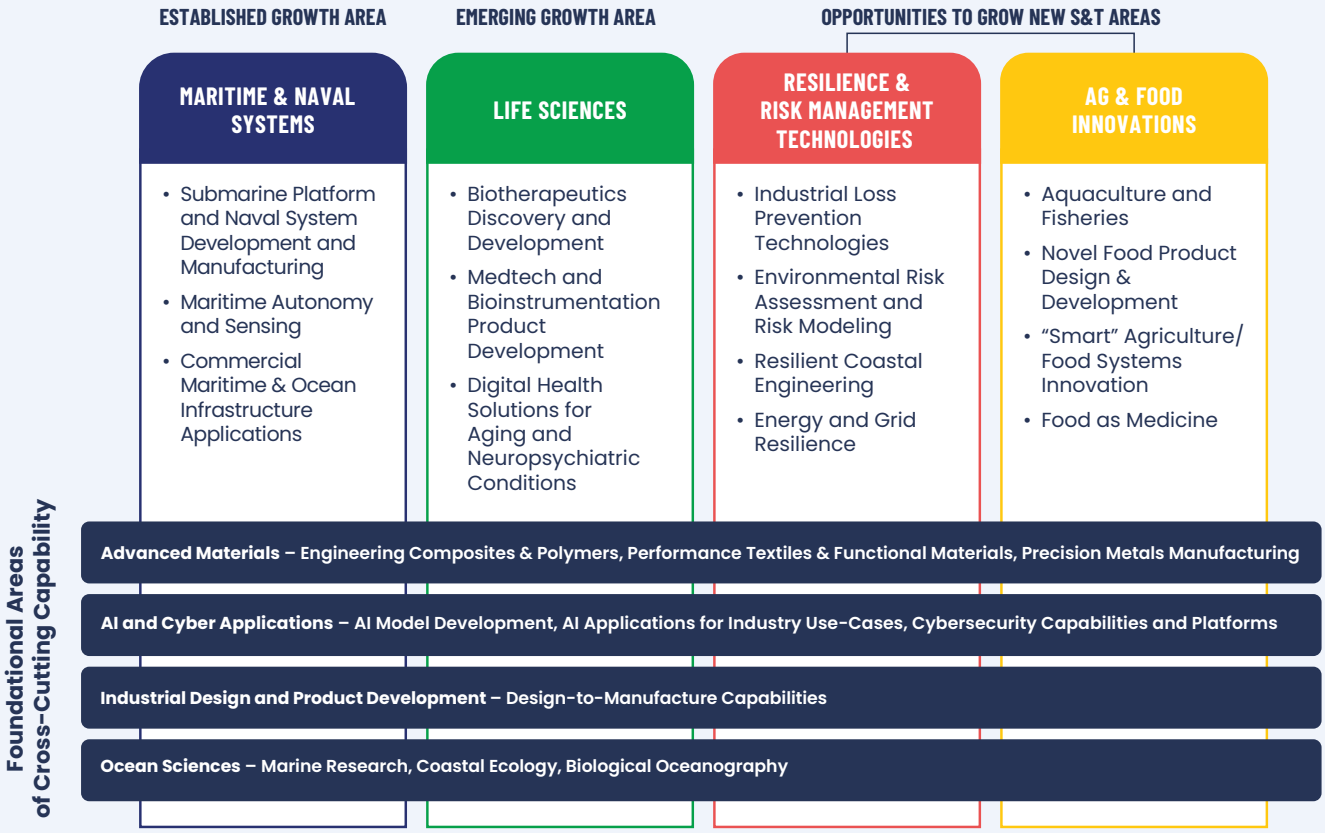
## Identification of Rhode Island's S&T Growth Opportunities

To maintain competitiveness and ensure long-term economic resilience, Rhode Island must build on its legacy of reinvention—from maritime enterprise to industrial manufacturing—and responds to the urgency of today's challenges: slower growth in traded sectors, a pressing need for skills-building and opportunity expansion, and the high stakes of competing in "winner-take-all" innovation markets.

To better understand the alignment of Rhode Island's industrial innovation needs with the core competencies of its research institutions, a rigorous, data-driven approach was undertaken to identify S&T opportunity areas that Rhode Island should target for future economic growth. The intersection of where Rhode Island excels in the "market pull" of industrial innovation activities and the "technology push" of research capabilities represents the greatest opportunities for future economic growth.

Ultimately, four opportunity areas were identified (Figure ES-1). These opportunities can be considered those areas in which Rhode Island is best positioned to compete in growing, innovation-led markets that can help sustain the state's leading industry sectors as well as advance emerging markets in new industries of the future. Each of these growth opportunity areas are supported by cross-cutting foundational areas of expertise and capabilities that enable innovation and technology development.

**Figure ES-1.**
Rhode Island's S&T Growth Opportunity Areas




**Source:** TEConomy Partners, LLC




## Naval and Maritime Systems (Established Opportunity Area)

**Scope:** Submarine platform and naval system development and manufacturing; maritime autonomy and sensing; and commercial maritime and ocean infrastructure applications (including marine electrification and battery systems, offshore wind and marine renewables, and ocean engineering).

**Rationale:** An unusually dense ecosystem— Naval Undersea Warfare Center Division Newport (NUWC Newport), General Dynamics Electric Boat at Quonset Point, the University of Rhode Island's (URI's) Graduate School of Oceanography and Ocean Engineering, and accessible test ranges in Narragansett Bay—creates the full value chain required to conceive, test, and field advanced ocean technologies. This concentration enables rapid iteration between research, prototyping, and operations and provides dual use pathways that reduce risk while expanding market reach.

## Life Sciences (Emerging Opportunity Area)

**Scope:** Biotherapeutics discovery and development (e.g., RNA based therapeutics, regenerative medicine, neurotherapeutics, geroscience); medtech and bioinstrumentation product development; and digital health solutions for aging and neuropsychiatric conditions.

**Rationale:** Brown and URI's nationally recognized strengths in neurobiology, neuroscience, and aging biology; Brown's Carney Institute for Brain Science and new RNA Center; URI's George and Anne Ryan Institute for Neuroscience, capabilities in the College of Engineering, including biomedical engineering, College of Health Sciences, College of Nursing and College of Pharmacy; integrated health systems in Providence; and state investments (e.g., the Rhode Island Life Sciences Hub, including its investment in Ocean State Labs) produce a differentiated platform. While the industrial base is still maturing, targeted translational infrastructure and coordinated branding can position Rhode Island credibly within the broader New England biosciences corridor.

## Resilience and Risk Management Technologies (Opportunity to Grow a New Cluster)

**Scope:** Industrial loss prevention technologies; environmental risk assessment and modeling; and resilient coastal engineering; energy/grid resilience.

**Rationale:** FM's world class research and certification campus, together with URI and Brown's coastal and hazard modeling capabilities and Rhode Island's living lab geographies, create unique conditions for advancing and validating resilience technologies. Demand is rising across insurers, infrastructure owners, and municipalities; a formal commercialization interface can translate research into certified products and services with national market reach.

## Agriculture and Food Innovations (Opportunity to Grow a New Cluster)

**Scope:** Aquaculture and fisheries; novel food product design and development; "smart" agriculture/food systems innovation (including controlled environment agriculture and precision/traceability solutions); and food as medicine.

**Rationale:** Rhode Island's coastal location, URIs Land and Sea Grant research and Cooperative Extension programs, the Department of Nutrition in URI's College of Health Sciences, Johnson & Wales University College of Food Innovation & Technology (CFIT) Ecolab Center for Culinary Science's FDA Process Authority for regulatory enablement, and a robust culinary entrepreneurship base catalyzed by Hope & Main point to a science led, high value food economy. Addressing mid-scale processing and coordinating translational research can help retain and scale companies and connect product innovation to regional markets.

In addition, four foundational cross cutting capabilities underpin these opportunities and must be maintained and expanded:

- **Advanced materials** link materials chemistry, mechanical engineering, and manufacturing science to produce components that are lighter, stronger, more durable, and increasingly "smart." It supports and differentiates multiple clusters—including defense, marine trades, offshore wind, and medtech—by enabling performance that off-the-shelf materials cannot deliver.

- **Artificial Intelligence and Cyber Applications** present a forward-looking area where ongoing rapid evolution of capabilities necessitates ongoing investment in R&D and innovation capabilities as a fundamental driver of applications across all major science and technology fields. This capability extends beyond generic software development; it focuses on deploying data-driven models and secure architectures in mission-critical, often sensor-rich environments—naval platforms, power grids, financial systems, and health networks. As such, it functions as an overlay that enhances the performance, autonomy, and resilience of physical assets and industrial processes.

- **Industrial Design and Product Development** functions as a key differentiator for Rhode Island's commercialization ecosystem that translates Rhode Island's research and engineering into integrated, manufacturable products by coupling human factors, digital interfaces, materials, and production methods. Historically rooted in design-intensive industries like jewelry and consumer products, it now underpins innovation in areas such as medtech and defense systems, where user-tested prototypes are rapidly refined and scaled for regulated, high-performance applications.

- **Ocean Sciences** provides a foundational environmental and biological systems capability for Rhode Island's maritime, defense, energy, and climate-resilience opportunities. Whereas Maritime and Naval Systems focus on engineered solutions operating in the ocean, Ocean Sciences concentrates on understanding the ocean as a complex, dynamic system—its biology, physics, biogeochemistry, ecology and evolution, and ecosystems-level interactions with human activity. This knowledge is essential both for sustainable resource use and for technical performance: vessel acoustics, offshore structures, fisheries management, and coastal adaptation all depend on R&D capabilities in this area.

These are long lived assets (specialized faculty, testbeds, cyber ranges, shared equipment) that enable multiple growth areas to advance simultaneously and help the ecosystem adapt to evolving market and technology demands.

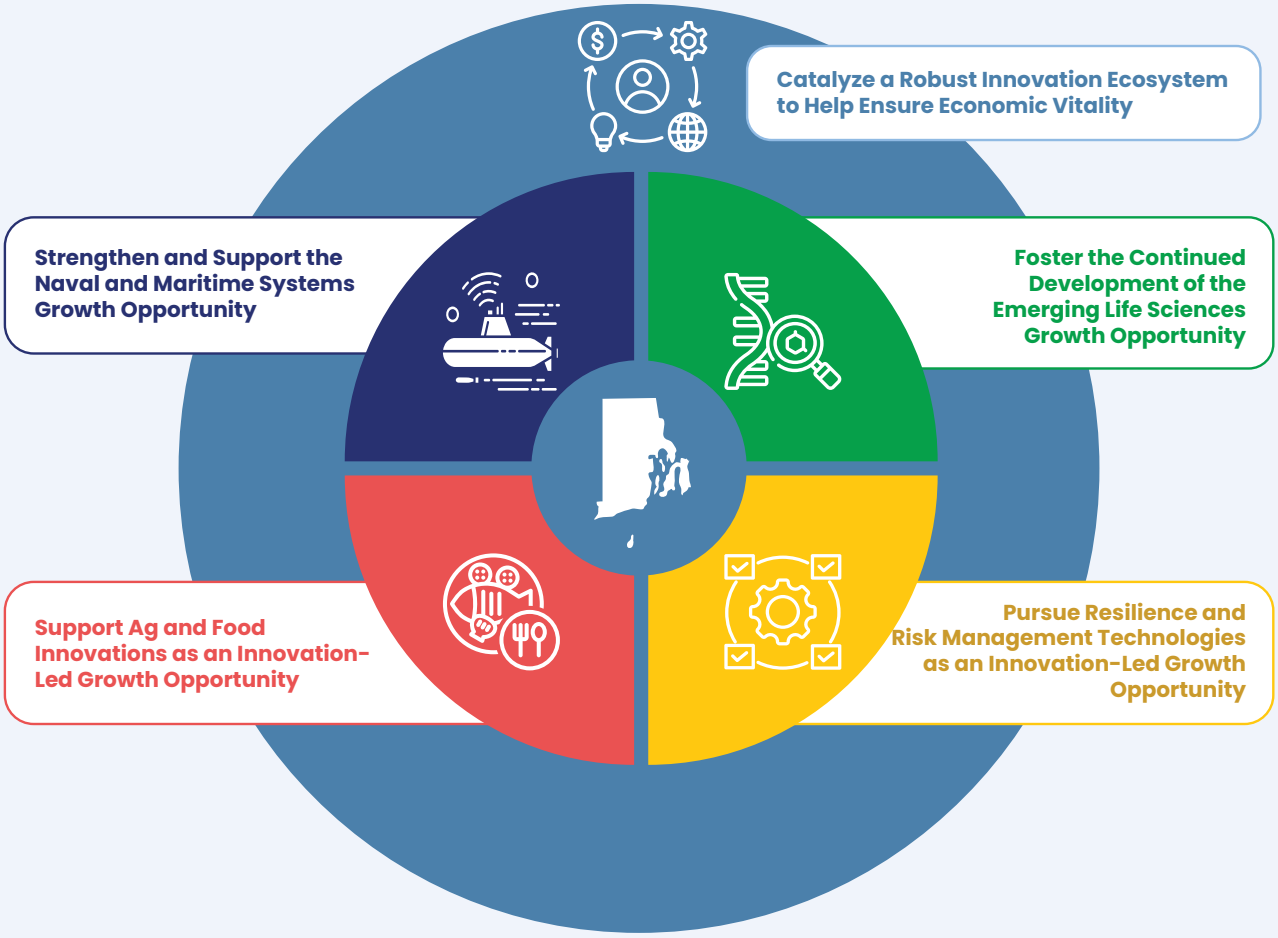


## Rhode Island's S&T Framework

"Business-as-usual" will not be sufficient if Rhode Island is to fully convert its research strengths, place-based advantages, and entrepreneurial energy into sustained growth in high-quality jobs and rising living standards. The Ocean State's small scale and dense networks can be a strategic advantage—but only if they are organized to move faster from discovery to deployment, and from pilot to scale. Rhode Island already has many of the essential building blocks of an innovation economy: strong research institutions, active cross-sector partnerships, federally supported research and training platforms, and state investments intended to accelerate translation and commercialization. What is needed now is a coordinated strategy that strengthens the "connective tissue" of the ecosystem—so that market-relevant innovations consistently traverse the innovation continuum and reach significant markets with the workforce, capital, and infrastructure required to scale.

Rhode Island's science and technology leadership is increasingly expected to do more than convene; it must also coordinate, align, and demonstrate impact. STAC was created to make science and technology innovation central to Rhode Island's leadership agenda and is charged with helping ensure that research and technology development are leveraged for commercialization, innovation, economic development, and jobs. At the same time, Rhode Island's role in national competitiveness programs is evolving, such as Rhode Island's designation as a NSF Established Program to Stimulate Competitive Research (EPSCoR) jurisdiction—shifting toward deeper expectations for jurisdiction-wide coordination, ecosystem analysis, and alignment to a current statewide S&T plan. These realities underscore a central point: innovation outcomes do not happen automatically. They are the result of intentional design choices, sustained investment, and disciplined execution across institutions and sectors as illustrated in Figure ES-2.

**Figure ES-2.**
Rhode Island's S&T Framework




This S&T Framework applies a line-of-sight approach to identify, design, and prioritize Rhode Island's most actionable growth opportunities where there is a clear pathway to significant markets, thereby enabling Rhode Island to differentiate itself nationally and create the conditions for sustained commercialization, productivity growth, and new-venture scale.

The strategies and actions that follow are designed to strengthen Rhode Island's innovation ecosystem in ways that are selective, focused, and measurable. They build directly on STAC's mission to increase R&D impact, encourage entrepreneurship, and enable innovation through an environment rich in talent, capital, and ideas. They also reflect the practical realities of building a modern innovation economy: translation requires more than great research—it requires predictable commercialization pathways, cross-institution coordination, risk-capital readiness, supportive infrastructure, and continuous workforce development aligned to priority innovation areas.

## **Strategy 1:** Strengthen and Support the Naval and Maritime Systems Growth Opportunity

Rhode Island's Maritime and Naval Systems opportunity area represents one of the state's most significant and distinctive economic assets. Extraordinary growth opportunities driven by Navy modernization programs create significant market demand, while at the same time innovative companies are seeking to pursue diversification strategies into new dual use markets. Beyond traditional submarine and undersea warfare systems, dual-use maritime technology represents an emerging high-growth opportunity critical to Rhode Island's long-term competitiveness. Autonomous underwater vehicles, unmanned surface vessels, underwater infrastructure robotics for offshore energy and subsea cable repair, and advanced marine sensors for climate observation and resource management constitute rapidly expanding commercial markets that can leverage existing defense-funded research and manufacturing capability. These technologies require substantial capital for prototype development, in-water testing, and manufacturing scale-up representing investment thresholds. If Rhode Island does not have established capital formation mechanisms and integrated testing infrastructure, these companies may relocate to regions with more developed innovation ecosystems, representing a permanent loss of economic opportunity and entrepreneurial leadership in commercial "blue tech" markets.

Rhode Island's current organizational fragmentation presents a potential challenge to its ongoing capacity to drive comprehensive state-level economic outcomes. This fragmentation dilutes the impact of investments, delays technology transition, and undermines potential for even larger state-level economic impact. Simultaneously, the cluster faces an acute workforce crisis, with technician and skilled trades workers constrained by aging populations and insufficient pipeline development, deep engineering expertise distributed across small and medium-sized enterprises with more limited capacity to attract and retain, and a supplier ecosystem requiring substantial modernization investment.

Without coordinated intervention, Rhode Island risks losing its leadership position as a coastal hub for marine and ocean technologies across multiple avenues: technology leakage as companies relocate to defense hubs with better-integrated ecosystems, failure to transition Navy-funded research into commercial dual-use opportunities, reducing return on flows of federal R&D investment, workforce supply constraints limiting submarine manufacturing expansion and supplier scaling, and supplier modernization failures that compromise supply chain reliability during critical military production cycles. The next generation of defense contracts focused on autonomous maritime systems, AI-enabled undersea capabilities, and advanced marine materials is likely to flow to regions demonstrating integrated innovation ecosystems that address these requirements.

This strategy addresses these challenges through five coordinated actions establishing unified industry coordination, integrated testing infrastructure, collaborative technology development pathways, targeted capital formation mechanisms, and comprehensive supply chain and workforce modernization. Collectively, these actions create the organizational architecture and resource mobilization necessary to modernize Rhode Island's research and industrial assets and maintain a sustained competitive advantage, supporting the state's research enterprise while also generating thousands of jobs and reinforcing the state's role as a global center for maritime and naval systems innovation.

**Action 1:** Establish a **Maritime and Naval Innovation Advisory Council**—an industry-led, central coordination mechanism and single point of entry that aligns priorities, reduces duplication, and improves access to partners, facilities, and programs.

**Action 2:** Develop an **Integrated Maritime Testing and Prototyping Infrastructure Network**—a transparent tank-to-bay corridor with shared protocols, scheduling, and access (including NUWC facilities, in-water ranges, URI labs, Roger Williams University Bristol Campus, and the Hereshoff Marine Museum in Bristol).

**Action 3:** Expand and diversify **Collaborative Technology Development Programs** focused on dual-use maritime technologies—challenge funding, CRADAs, accelerators, and facilitated "on-ramps" for SMEs.

**Action 4:** Establish **sector-specific financial resources** for capital-intensive early-stage ocean and maritime technology companies based in Rhode Island—co-investment/matching mechanisms that de-risk prototype and validation stages.

**Action 5:** Expand **advanced manufacturing supply-chain and workforce development** programming—supplier modernization (e.g., CMMC), apprenticeships, and Industry 4.0 adoption to meet defense and commercial demand.

## **Strategy 2:** Foster the Continued Development of the Emerging Life Sciences Growth Opportunity

Significant recent state investment and emerging institutional capacity in Rhode Island's emerging life sciences cluster have created momentum that must be sustained and focused to continue to grow the industry base into an economically significant industry cluster. The state has made a major commitment through the Rhode Island Life Science Hub (RILSH), with funding supporting cluster growth and ongoing development in the 195 Innovation District focused on life sciences infrastructure including Ocean State Labs incubator (planned opening January 2026), Brown Health lab facilities, and State Health Laboratories consolidation. This investment represents recognition that Rhode Island must build physical infrastructure, convening capacity, and commercialization support to translate research excellence into economic outcomes.

Rhode Island is positioned to further leverage its research institutions and emerging biosciences translation and digital health ecosystem to catalyze broader life sciences commercialization and build a regionally-differentiated innovation cluster. However, Rhode Island's life sciences research assets must orient toward technology transfer and commercialization, and the state must expand on recent investments and organizational capacity to grow life sciences as a true industry cluster backed by a unique value proposition based on focused differentiation in areas where research excellence, clinical partnerships, design and manufacturing expertise, and lower operating costs create distinctive advantages.

Without strategic focus and continued investment in commercialization infrastructure, Rhode Island risks dissipating recent momentum through researcher and company migration to better-supported ecosystems, failure to convert applied research into IP and startups, insufficient lab and manufacturing space constraining company scaling, and lack of differentiated market positioning leading to perception as a satellite of other New England biosciences hubs rather than a distinctive cluster. This strategy addresses these challenges through three coordinated actions:

**Action 6:** Coordinate **Neuroscience and Aging** research clusters into a focused tech-transfer brand and consortium—unified pipeline, shared industry interface, and priority areas for translation (e.g., digital biomarkers, neurotherapeutics, senescence).

**Action 7: Expand support for translational activity**—shared cores and computational biomedicine, proof-of-concept funding, and structured regulatory/reimbursement guidance to move assets from discovery to investable readiness.

**Action 8: Expand economic development support**—wet-lab and scale-up space, "C-suite-for-hire" and EIR networks, and targeted attraction/retention strategies aligned to Rhode Island's differentiated value proposition.

## **Strategy 3:** Pursue Resilience and Risk Management Technologies as an Innovation-Led Growth Opportunity

Rhode Island possesses distinctive assets enabling the state to establish a differentiated, forward-looking innovation cluster focused on resilience and risk management technologies, an area with demonstrated and growing market demand, clear commercial pathways, and natural advantages in research capability, testing infrastructure, and geographic positioning. FM's world-leading research facilities, IP portfolio, and direct market access to a global customer base of major corporations and institutions represents a near-term anchor and innovation catalyst. In addition, Rhode Island's research base similarly includes distinctive capability in ocean engineering, coastal systems, and climate change hazard modeling. These research capabilities demonstrate the technical foundation and domain expertise necessary to scale innovation activity in resilience and loss prevention over time. Finally, Rhode Island's coastal geography creates both distinctive market demand and natural testing advantages.

This opportunity aligns with sizable markets, where risk of losses from natural disasters and industrial incidents are driving demand for innovative loss prevention and risk analysis solutions from insurance companies, governments, and enterprises. Establishing Rhode Island as a hub for resilience and risk management technology innovation would enable the state to pursue a differentiated innovation identity that complements rather than competes with other regional innovation ecosystems while also providing the potential to further diversify existing industries into new markets. This strategy seeks to pursue this opportunity through two coordinated actions:

**Action 9:** Establish a **signature loss-prevention and resilience technology commercialization** initiative—a public–private interface that brokers testing/certification access (e.g., FM labs), coordinates pilot deployments and provides early de-risking capital.

**Action 10:** Develop the environment for Rhode Island to serve as **a regional testing and development hub**—preferential sites, living-lab agreements with municipalities/utilities, and coordinated branding to attract firms and capital.

## *Strategy 4:* Support Ag and Food Innovations as an Innovation-Led Growth Opportunity

Rhode Island's ag and food innovation ecosystem represents a distinctive and under-leveraged asset for innovation-led growth. Unlike vertically integrated agricultural regions, Rhode Island's strengths are distributed across the agri-food value chain—spanning sustainable aquaculture, specialty food product development, and advanced packaging and process innovation—underpinned by enabling technologies in controlled environment agriculture (CEA), precision/smart agriculture, and marine-derived functional ingredients and bioactive compounds.

Demand-side dynamics reinforce the opportunity. Converging pressures—climate adaptation, consumer demand for sustainable and health-oriented products, supply chain resilience imperatives, regulatory shifts in packaging, adoption of precision agriculture and automation, and cold chain modernization—are reshaping market requirements across production systems, enabling technologies, and distribution. Rhode Island is well positioned for high-value specialty products (premium oysters, artisanal foods, functional ingredients), demonstration/validation platforms (CEA systems, sustainable/active/smart packaging), and enabling technologies (sensors, process control, and traceability) rather than commodity production where the state cannot achieve cost advantages.

Yet, the cluster sits at a critical inflection point. Systemic gaps are forcing promising companies to relocate to scale production eroding local value capture and talent retention. Without coordinated intervention, Rhode Island may miss the chance to build a distinctive identity in high-value ag-food innovation that complements its maritime and life sciences opportunities, thereby undermining economic diversification and resilience goals. Conversely, decisive action can convert existing strengths into a cohesive, S&T-led growth engine with near-term wins and durable competitive differentiation. This strategy seeks to pursue this opportunity through three coordinated actions:

**Action 11:** Create a **specialized translational research initiative** in ag-food—linking aquaculture/CEA, functional ingredients, process/packaging innovation, and regulatory enablement to line-of-sight products and platforms.

**Action 12: Establish second-stage manufacturing infrastructure and intermediate processing capacity**—the "missing middle" (co-packing, cold chain, HACCP/PCQI) to retain and scale companies in state.

**Action 13: Increase innovative research around "smart" agriculture and the agri-food nexus**—precision aquaculture, food-as-medicine trials, supply-chain modeling, and shared pilot facilities.

## **Strategy 5:** Catalyze a Robust Innovation Ecosystem to Help Ensure Economic Vitality

Growth in Rhode Island's identified opportunity areas will not happen in a vacuum. To translate research into jobs, firms, and durable prosperity, the state must simultaneously invest in the foundational conditions that make innovation and commercialization possible. National trends underscore why Rhode Island must catalyze a coordinated, adaptive innovation ecosystem rather than relying on legacy, ad hoc approaches to technology transfer and commercialization. National evidence illustrates that it takes proactive leadership to turn campus discoveries into regional economic gains. In addition, in an environment in which it is critical to diversify academic revenue streams, creating stronger inter institutional collaborations to build synergies and eliminate duplication, catalyzing support for startup formation, and developing an intentional focus on value-added industrial relations will help create new and expanded funding models.

Catalyzing Rhode Island's innovation ecosystem therefore means targeted investments in three complementary pillars. First, creating a robust, proactive commercialization system that validates market need, develops prototypes, navigates regulatory pathways, and brings new products to market will build a pipeline of deal flow in the growth opportunity areas. Second, a more holistic industrial relationship building and contracting process so that collaborations move faster and at lower cost. Third, a statewide I Corps style training and mentor network that pairs principal investigators and student teams with serial entrepreneurs and industry experts to accelerate investor readiness and success. Furthermore, these pillars are mutually reinforcing and foster a more robust innovation ecosystem.

The economic rationale is straightforward: these investments convert research capacity into durable prosperity by scaling startups, expanding industry partnerships, and attracting risk capital. By adopting these practices, Rhode Island can systematically translate research into jobs and firms, and build a resilient, connected ecosystem that sustains growth through industry cycles. In short, catalyzing a robust innovation ecosystem is not optional—it is the enabling platform for Rhode Island's long term economic vitality. This strategy focuses on these investments through three coordinated actions:

**Action 14:** Create a **proactive commercialization system** to build a pipeline of deal flow—market validation, proof-of-commercial-readiness, venture-readiness services, and startup-friendly terms.

**Action 15: Ensure industrial engagements** are advanced between academic institutions and corporate partners—dedicated industry contracting, standard terms/templates, and faster cycle times.

**Action 16: Invest in entrepreneurial support** within academic research institutions—statewide I-Corps–style training, mentors/EIRs, fractional C-suite talent, and structured founder pathways connected to priority opportunity areas.

Taken together, these five strategies aim to ensure Rhode Island's innovation economy is not defined by isolated wins, but by a repeatable system—one that turns research strengths into commercial outcomes, raises productivity in existing industries, and builds inclusive pathways to high-wage opportunity.

# A Call to Action

Rhode Island possesses the assets to succeed in a knowledge-driven economy—deep research capability, strong institutional networks, a distinctive coastal and defense-linked identity, and momentum in key S&T domains. But assets alone do not produce prosperity. Prosperity comes from execution: connecting research to market demand, enabling firms to scale without leaving the state, and ensuring Rhode Islanders can access the skills and opportunities those innovations create.

This plan invites leaders across industry, higher education, government, and the broader innovation community to align around a shared agenda that turns research strengths into market impact. Expectations for statewide coordination are rising; the moment requires not only a strategy, but a system that delivers outcomes. By focusing on growth areas with clear line-of-sight to significant markets and by systematically strengthening commercialization, infrastructure, capital, and talent pipelines, Rhode Island can make innovation repeatable—and convert research strengths into scaled industries, higher-wage jobs, and long-term resilience.

# INTRODUCTION

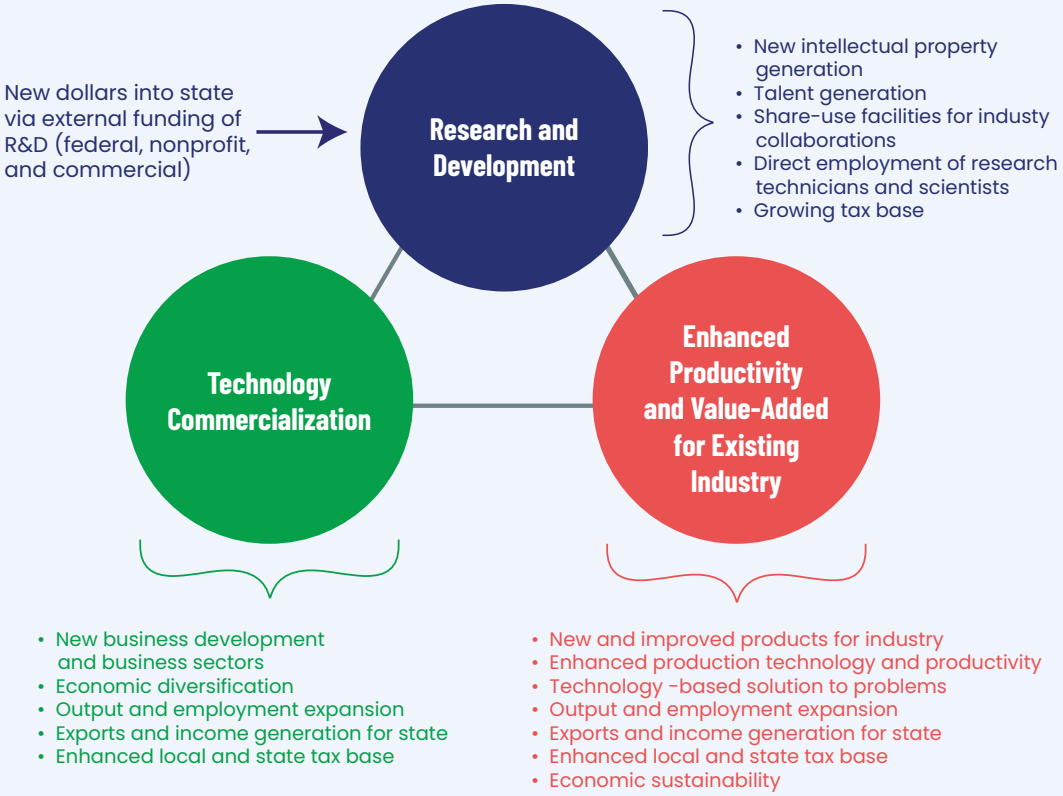
## Role of Science and Technology in Driving Economic Growth

In an economy increasingly defined by knowledge, speed, and global competition, innovation has emerged as the most reliable engine of sustained growth, high-quality employment, and rising living standards. The states that pull ahead are those that can consistently generate new knowledge and convert it into real-world advantage—new technologies, better solutions to pressing challenges, and stronger industries that can compete in global markets. As scientific discovery accelerates and technology cycles shorten, the margin between leading and lagging places is increasingly determined by how quickly ideas move from concept to capability and from capability to scale.

The payoff from research and development is not determined solely by the scale or excellence of scientific work—it depends on whether discoveries can be translated into commercial outcomes and productivity gains that strengthen both emerging and established industries. Research breakthroughs do not automatically become new products, new firms, or improved competitiveness. Translation requires deliberate pathways that connect research to market needs, reduce technical and business risk, and help innovations cross the "valley of death" between invention and adoption. As Figure 1 illustrates, the highest-return R&D environments are those that consistently do two things at once:

- Commercialize new technologies into new markets and companies, and
- Diffuse technology into existing firms to raise productivity, value-added output, and resilience.

**Figure 1.**
Innovation-led Development is a Key Driver of Economic Growth




**Source:** TEConomy Partners, LLC

The most competitive states therefore build innovation ecosystems—not simply research enterprises—that connect institutions, people, and resources into a functioning pipeline from ideation to market impact. These ecosystems link universities, laboratories, and clinical or applied research settings with industry through shared-use facilities, talent pipelines, and collaborative problem-solving that aligns scientific capability with real operational demands. They also supply the "connective tissue" that makes progress repeatable: technology transfer capacity, proof-of-concept funding, prototyping and testing infrastructure, regulatory and reimbursement expertise where relevant, mentorship and entrepreneurship support, and coordinated access to capital across stages—from seed and early validation to growth financing. When this infrastructure is present, innovators can move more seamlessly from discovery to demonstration, from demonstration to commercialization, and from commercialization to scaling across new and existing industries.

When these elements align, R&D investment becomes a multiplier rather than a cost center. It attracts external funding and partners, expands specialized employment, and generates intellectual property that can anchor new enterprise formation. It also strengthens existing industries by enabling technology-based solutions to persistent problems—improving processes, reducing costs, raising quality, accelerating time-to-market, and enabling product innovation. Over time, these effects compound: commercialization contributes to new business creation and diversification, while productivity gains increase competitiveness and help firms retain and grow higher-wage jobs. The result is a broader base of exports and income generation, stronger local and state tax revenues, and a more sustainable economic trajectory.

In a global economy where knowledge and innovation increasingly determine competitiveness, Rhode Island's future prosperity will hinge on how effectively it converts scientific and technological strengths into new products, new companies, and higher-value growth across existing industries. The Ocean State's advantages are distinctly place-based: a compact geography that enables fast collaboration; 400 miles of coastline that anchors a modern blue economy; deep-water ports that connect the state to trade and naval defense; and a dense network of assets—including thirteen institutions of higher education, a significant naval presence, and a growing, connected health care system—that continuously attract talent and expand research capacity. These characteristics make Rhode Island not only a center of specialized expertise, but also a living laboratory where domains can intersect, share infrastructure, and move quickly from idea to impact.

## Role of STAC

The Rhode Island Science and Technology Advisory Council (STAC) is the State's cross-sector leadership body for science, technology, and innovation—established by executive order in 2005 and codified in statute in 2006—and is charged with ensuring that Rhode Island's research and technology development translate into stronger economic outcomes, including commercialization, innovation-driven business growth, and job creation. STAC assists state leadership by advancing programs and policies that increase R&D, encourage entrepreneurship through technology transfer, and enable innovation by strengthening the conditions needed to compete in world markets.

In addition to its advisory role, STAC provides practical "translation" infrastructure through program oversight, including the Innovate Rhode Island Small Business Fund (IRISBF)—which supports SBIR/STTR participation and matching—and the RI Research Alliance/Collaborative Research Grants, which build research capacity and support projects with translational potential. STAC also serves as Rhode Island's NSF EPSCoR governing/steering body, a role that is expanding as NSF transitions to newer EPSCoR models with stronger expectations for jurisdiction-wide coordination, ecosystem assessment, and alignment to an up-to-date statewide science and technology plan.

# Purpose of the Rhode Island's S&T Plan and Framework

**Ocean State Accelerates** is Rhode Island's blueprint for the future. It serves as the State's 2023-2028 Comprehensive Economic Development Strategy (CEDS) and Long-Term Economic Development Vision and Policy and continues the RI2030 vision with robust data analytics and invaluable insights from a diverse array of public, private, and institutional stakeholders. This S&T Plan recognizes Ocean State Accelerates and the RI 2030 Plan and builds upon these initiatives with comprehensive strategies for driving innovation in Rhode Island.

Against this backdrop, STAC commissioned this Science and Technology (S&T) Strategy, a natural extension of its mission and responsibilities. It provides an evidence-based framework to align research assets with industry needs, identify gaps that slow commercialization, coordinate investments across the innovation ecosystem, and position Rhode Island to remain competitive for key federal research and capacity-building opportunities. TEConomy Partners LLC, a global leader in research, analysis and strategy for innovation-driven economic development, was engaged to lead the assessment in close collaboration with STAC and its stakeholders.

This report draws on these principles to examine how Rhode Island can convert research strengths into market impact, identify ecosystem gaps that slow translation, and implement targeted strategies that accelerate innovation-driven prosperity over the long term. It focuses on the practical requirements of a high-performing innovation continuum—where discovery is connected to deployment—and on the coordinated public–private actions needed to strengthen the institutions, networks, and investment mechanisms that make innovation not episodic, but systematic.

The narrative that follows outlines Rhode Island's Science & Technology (S&T) Plan and Strategic Framework, built from quantitative analysis and shaped by the on-the-ground expertise of Rhode Islanders across the innovation ecosystem. Through in-depth interviews, small-group discussions, and surveys, nearly 200 stakeholders from business, academia, and government helped identify priorities, pressure-test opportunities, and clarify what it will take to translate innovation into growth. Their time and engagement underscore a statewide commitment to this work—and that commitment is reflected in the action orientation and energy of the strategy that follows.

This plan builds on Rhode Island's legacy of reinvention—from maritime enterprise to industrial manufacturing—and responds to the urgency of today's challenges: slower growth in traded sectors, a pressing need for skills-building and opportunity expansion, and the high stakes of competing in "winner-take-all" innovation markets. Rhode Island's opportunity is to unify its science and technology identity while deliberately strengthening the continuum that moves concepts into viable products, new markets, and scaled enterprises. Through coordinated actions to increase connectivity and communication, enhance enabling infrastructure, and simplify commercialization and translation, Rhode Island can leverage its unique assets to build a vibrant, flexible, and more inclusive innovation economy—one that grows high-quality jobs, expands economic resilience, and sustains the Ocean State's long-term competitiveness.

# IDENTIFICATION OF RHODE ISLAND'S S&T GROWTH OPPORTUNITIES

**Each state has its own distinctive set of industry drivers and growth opportunities through which it is best positioned to differentiate itself and develop world-class, specialized areas of expertise. In Rhode Island, those differentiators are inherently place-based and ecosystem-driven: a compact geography that enables rapid collaboration; a long-standing maritime and defense footprint; deep institutional strength across higher education; and a set of innovation domains where the state has both legacy capabilities and emerging momentum.**

Within this context, Rhode Island's competitive path is not to replicate what larger states do at scale, but to leverage its density of connections—across research, industry, and workforce systems—to accelerate innovation, adoption, and commercialization in targeted areas.

At the same time, Rhode Island's research institutions each bring distinct core competencies—reflected in those fields where there is a critical mass of research activity, specialized facilities, and talent development capacity. These competencies are not as valuable in isolation; they generate the greatest economic impact when they are tightly linked to real industry needs and to market opportunities that are significant in size, strategic importance, and growth potential. STAC's statutory charge and programmatic focus reinforce this translational imperative: STAC exists to strengthen the connection between research activity and commercialization outcomes that drive innovation, economic development, and jobs in Rhode Island.

**Maximizing economic development impact requires a disciplined approach:** one that narrows priorities to those areas where Rhode Island can plausibly lead, where collaboration can be mobilized quickly, and where investments can translate into measurable outcomes such as new products, new firms, industry upgrading, and higher-wage employment.

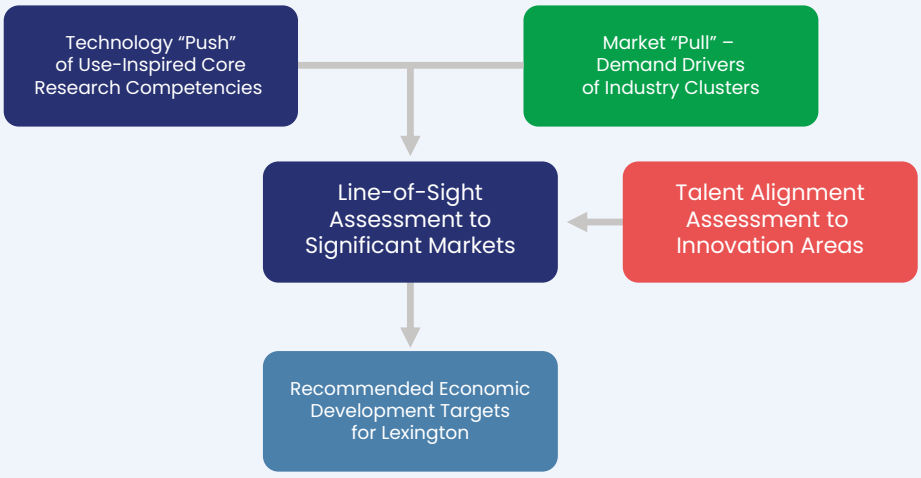
Identifying the highest-value areas of alignment within Rhode Island—where research competencies and industry innovation drivers meet—can be challenging precisely because the number of opportunities is so broad. Research can advance an enormous range of technologies, and industry clusters often span multiple supply chains and overlapping capability needs.

For this reason, maximizing economic development impact requires a disciplined approach: one that narrows priorities to those areas where Rhode Island can plausibly lead, where collaboration can be mobilized quickly, and where investments can translate into measurable outcomes such as new products, new firms, industry upgrading, and higher-wage employment.

This logic is consistent with best-in-class innovation strategies nationally: leading institutions and states increasingly define "industry-facing" research agendas that intentionally connect use-inspired research strengths to market demand and active industry partners, ensuring that innovation does not remain confined to discovery but moves into deployment.

In Rhode Island, this requires focusing on the intersection of three forces (see Figure 2). First is the "market pull" of the state's existing and emerging industry clusters—reflected in indicators such as industry performance, competitiveness, innovation investment, patenting and entrepreneurial activity, SBIR/STTR traction, and access to growth capital. Second is the "technology push" represented by Rhode Island's use-inspired research competencies—evidenced by research expenditures and publications, major research centers and grants, shared facilities, and demonstrated commercialization activity. Third—and increasingly essential—is talent alignment: the degree to which Rhode Island's workforce and education-and-training systems can supply the specialized skills required to develop, deploy, and scale innovation in targeted domains. The most attractive opportunity areas are those where the state can demonstrate a credible "line of sight" not only from research to application, but from application to commercialization and growth.

**Figure 2.**
"Line of Sight" Approach for Identifying Strategic S&T-Driven Industry Opportunities



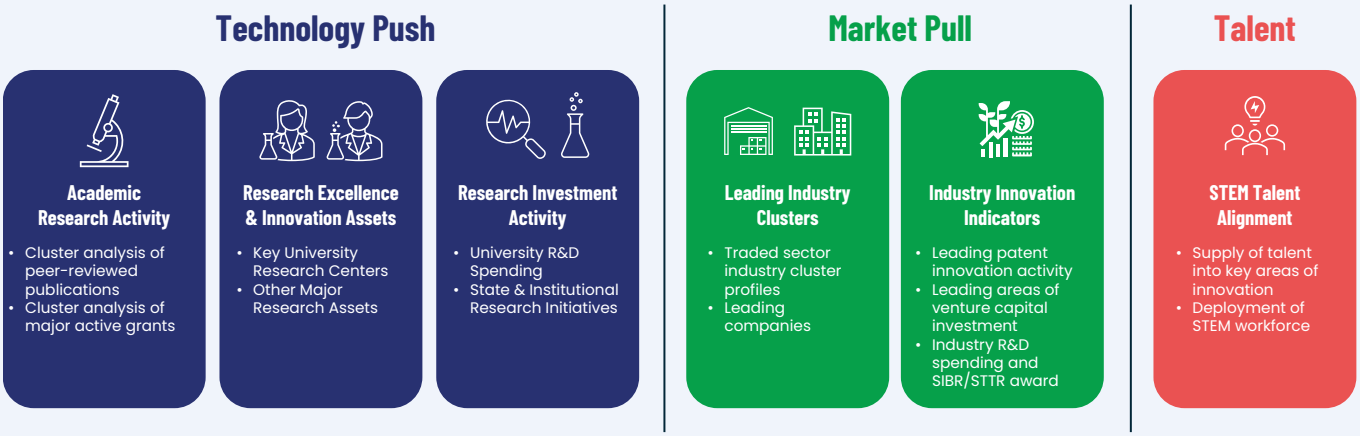

**Source:** TEConomy Partners, LLC

In the face of ongoing technological innovation and disruption of existing industry business models, an assessment of innovation-led growth opportunities must be forward looking rather than retrospective. Traditional industry targeting analysis relies on examining in-depth trends and competitive position in industry activities that largely shed light on where an economy has been. While helpful, this is not sufficient to understand the development opportunities that can grow a state's economy into the future in the face of ever-changing technology and market dynamics. It is equally important to understand where an economy has the capacity to grow and leverage comparative advantage, which is informed by an analysis of core industry-facing technology competencies.

To better understand the alignment of Rhode Island's industry innovation needs with the core competencies of its research institutions, TEConomy applied a rigorous, evidence-based approach to evaluate Rhode Island's competitive positioning within its target science and technology sectors by examining the market pull of established and emerging innovation clusters, the technology push embedded in the state's research ecosystem, and the talent alignment required to scale innovation into significant markets. This line-of-sight framing is especially timely given STAC's role in convening statewide science and technology leadership and its responsibilities to support a coordinated innovation ecosystem, including its formal role in EPSCoR governance and the expectation for an up-to-date statewide S&T plan as part of maintaining competitiveness for key federal research ecosystem opportunities.

The intersection of where the state excels in the "market pull" of industrial innovation activities and the "technology push" of industry-facing core competencies represent the greatest opportunities for future economic growth. As depicted in Figure 3, identifying these growth opportunity areas involves analyzing a number of key indicators. Taken together, these indicators can offer the line-of-sight to growing innovation-led market opportunities that can help sustain the vibrancy of Rhode Island's leading existing industry clusters as well as position the state to respond to market opportunities in new emerging industries that evolve in the future (see the separate Technical Appendix for the detailed analysis findings).

**Figure 3.**
Key Indicators and Analyses Leveraged for the Line-of-Sight Assessment of Rhode Island's Growth Opportunities




**Source:** TEConomy Partners, LLC

Ultimately, four S&T growth opportunity areas were identified for Rhode Island through the line-of-sight assessment (Figure 4). These four areas can be considered those in which Rhode Island is best positioned to compete in growing, innovation-led, market opportunities that can help sustain the state's leading industry clusters as well as advance emerging market opportunities in new industries of the future.

**Maritime and Naval Systems, including:**

- Submarine Platform and Naval System Development and Manufacturing.
- Maritime Autonomy and Sensing.
- Commercial Maritime and Ocean Infrastructure Applications, which include marine electrification and battery systems, offshore energy and marine renewable energy, and ocean Infrastructure and engineering.

**Life Sciences, including:**

- Biotherapeutics Discovery and Development, which includes RNA-based Therapeutics, Biologics for Regenerative Medicine, Gerosciences, and Neurotherapeutics.
- Product Development for Medtech and Bioinstrumentation.
- Digital Health Solutions for Aging and Neuropsychiatric Conditions.

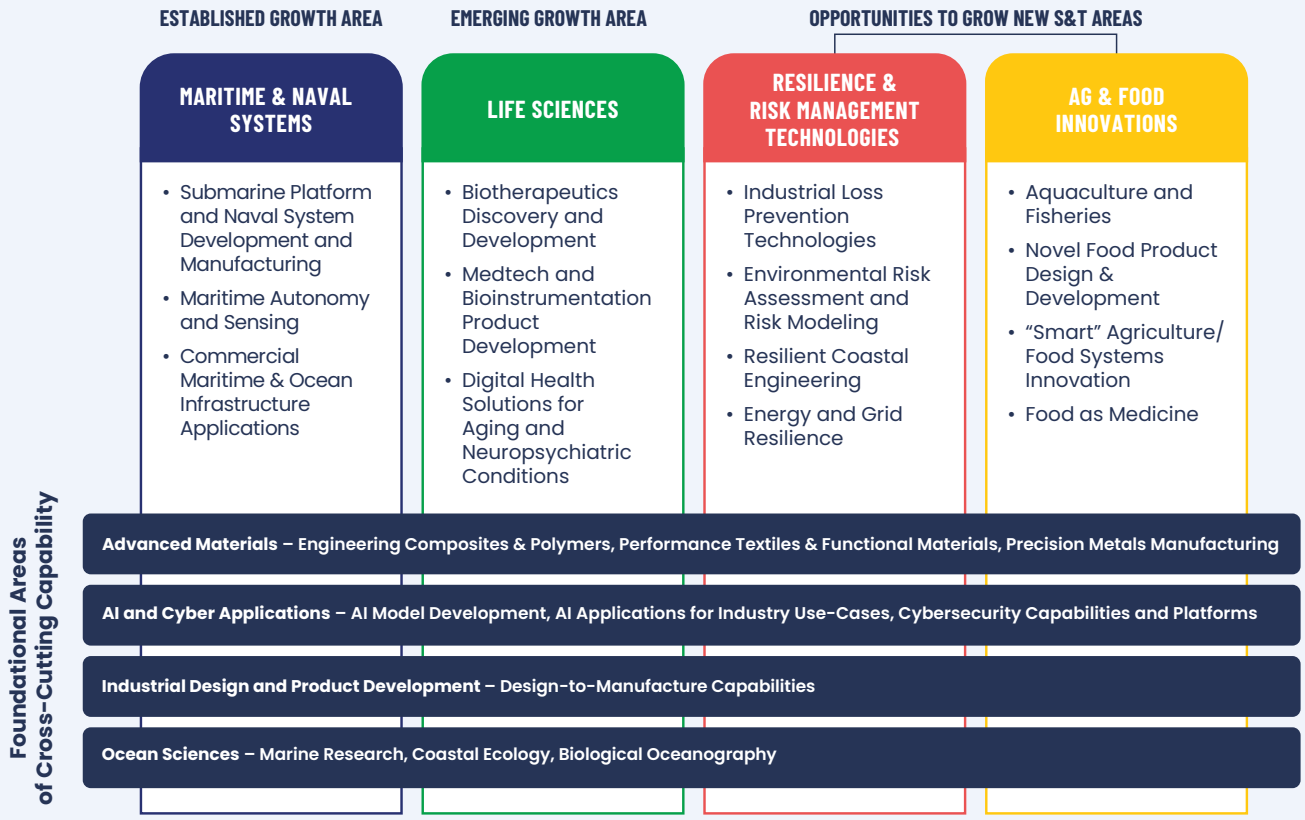
**Resilience and Risk Management Technologies, including:**

- Industrial Loss Prevention Technologies.
- Environmental Risk Assessment and Risk Modeling.
- Resilient Coastal Engineering.
- Energy and Grid Resilience.

**Agriculture and Food Innovations, including:**

- Aquaculture and Fisheries
- Novel Food Product Design & Development
- "Smart" Agriculture/ Food Systems Innovation
- Food as Medicine

**Figure 4.**
Rhode Island's S&T Growth Opportunity Areas




**Source:** TEConomy Partners, LLC

The narrative that follows profiles Rhode Island's S&T growth opportunities. The profiles are organized to provide the following intelligence gathered for each opportunity area:

- An explanation of what the S&T opportunity area is and the key technologies that support it.
- An examination of the market outlook and growth dynamics surrounding the S&T opportunity area.
- An explanation of why this opportunity is a fit for Rhode Island in the context of the market pull of emerging or existing industry clusters and the technology push of core technology competencies.
- Implications/potential barriers for realizing future growth based on insights/discussions with Rhode Island stakeholders from industry, universities, and the broader community.

**Rhode Island's S&T growth opportunity areas are built upon four foundational areas of cross-cutting capabilities.** Cross-cutting science and technology capabilities represent the underlying core competencies, expertise, and innovation infrastructure that enable multiple growth areas to advance simultaneously, serving as a foundation rather than a single market on their own. In Rhode Island, these foundational areas provide the connective fabric between research institutions, federal labs, and companies, supporting both existing growth opportunity areas and also serving as the enablers of new opportunities that arise in response to changing market demands or ecosystem dynamics. Rhode Island's four foundational areas of cross-cutting capabilities are:

- **Advanced Materials,** which includes engineering composites and polymers, performance textiles and functional materials, and precision metals manufacturing.
- **AI and Cyber Applications,** which includes AI model development, AI applications for industry use-cases, and cybersecurity capabilities and platforms.
- **Industrial Design and Product Development,** which encompasses Rhode Island's extensive design-to-manufacture capabilities.
- **Ocean Sciences,** which includes marine research, coastal ecology, and biological oceanography.

Because these capabilities are embodied in long-lived R&D assets such as specialized faculty, testbeds, cyber ranges, and shared equipment, their strength influences Rhode Island's ability to adapt and evolve. Maintaining and expanding these cross-cutting R&D bases is therefore not just an academic priority but a strategic requirement for keeping the state's flagship research competencies and industry clusters competitive, resilient, and differentiated across a national and global landscape.

# MARITIME & NAVAL SYSTEMS:

## AN ESTABLISHED OPPORTUNITY TO GROW A NEW S&T AREA

**The maritime and naval systems opportunity area encompasses the engineering and manufacturing of high-performance naval vessels, maritime systems, and other advanced hardware for ocean environments. It integrates ocean engineering, robotics, materials science, and emerging areas of technology such as machine learning and AI to revolutionize marine navigation, defense, and exploration.**

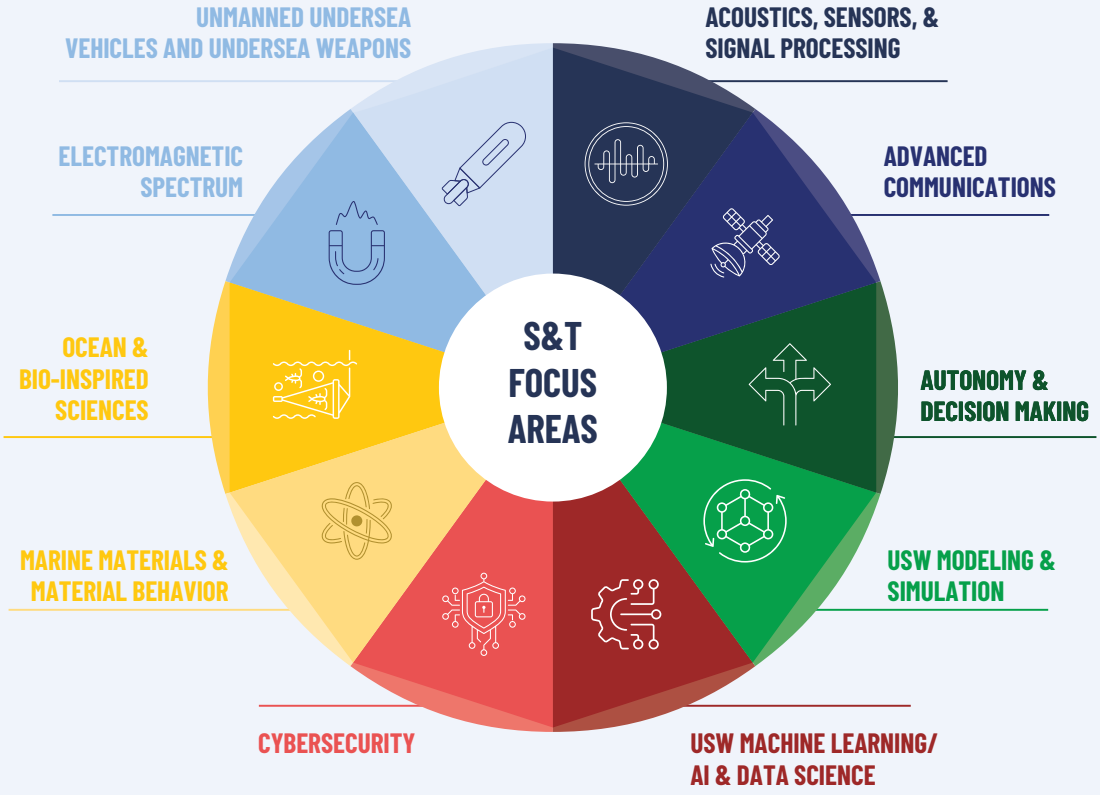
The strategic importance of this sector is underscored by its increasing role in national defense, the blue economy, and climate monitoring, with applications ranging from next-generation nuclear submarines to autonomous underwater vehicles (AUVs). Defense manufacturing and R&D expenditures have reached record levels, driving unprecedented investment in undersea capabilities. Simultaneously, the commercial maritime sector is experiencing parallel momentum driven by offshore renewable energy expansion, port and marine logistics infrastructure modernization initiatives, and commercial maritime products, creating a rare convergence of defense and commercial market pull for maritime technologies.

Rhode Island is uniquely positioned to leverage its historical legacy in ocean sciences alongside its defense industry base and specialized testing and demonstration environments to grow its economy through ongoing investment in maritime and ocean innovation drivers.

# What is Maritime & Naval Systems?

As depicted in Figure 5, maritime and naval systems consist of an integrated set of complex technologies that must work together at the systems level to enable reliable operation in challenging marine environments. This opportunity area is driven by a diverse portfolio of technology applications - marine vessels, robotics, and other infrastructure that must be carefully integrated, optimized, and hardened for surface and undersea conditions. At its core, maritime and naval innovation draws on multiple disciplines across engineering, physical sciences, and computational fields to drive new research and technical capabilities, which are then combined into cohesive, mission-ready systems tailored to specific surface or undersea ocean environments.

**Figure 5.**
NUWC Division Newport S&T Focus Areas




**Source:** Naval Undersea Warfare Center (NUWC) Division Newport

Across this interconnected landscape of scientific and innovation drivers, three primary domains emerge as the key market forces shaping solution development, each supported by cross-cutting enabling technologies such as materials sciences and advanced computing.

## *Submarine Platform and Naval System Development*

A longstanding market for maritime technologies centers on the precision engineering and production of complex naval vessels that serve as platforms for undersea warfare and strategic deterrence. The sector involves the integration of advanced propulsion systems, hull designs with specialized acoustic and maneuvering properties, and sophisticated combat systems for fire control and decision support. The engineering complexity is immense—a single modern submarine contains millions of precision-machined components that must operate as an integrated system under operational stress. Rhode Island's General Dynamics Electric Boat (EB) facility at Quonset Point is a longstanding national hub for this capability, serving as a primary site for fabricating advanced hull modules for the Virginia-class attack submarines and the newly authorized Columbia-class ballistic missile submarines. Electric Boat is currently executing an $860 million facility expansion at Quonset Point to accommodate accelerated Columbia-class production, underscoring the Navy's commitment to a modernized submarine fleet through the 2030s and beyond.

The manufacturing challenge in submarine and other major naval system construction is fundamentally different from civilian shipbuilding. Manufacturing processes involve large-scale integration of precision metalworking, advanced composites, defense electronics, and weapons systems within submarine platforms. For example, modern nuclear-powered submarines require precision-crafted hull sections with quieting technologies, nuclear propulsion systems, and sophisticated sonar and combat systems – all assembled to detailed military specifications, with quality control processes similar to the aerospace industry. Fabrication of major components requires specialized expertise in techniques like hyperbaric welding for deep-dive capability, with individual components subject to multiple inspections and non-destructive testing protocols as a part of the manufacturing process. Key engineering challenges include production the scale, maintaining quality under strict naval standards, and recruiting and training a highly-specialized security-cleared workforce. At the same time, new innovations are being progressively integrated to improve productivity and performance, including digital shipbuilding tools (such as three-dimensional design modeling), modular construction techniques, and additive manufacturing for complex components.

Beyond primary manufacturing operations, a vertically integrated supply chain of specialized firms is also required to support the submarine industrial base, including precision metalworking shops, advanced electronics manufacturers, and systems engineering firms. These firms are both contributors to and consumers of new technologies and innovation, collectively representing an additional demand base for applied innovation whose expertise spans mechanical engineering, electrical systems integration, software development, and specialized trades. This collective capacity and complexity is difficult for other regions to replicate quickly, positioning Rhode Island as a uniquely significant center of U.S. undersea defense production and a powerful end market for innovations that can continuously enhance industrial performance and resilience.

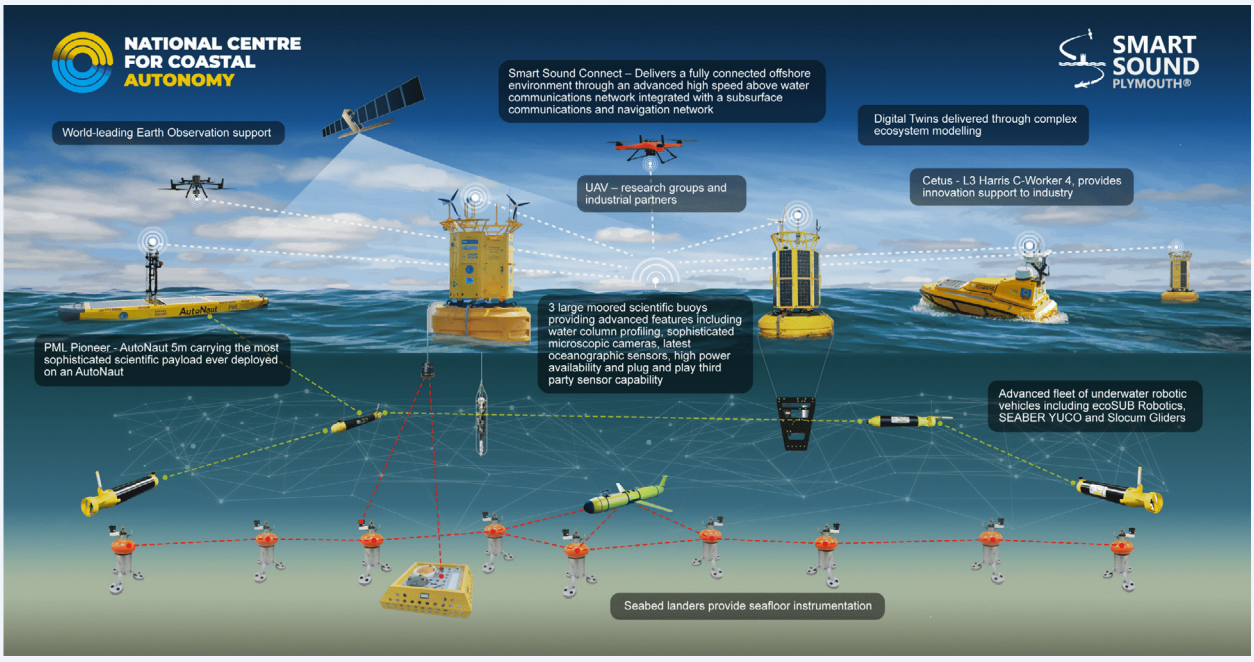
## *Maritime Autonomy and Sensing Systems*

A rapidly expanding technological domain within the maritime sector involves uncrewed and intelligent systems capable of operating across surface and subsurface environments. This market segment encompasses autonomous underwater vehicles (AUVs), unmanned surface vessels (USVs), and distributed intelligent sensor networks designed for surveillance, survey, and data collection. Technical architectures, both within and across systems, integrate advanced robotics, artificial intelligence, oceanography, and acoustic engineering to enable autonomous decision-making in challenging communications environments.

The engineering challenges associated with maritime autonomy differ substantially from terrestrial or aerial robotics due to the physics of the underwater medium. Communication relies primarily on acoustic transmission rather than radio frequency, creating severe bandwidth constraints and latency issues that necessitate high levels of onboard autonomy and edge computing capability. Vehicle endurance is constrained by energy limitations of submerged power systems, driving demand for innovation in battery chemistry and power management systems. Navigation in GPS-denied underwater environments requires sophisticated inertial guidance systems and terrain-relative navigation algorithms. Recent technical advances are addressing these constraints through the integration of low-power, high-performance computing modules for real-time data processing, development of high-density energy storage solutions, and deployment of swarm logic algorithms that enable coordinated multi-vehicle operations. Because of its multidisciplinary nature, the supply chain supporting this domain spans developers of specialized sensors (synthetic aperture sonar, underwater LiDAR), manufacturers of composite structures, and software firms specializing in marine autonomy and signal processing.

As illustrated in Figure 6, cross-platform and multi-vehicle operations increasingly define the deployment and use of marine autonomy systems. Groups (or "swarms") of marine-based systems often operate as a multi-platform system in which satellites, UAVs, USVs, moored buoys, seabed landers, and AUVs function as nodes within a shared communications and navigation network, rather than isolated assets. Within this architecture, data from surface and subsurface sensors are fused to generate high-value information products ranging from near real time defense and logistics decision support to digital twins of coastal environments for modeling purposes. Software and communications coordination and management solutions are equally critical for integrated sensing and monitoring capabilities, as they enable coordinated tasking, adaptive mission planning, and cross-platform handoff of sensing and communications functions at fleet operations levels.

**Figure 6.**
Example of Cross-Platform, Integrated Operating Environment Approach Being Advanced in Marine Autonomy Technologies



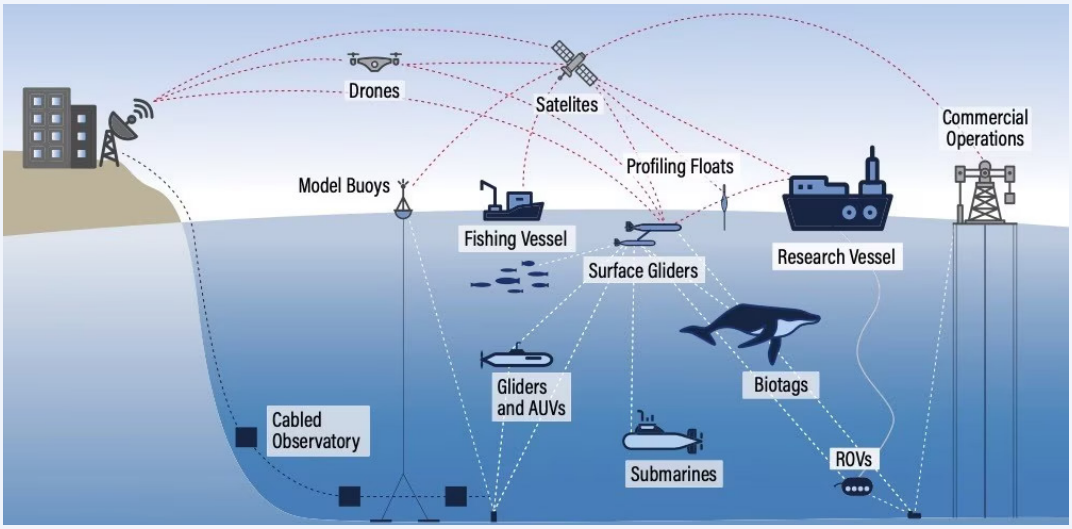

**Source:** National Centre for Coastal Autonomy and University of Plymouth (UK)

The convergence of defense requirements for persistent surveillance and mine countermeasures with commercial demand for subsea infrastructure inspection and environmental assessment has created growing dual-use market opportunities. This application space is also characterized by rapid iterative prototyping and testing requirements, with the ability to leverage Rhode Island's accessible coastal waters and specialized testing facilities to validate performance in real-world conditions representing a capability that distinctively anchors the industry within the region.

### *Commercial Maritime and Ocean Infrastructure Applications*

A final broad domain of civil and economic applications focuses on the deployment and management of critical infrastructure within the marine environment, spanning ports, shipping, offshore energy, and ocean observation systems (Figure 7). Opportunities for research and technology growth in this area involve the application of maritime technologies to optimize logistics, support the construction and maintenance of offshore energy assets, and monitor environmental conditions. Maritime operating environments require commercial and scientific systems capable of withstanding corrosion, biofouling, and extreme hydrodynamic loads while maintaining high reliability. Rhode Island's commercial ports, marine commerce operations, and early adoption of offshore energy have positioned the state to utilize this technology base to support heavy logistics and complex marine construction projects.

**Figure 7.**
Example of Interconnected Technology Ecosystem Supporting Variety of Commercial Maritime and Coastal Infrastructure Applications




**Source:** DARPA Ocean of Things (OoT) Program

The technical requirements for this sector center on durability, remote monitoring, and autonomous maintenance capabilities. Offshore energy infrastructure, for instance, demands specialized support vessels equipped with dynamic positioning systems and robotic systems for subsea cable and foundation inspection, reducing reliance on high-risk human diving operations. Port modernization similarly involves the integration of Internet of Things (IoT) sensor arrays and other routing and monitoring technologies to optimize cargo flow and predictive maintenance of port machinery. Engineering challenges include developing materials and coatings that resist degradation in saltwater environments and creating secure, resilient data networks for maritime

logistics. Innovations in this space also include significant potential dual use context such as the deployment of autonomous drones for structural inspection, development of bio-inspired anti-fouling materials, and implementation of AI-driven predictive analytics for asset management.

### *Maritime and Naval Systems Opportunity Provides Potential Across a Spectrum of "Ocean Technology" Markets*

Collectively, these applications domains rely on common, cross-cutting enabling technologies and provide the potential to drive S&T-based economic growth across defense, commercial, and dual-use markets (Figure 8). Advanced materials and manufacturing methods underpin all three sub-themes: for instance, high-strength lightweight composites and novel alloys are critical for submarine hulls and turbine blades alike. Likewise, ocean-based data and computing technologies are a shared foundation: modern maritime and naval systems increasingly depend on large-scale analytics processing, machine learning, and secure communications across subsea communication networks and satellite feeds.

Notably, these application domains are aligned with the majority of science and technology areas typically categorized as enabling "blue economy" or "ocean tech" innovation, supporting relevant solutions in defense, energy and infrastructure, aquaculture and fisheries, environmental sciences, and other industries that are based on Rhode Island's coastal location.

**Figure 8.**
Maritime & Naval Systems Spans Opportunities Germaine to Ocean Tech and Blue Economy




**Source:** TEConomy Partners, LLC

Developing these capabilities requires specialized facilities such as characterization and signals processing labs, test tanks that simulate ocean environments, and real-world ocean demonstration ranges. Rhode Island's federal and university assets provide such underpinning capabilities, which can continue to be leveraged to provide a unique value proposition for S&T-driven industries in this space.

# Market Outlook and Growth Dynamics

The global market for maritime and naval systems is undergoing a structural expansion driven by the convergence of intensified geopolitical competition and the rapid scaling of blue economy-related industry sectors. This shift marks a transition from relatively steady defense procurement and commercial maritime investment cycle to a more dynamic growth phase characterized by continuous technological modernization and the emergence of multiple new commercial verticals.

On the defense side, renewed focus on undersea superiority, contested sea lanes, and critical subsea infrastructure protection is driving sustained demand for multi-domain awareness systems that utilize advanced platforms, unmanned systems, and networked sensing and communication architectures. At the same time, blue economy activities are accelerating the adoption of similar technologies across civilian markets: port operators are investing in smart-port and logistics automation to increase throughput and resilience; shipping companies are modernizing fleets and onboard systems to improve efficiency, safety, and emissions performance; and offshore energy developers are scaling wind and marine energy projects that depend on robust subsea inspection, monitoring, and control capabilities.

Additional emerging opportunities are also being commercialized to support marine and seabed natural resources sectors. Fisheries and aquaculture operators are deploying advanced sensing, automation, and data systems to improve stock management, optimize feed and health monitoring, and reduce environmental impacts, while emerging interest in deep-sea mineral exploration and bioprospecting for novel bioactive compounds is creating new requirements for high-endurance autonomous vehicles, sampling systems, and in situ analytical tools. Taken together, these defense and non-defense drivers are expanding the scope of the maritime and naval systems market globally from a historically narrow set of military programs to a broader, multi-sector technology landscape in which common undersea and ocean-sensing capabilities are leveraged across security, energy, logistics, food systems, and advanced materials and biotechnology applications.

Several specific global trends impacting market growth in this space include:

- **Expansion of Undersea Defense Capabilities:** Global military strategies are now prioritizing the undersea domain as a critical theater for strategic competition, driving procurement of next-generation submarine platforms, distributed undersea networks, and unmanned systems to secure sea lines of communication and critical subsea infrastructure. This sustained recapitalization cycle creates long-term demand for high-end manufacturing, advanced sensing, and autonomy, while opening entry points for non-traditional defense suppliers that can deliver differentiated capabilities in AI, cyber-physical security, and novel materials.

- **Offshore Renewable Energy and Marine Infrastructure:** The rapid build-out of offshore wind and other marine energy systems is catalyzing a large-scale expansion globally of ocean infrastructure, including foundations, export cables, and grid interconnections. These projects also generate demand for specialized vessels, maritime robotics, subsea inspection and repair services, and continuous environmental monitoring, pushing operators toward automated and autonomous solutions that reduce lifecycle costs and improve safety while broadening the addressable market for maritime systems beyond traditional defense programs.

- **Maritime Trade and Port Modernization:** Global shipping and port operators are accelerating digitalization and automation to increase throughput, improve reliability, and meet decarbonization and regulatory targets. Investments in smart-port systems, autonomous harbor craft, connected navigation and traffic management, and emissions monitoring drive demand for integrated sensing, secure communications, and decision-support tools, while the emphasis on supply chain resilience increases requirements for coastal and port-approach surveillance and anomaly detection.

- **Living Marine Resources and Emerging Seabed Markets:** The need to manage fisheries sustainably, expand offshore aquaculture, and monitor ecosystem health is stimulating adoption of advanced sensing, data analytics, and automation across food and environmental applications. At the same time, emerging interest in deep-sea mineral exploration and bioprospecting for novel bioactive compounds is creating requirements for high-endurance autonomous vehicles, sampling systems, and in situ analytical instruments, extending maritime systems demand into resource and biotechnology domains.

- **Ocean Sustainability and Security Convergence:** Recognition of the ocean's central role in climate regulation and economic activity is driving investment in large-scale ocean observation networks, even as the vulnerability of subsea cables, pipelines, and offshore energy assets elevates infrastructure protection to a security priority. This convergence is creating a robust market for dual-use sensing, communications, and surveillance architectures that can simultaneously support environmental science, regulatory compliance, and defense missions, improving the risk-return profile for technology developers by enabling multi-mission deployment of common platforms.

- **Expansion of Dual-Use Maritime Markets:** Across these domains, common technology building blocks—autonomous vehicles, modular sensor payloads, resilient communications, digital twins, and advanced materials—are increasingly designed for deployment in both defense and civilian marine applications. This expansion of dual-use markets allows firms to diversify revenue across naval programs, offshore energy, ports, fisheries, aquaculture, and emerging seabed industries, reducing exposure to single-customer or single-program risk while accelerating innovation through cross-sector learning and shared infrastructure.

# Why is this S&T Opportunity Area for Rhode Island?

Rhode Island is uniquely positioned in maritime and naval systems as a leading national hub. Over time, the state has developed a concentrated geography that contains the full set of capabilities required to conceive, test, and field advanced ocean technologies. A historic base of naval industrial capacity is tightly coupled with federal research installations, specialized academic programs, and working waterfront infrastructure, creating an ecosystem where concepts can move from laboratory insight to in-water demonstration and into production within a single regional value chain. This density of assets also enables a feedback loop between research, prototyping, and operations that is difficult for more dispersed or less specialized regions to replicate.

At the core of this ecosystem is a cluster of federal and academic institutions that anchor undersea research and strategic thinking. NUWC Division Newport serves as the Navy's primary center for undersea warfare research and development, concentrating on scientific talent, specialized facilities, and sustaining federal funding within the state and creating continuous demand for advanced technologies and engineering services. The Naval War College adds a complementary layer of strategic analysis and doctrine development, shaping future requirements and ensuring that emerging capabilities are aligned with evolving operational concepts. In parallel, the University of Rhode Island's Graduate School of Oceanography and Department of Ocean Engineering, together with Brown University's engineering and applied science programs, maintain critical mass in ocean sciences, underwater acoustics, autonomy, and robotics, generating intellectual property and a specialized workforce that map directly onto regional industry needs.

These institutional assets are embedded within a uniquely favorable physical environment for maritime innovation. Narragansett Bay and adjacent offshore waters provide a highly accessible, variable testbed spanning sheltered inshore areas, complex coastal regimes, and nearby deepwater conditions, allowing rapid and repeated at-sea validation of new sensors, platforms, and algorithms. The state's commercial ports and associated industrial waterfronts supply the heavy-lift, fabrication, and logistics capabilities required for submarine construction, offshore energy staging, and marine infrastructure deployment. Taken together, this combination of institutional density, research specialization, and geographic assets positions Rhode Island as a natural home for innovation and research leadership across a breadth of potential maritime and ocean science applications.

## Highlights of Rhode Island's Market "Pull"

The demand side of Rhode Island's maritime ecosystem is characterized by a unique constellation of anchor customers spanning defense, energy, and maritime infrastructure. This diverse customer base creates sustained, long-term market pull for advanced technologies while enabling regional firms to serve multiple end-markets and reduce dependence on single programs or procurement cycles.

Several key highlights of the state's market pull include:

- **Strategic Defense Procurement for Naval Systems and the Submarine Industrial Base:** The submarine industrial base represents the foundation of regional market demand and economic value. General Dynamics Electric Boat's multi-decade backlog for Virginia-class attack submarines and the newly authorized Columbia-class ballistic missile submarines creates a predictable, high-volume requirement for precision manufacturing, systems integration, and specialized engineering services. The company's ongoing facility expansion at Quonset Point designed to support next generation production technologies underscores the scale and certainty of this demand pipeline. Electric Boat operations support an extensive

tiered supply chain of hundreds of regional suppliers including precision metalworking shops, advanced composites manufacturers, defense electronics firms, and specialized systems integrators, each generating continuous demand for process innovations, specialized components, and technical expertise. This vertically integrated industrial structure creates a stable ecosystem where prime contractors and suppliers are co-located, enabling rapid feedback cycles and coordinated responses to emerging capability requirements. Beyond Electric Boat, other major defense primes maintain research and development centers and subcontract relationships within Rhode Island, including Raytheon Technologies, Lockheed Martin, BAE Systems, and Huntington Ingalls Industries, all of which maintain local R&D and procurement linkages with NUWC Newport and the regional supply base.

- **Expanding Commercial Maritime Diversification and Offshore Infrastructure Development:** The regional maritime economy is diversifying beyond traditional defense applications into offshore energy support and advanced marine services, creating new channels for technology deployment and revenue generation. The operational requirements of existing projects like the Block Island Wind Farm and a potential pipeline of offshore infrastructure developments in federal waters create sustained demand for subsea inspection robotics, environmental monitoring systems, and specialized vessel support services. This commercial maritime activity increasingly leverages the same underlying industrial capabilities as the defense sector (precision welding, composite fabrication, marine electronics, and systems integration), allowing established firms to pivot between defense and commercial work and enabling new entrants to build capabilities in one market with applicability to the other.

## Quonset Point's Role as a Leading Naval Systems Hub Generating Market Pull

General Dynamics Electric Boat's submarine manufacturing campus at Quonset Business Park at the Port of Davisville (Quonset Point) is Rhode Island's largest single industrial complex, with multi decade contracts for Virginia and Columbia class submarines that translate into predictable, long horizon demand for precision fabrication, systems integration, and specialized services. This backlog, and the associated $800 plus million ongoing facility expansion creates a durable demand driver that shapes investment decisions across the regional supply base and reduces market risk for firms considering upgrades in equipment, workforce, and digital capabilities.

The facility's role extends beyond direct employment and contract volume. Quonset Point anchors a vertically integrated second-tier and third-tier supplier network involving metals fabrication, composites, electronics, and engineering services spread across Rhode Island and neighboring states. These suppliers depend heavily on Electric Boat programs for revenue, but they also represent a ready-made customer base for new process technologies. Stakeholder interviews indicate that modernization initiatives are being designed explicitly around the needs of Quonset-linked suppliers, underscoring the facility's centrality in shaping regional innovation priorities.

Quonset Point is also a distinctive physical asset the state can continue to leverage to drive S&T-based growth. The business park combines deepwater port access, rail and highway connectivity, and large-footprint industrial parcels, enabling simultaneous support for naval fabrication, commercial shipbuilding and repair, and offshore staging activities. This co-location of defense and commercial maritime operations creates practical opportunities for dual-use technology deployment that the state can continue to leverage as new maritime technologies emerge.

Companies such as Senesco Marine, which operates sophisticated shipbuilding and repair capabilities, serve both defense and commercial customers, maximizing asset utilization and providing workforce stability. Additionally, Rhode Island's commercial ports and emerging offshore wind staging infrastructure create opportunities for port modernization technologies, autonomous logistics systems, and smart-port digital solutions. The diversification of commercial maritime activity reduces the risk profile for the regional ecosystem by creating alternative revenue streams and customer bases that can partially insulate the cluster from cyclical variations in defense spending.

- **Growing Dual-Use Technology Integration and Innovation Acceleration:** The regional ecosystem has developed mechanisms to facilitate the translation of defense technology into civilian applications and to accelerate the adoption of emerging technologies across both domains. Interface organizations and collaborative forums connect Navy technology requirements with innovation from startups, academic researchers, and non-traditional suppliers, allowing firms to access defense markets without requiring the full burden of traditional defense-contractor development cycles. This two-way flow of innovation creates the potential for dual-use technologies in areas such as autonomous systems, advanced materials, cybersecurity, and artificial intelligence, where commercial pace-of-innovation often exceeds traditional defense development timelines. The result is a market ecosystem in which emerging technologies can be validated through dual-use deployments, reducing market risk for innovators and accelerating the adoption of promising capabilities into both civilian and defense applications. University-Industry collaborations and support organizations, including the Ocean Tech Hub, SENEDIA, and 401 Tech Bridge, have continued to actively work to bridge defense and commercial maritime markets.

## NUWC and Narragansett Bay's Unique Ecosystem

NUWC's Narragansett Bay Test Range is a world-class in water proving ground that provides an asset few regions can offer rapid, instrumented testing of underwater, surface, and aerial systems in a realistic East Coast operating environment directly linked to the U.S. Navy's premier undersea warfare center. As an extension of NUWC Newport's full spectrum research, development, test, and evaluation mission, the range supports everything from advanced sonar and acoustic systems to autonomous underwater vehicles, enabling evaluation of defense and commercial ocean tech solutions in operationally relevant conditions. This combination of scientific rigor, fleet driven requirements, and access to a controlled coastal testbed makes the facility a unique national asset for de risking new technologies and accelerating their path from lab to sea.

Ecosystem initiatives such as the NavalX/401 Tech Bridge partnership and the Ocean Tech Hub wrap an innovation network around the range that must be further scaled, turning Narragansett Bay into a living lab for dual-use maritime autonomy, sensing, and undersea infrastructure protection. In particular, BlueTIDE's annual in-water demonstrations, prize challenges, and tech-scouting activities serve as a potential model for deliberately channeling startups, university teams, and established firms into real-world trials putting emerging blue-economy solutions in front of Navy buyers, investors, and industry primes. Together, the range and its surrounding programs create the potential for a tightly coupled pipeline where novel concepts can be conceived, tested, iterated, and scaled in one geography.

## Highlights of Rhode Island's Technology "Push"

Rhode Island's research enterprise has longstanding specialization in ocean sciences and the advancement of maritime technologies with direct applicability to naval, autonomy, and commercial challenges. The state's technology push is anchored by significant federal research expenditures, specialized academic programs, and a growing set of dedicated facilities and test ranges that shorten the path from concept to in-water demonstration. This technology base is increasingly characterized by multi-institutional efforts that integrate software, materials, sensing, and systems engineering across public and private entities to address complex maritime use cases. However, these efforts have significant potential to scale further, particularly if backed by coordination and tech transfer mechanisms that more tightly link federal R&D priorities being advanced by NUWC with academic centers of excellence in ocean sciences, materials, and digital technologies at URI, Brown, and other institutions and in turn provide pathways for collaborative research with industry partners.

Key themes that emerge from quantitative and qualitative assessment of Rhode Island's research and innovation base include, but are not limited to:

- **Anchor Institutions Focused on Undersea Warfare and Naval Platform R&D Leadership:** NUWC Newport anchors national R&D in undersea warfare systems, including sonar, torpedoes, payload integration, survivability testing, and undersea vehicle autonomy, and maintains direct technical linkages to URI's Ocean Engineering and Narragansett Bay campus assets. Its facilities such as acoustic test tanks, pressure-testing chambers, and hardware-in-the-loop integration labs provide critical infrastructure for validating new materials, sensors, weapons, and combat-system components before they transition into the submarine industrial base. NUWC's portfolio is complemented by regional collaborations through 401 Tech Bridge and UTIC, which connect Navy engineers with local innovators for technology demonstrations, prototyping, and dual use testing collaborations.

### Investing in Growing Research Excellence: URI's Ocean Robotics Lab Modernization

The new Ocean Robotics Laboratory at URI's Narragansett Bay Campus is emerging as a flagship engine of research excellence in marine autonomy and sensing, purpose-built to design, develop, and test technologically driven ocean exploration solutions. The 27,000–32,000 square-foot facility will integrate primary and secondary labs, shops, offices, an incubator suite, and a large staging area with a 4,500-cubic-foot test tank, tightly coupled to the campus pier and new research vessel to enable rapid "lab-to-sea" experimentation. By co-locating oceanography, ocean engineering, and robotic systems under one roof, the lab creates a high-density environment for advancing undersea vehicles, imaging, acoustics, and AI-enabled sensing that few coastal campuses can match.

This shoreside test infrastructure and direct water access are designed to complement NUWC's Narragansett Bay ranges, giving faculty, students, startups, and industry partners streamlined access to real-world and digital twin test environments in the same geography. The new facility reinforces URI as a national leader in ocean robotics research and as a primary academic gateway into rapidly growing ocean-technology and undersea systems applications.

- **Academic Research Excellence in Ocean Systems, Autonomy, and Marine Infrastructure:** The University of Rhode Island's Graduate School of Oceanography, Ocean Engineering, and Coastal Institute provide research leadership in ocean systems, resilience engineering, underwater robotics, and marine resource management, while other facilities such as the URI Ocean Robotics Facility and Narragansett Bay Test Facility provide the ability to conduct experimental work in real-world conditions. Brown University's strengths in materials science, environmental science, applied mathematics, and computer science also contribute research strength in advanced modeling of marine systems, structural and acoustic behavior, logistics optimization, and AI/ML algorithms for autonomy and decision support. Roger Williams University Bristol Campus's strengths in blue biotech and marine science. Together, these institutions represent a base of highly aligned state R&D excellence and provide a pipeline of trained graduates that directly feed regional needs in submarine platforms, autonomous vehicles, port optimization, and ocean systems management.

- **Emerging Network of Maritime Innovation Infrastructure, Testbeds, and Coordinating Platforms:** Specialized facilities and coordinated initiatives, while not yet fully funded, are further strengthening the ability to move innovations from prototype scale to higher technology readiness levels. Narragansett Bay and associated test ranges are being organized into a Test Range Network that supports trials of AUVs, USVs, advanced sensing systems, and navigation and communications concepts for both defense and commercial partners. The Ocean Tech Hub, Blue Robotics Lab, and related university consortia are beginning to scale the ability to provide shared labs, prototyping space, and commercialization pathways that lower barriers for startups and SMEs to work with Navy and commercial customers on autonomy, sensing, and other ocean sciences innovations. Collectively, these assets have the potential to function as an integrated innovation pipeline, advancing new maritime systems from fundamental research through applied R&D, field testing, and transition to market.

## Highlights of Talent Pipeline

In addition to research excellence, a specialized workforce is essential to sustain the technical complexity of the region's maritime industry. Rhode Island's maritime and naval workforce shows clear areas of concentration based on the naval systems industry base, but stakeholder comments and quantitative analysis indicate growing structural constraints across both entry-level technician/skilled trades as well as more senior STEM-intensive labor segments. These constraints are already affecting the ability of firms to meet current program demand and to absorb new technology, particularly in autonomy, secure systems, and digital manufacturing.

On the technician and skilled trades side, many defense and maritime stakeholders including SENEDIA and members of the submarine industrial base characterize the labor market as facing challenging headwinds, citing simultaneous national shortages and an aging incumbent workforce. In Rhode Island, existing defense manufacturers and scaling ocean-technology firms both report that recruitment is constrained by insufficient local supply of specialized welders, machinists, marine electricians, and other blue collar technicians with security clearances and shipyard experience. Organizations are responding with multi level pipeline initiatives, including high school experiential programs, CTE centers supported by DoD funding, and third party training providers. However, stakeholders consistently indicate that capacity remains below projected demand, especially as submarine production ramps further. At the same time, the skill profile of these roles is shifting; in addition to core metalworking and fabrication capabilities, employers now expect familiarity with PLCs, industrial automation, computerized logistics, and quality systems, which raises the bar for both new entrants and incumbent upskilling.

- **Implication for technician and skilled trades segment:** Without faster expansion of training throughput and more systematic alignment of CTE, community college, and employer programs to submarine and ocean tech requirements, workforce shortfalls in welding, precision machining, marine electrical work, and digital industrial maintenance are likely to remain a binding constraint on Rhode Island's ability to capture additional Maritime & Naval Systems work and to adopt Industry 4.0 manufacturing technologies.

For senior engineering and STEM roles, Rhode Island benefits from a comparatively strong base of domain-specific expertise but faces increasing competition and retention risks. Stakeholders describe the regional engineering workforce as having an unusual combination of systems engineering capability and long experience with marine and defense supply chains, particularly within small and mid sized firms that support the existing naval manufacturing base. URI's Graduate School of Oceanography and ocean engineering programs are repeatedly cited as a "crown jewel" for senior level talent in underwater robotics, composite materials, and cyber physical marine systems, and companies report active engagement with these programs for recruitment and collaborative projects. However, employers also emphasize that knowledge is fragmented across organizations, graduate output is not sufficient to meet all emerging needs in autonomy and secure systems, and retention is challenged by competition from national tech employers and higher paying metropolitan markets for AI, cyber, and software engineering skills.

- **Implication for senior engineering and STEM segment:** Although Rhode Island has differentiated strengths in ocean engineering, underwater acoustics, and applied AI for autonomy, these capabilities are more thinly staffed and under pressure from external demand, making coordinated retention strategies and targeted growth in high end STEM programs (e.g., secure AI, cyber physical systems, and electronics test/integration) critical to sustaining the region's competitive position in advanced undersea systems.

## Line-of-Sight Market Applications for Rhode Island

Within each of the three maritime and naval systems market segments identified above, Rhode Island has several potential opportunities to drive convergence of regional research strengths and industrial capabilities to build on its role as an established hub in maritime technologies and ocean sciences.

For **Submarine Platform and Naval System Development and Manufacturing**, specific market opportunities include:

- **Submarine hull sections and pressure-resistant structural components,** which align with module production and the vertically integrated metals and fabrication supply base serving the submarine industrial ecosystem.

- **Stealth materials and coatings for signature reduction in undersea operations,** leveraging regional strengths in advanced materials and coatings R&D at universities and supplier needs for corrosion- and fouling-resistant finishes on hull and appendage structures.

- **Integrated combat systems including sensors, weapons, defensive systems, and electromagnetic warfare capabilities,** with demand supported by NUWC's role in undersea combat systems R&D and by local electronics and systems-integration firms that already contribute to sonar, periscope, and combat-control subsystems.

- **Anti-submarine warfare sensor platforms and training targets,** which build on testing ranges and acoustic research capabilities that require instrumented targets, tow bodies, and deployable sensor payloads for fleet training and evaluation.

- **Supply chain components spanning precision machining, composite structures, and specialized electronics manufacturing,** reflecting the concentration of Rhode Island firms in metals, composites, and electronics that already feed submarine programs and are seeking modernization support to meet increased volume and quality requirements.

For **Maritime Autonomy & Sensing Systems**, specific market opportunities include:

- **Autonomous underwater vehicles for oceanographic research, underwater infrastructure inspection,** and environmental monitoring leveraging signature capabilities in applied R&D in underwater robotics and autonomy as well as regional startups commercializing small AUVs for science and inspection missions.

- **Unmanned surface vehicles for offshore monitoring, aquaculture site management, and port security,** aligned with commercial and defense interest in persistent surface surveillance and to Rhode Island's port, aquaculture, and offshore energy operations that can serve as early adopters and test customers.

- **Marine sensor networks for real-time ocean condition monitoring, fish population tracking, climate change research, and digital twin model development,** reinforced by regionally-anchored ocean observing programs and NOAA-affiliated activities, which require integrated sensing, data management, and modeling capabilities.

- **Acoustic communication systems enabling AUV coordination and underwater internet-of-things applications,** aligned with longstanding innovation strengths in underwater acoustics and signaling and with dual use market demand for reliable subsea communications in multi-vehicle operations.

- **Computer vision and machine learning systems for underwater object recognition and autonomous decision making,** tapping into growing AI and machine-learning research at Rhode Island universities and into operational requirements for automated target recognition and adaptive mission planning in both defense and infrastructure-inspection use-cases.

For **Commercial Maritime & Ocean Infrastructure Applications,** specific market opportunities include:

- **Dual use technologies for maritime electrification**, which sit at the intersection of Rhode Island's marine trades and emerging energy cluster and include firms exploring electric propulsion and power management for workboats and short-sea transport.

- **Electric and autonomous vessel support technologies including docking automation, charging infrastructure, and collision avoidance systems for commercial fleets**, supported by regional competencies in controls, navigation, and maritime operations and aligned with identified needs for safer, lower-emission harbor and coastal vessels.

- **Commercial shipping and "smart" port solutions,** which build on activity at Quonset Point and Providence-area ports, where operators are exploring digital tools for asset tracking, berth scheduling, and security integration.

- **Site evaluation and oceanographic mapping,** providing solutions to meet demand for high-resolution seabed and ocean data for offshore energy, cable routes, and coastal resilience projects.

- **Offshore energy staging, installation, and support,** directly aligned with Rhode Island's early experience with the Block Island Wind Farm and ongoing efforts to position its ports and marine construction companies within the broader New England offshore wind supply chain.

- **Underwater infrastructure installation, inspection, and repair for telecommunications, power transmission, and offshore energy interconnection,** providing support services and ongoing operational capabilities for ocean-based platforms and installations.

## Global Markets for defense, dual use, and commercial technologies that are relevant to various elements of maritime and naval systems, include (but are not limited to):

- Rising demand for global conventional submarine platforms, estimated at over $8.8 billion in global naval procurement spend in 2024 with CAGR of 3.6 percent through 2033. In particular, recent U.S. Navy submarine programs have generated major spending relevant to Rhode Island's operations, including:
  - U.S. Navy awarded General Dynamics Electric Boat contract of $18.4 billion for production of new Virigina-class submarines in April 2025.
  - U.S. Navy awarded General Dynamics Electric Boat contract of $2.3 billion for work on Columbia-class submarines in November 2025.
- Estimated global commercial market for autonomous unmanned vehicles of $875 million in 2024 with CAGR of 19 percent through 2030, estimated military and defense market for AUVs of $970 million in 2024 with CAGR of 17 percent through 2030, and estimated academic research market for AUVs of $528 million in 2024 with CAGR of 10 percent through 2030.
- Projected market for unmanned underwater vehicle composites of $348 million as of 2027.
- Estimated floating offshore wind energy market size of $1.5 billion in 2024, CAGR of 60 percent through 2030.
- Variety of additional emerging commercial maritime markets, which represent major global markets where U.S. shipbuilding can play a major role in developing disruptive technologies.

Sources: BCC Market Research, U.S. Navy and Department of Defense, McKinsey, and Deloitte

## What is Still Needed to Realize/Maximize the Opportunity

While Rhode Island continues to have success in attracting substantial naval systems manufacturing contracts to its ecosystem, to fully maximize the science and technology potential of this growth opportunity Rhode Island must both proactively invest to maintain its position as a leading hub for defense-related applications in response to potential challenges while also expanding dual use, commercial maritime, and broader ocean sciences-driven market sectors to diversify its innovation footprint around an area of signature strength. Even though the state has substantial federal R&D anchors, an established submarine industrial base, and growing maritime autonomy and composites activity, stakeholders emphasize that current systems for capital formation, infrastructure access, and coordination are not yet configured to support a next wave of dual-use growth. Across the three sub-domains identified above, a common theme is the presence of strong individual assets and programs, but fragmented commercialization pathways and uneven spillover into adjacent markets.

To maintain Rhode Island's competitive position and enable the state to capitalize on expansion into new maritime and naval market opportunities, strategic interventions are required to address ecosystem gaps in the following areas:

- **Need for Additional Translational Capital Mechanisms:** Existing funding tools support basic and applied research (e.g., NUWC S&T, academic grants) and very early-stage commercialization (e.g., state innovation vouchers, SBIR/STTR matches), but stakeholders report a persistent financing gap for capital intensive, hardware centric ventures trying to move from prototype to qualified product in defense and offshore markets. This gap is particularly acute for AUV/USV and sensor network companies, where development requires specialized engineering talent, facilities, and long lead times before revenue, conditions that traditional venture investors in are often reluctant to underwrite. Stakeholder interviews indicate that without dedicated translational capital, potentially in the form of a blue tech oriented support fund, expanded federal matching programs, or other structured public private financing, promising technologies and early stage companies risk stalling in demonstration phases rather than scaling into reliable supply chain actors.

- **Testing and Demonstration Infrastructure Modernization and Access:** Stakeholders are quick to note that the state has unique environmental and physical testing assets, but also that the current ecosystem exhibits some constraints in fully realizing the potential of those assets. NUWC and Narragansett Bay test environments continue to attract undersea R&D investment, and Quonset's industrial base anchors submarine manufacturing, but SMEs and emerging autonomy firms frequently lack affordable access to secure, waterfront adjacent space and to shared test assets necessary to validate systems at scale. Stakeholders also highlighted some capacity bottlenecks in port and yard infrastructure for offshore platform staging as well as limited commercial mechanisms to use federal test ranges for non federal projects, leading to underutilization of what stakeholders view as a major comparative advantage.

- **Fragmented Second Tier Naval Supplier Ecosystem and Evolving Defense Supplier Requirements:** Stakeholders describe Rhode Island's second tier defense and maritime suppliers as numerous and having deep expertise in systems engineering but fragmented, with many SMEs focused on niche engineering services or customized build work rather than coordinated R&D strategies or integration into broader defense or commercial maritime cluster ecosystems. Capacity constraints, uneven adoption of advanced manufacturing and cybersecurity practices, and more limited transition into suppliers for commercial

maritime markets create risk as prime contractors and the Navy raise expectations around digital quality systems, secure supply chains, and cost and schedule performance.

- **Ongoing Need For Specialized Talent to Support Maritime and Naval Innovation Ecosystem Capacity:** Stakeholders across the defense ecosystem consistently emphasize that both technician and senior technical role shortages are now a binding constraint on growth, with the submarine industrial base in particular reporting potential "crisis-level" demand for welders, machinists, marine electricians, systems engineers, and AI/cyber specialists. Existing pipeline initiatives have been created to meet the need but are not yet scaled to match multi-decade procurement plans or expansion into potential dual use markets. There are also critical needs to ensure that training content for entry level technical positions keeps pace with evolving requirements in autonomy, digital shipbuilding, and secure systems integration. Similarly, specialized talent pipelines in marine and ocean engineering need to be scaled and anchored in the state to help support both emerging companies and existing institutions while also integrating emerging technology trends in AI and data fusion in academic programs.

# LIFE SCIENCES:
## AN EMERGING S&T GROWTH OPPORTUNITY AREA

**Life Sciences continues to represent an expanding domain of research, innovation, and commercialization activity centered on the advancement of therapeutic, diagnostic, medical device, and digital health technologies that address significant healthcare challenges in aging, neurological disease, cancer, and chronic conditions.**

This opportunity area integrates a wide array of different research disciplines to develop next-generation interventions that leverage advances in genomics, immunotherapy, regenerative medicine, and precision medicine. The strategic importance of this sector continues to be underscored by its role in national health innovation priorities, aging population demographics across New England, substantial federal research funding through the National Institutes of Health (NIH), and significant venture capital investment in the biotechnology and digital health sectors.

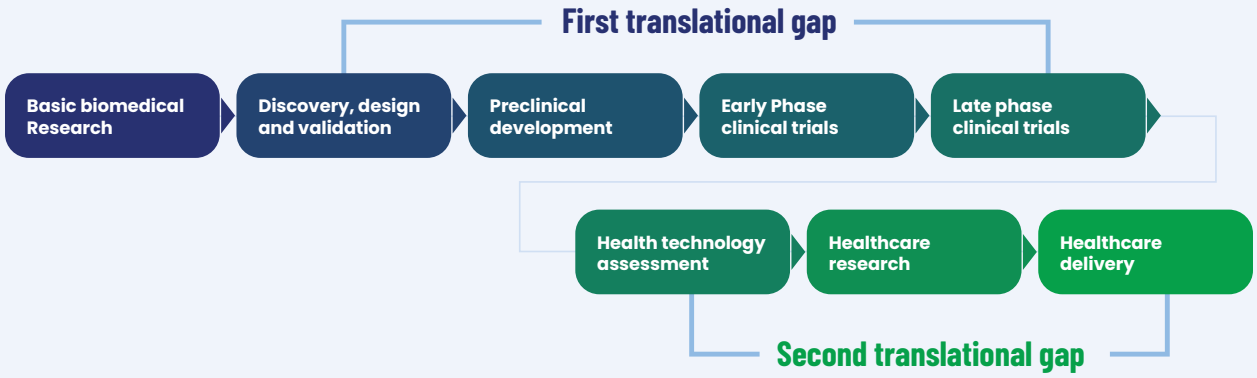
Rhode Island's emergence in life sciences is being catalyzed by a convergence of nationally-ranked academic research institutions conducting cutting-edge work in neuroscience, molecular therapeutics, and regenerative medicine, the ongoing presence of a major pharmaceutical biomanufacturing anchor with Amgen's advanced biologics production facility and a cluster of medtech product development firms, and strategic state investments of $45 million through the Rhode Island Life Sciences Hub and supporting infrastructure initiatives. Simultaneously, the region's healthcare ecosystem is anchored by major integrated delivery networks, an aging population driving clinical demand, and emerging digital health and medtech innovation companies, creating an additional market pull for locally-developed solutions.

While the state's life sciences industry cluster has not yet grown to the same level as other sectors, Rhode Island is positioned to further leverage its research institutions and emerging biosciences translation and digital health ecosystem to catalyze broader life sciences commercialization and build a regionally-differentiated innovation cluster capable of competing within the broader New England biotech landscape while maintaining specialization in neuroscience-driven research, biotherapeutics discovery and development, medtech product development, and digital health solutions aimed at addressing broad population health drivers.

# What is Life Sciences?

Life Sciences encompasses a far-ranging continuum of research, development, and commercialization activities extending from fundamental molecular and cellular research through translational therapeutics, product development, manufacturing, and clinical deployment (Figure 9). Along this continuum, discoveries typically move from basic biology labs into target validation and pre-clinical models, then into early-phase clinical trials, and ultimately into scaled manufacturing and real-world care delivery, with feedback loops at each stage informing subsequent research and product refinement.

**Figure 9.**
Example of Life Sciences Translational Research Spectrum With Highlighted Gaps Preventing Research and Innovation from Translating to Market




**Source:** University of Cambridge

Rhode Island's life sciences trajectory is unfolding within one of the densest biotech corridors in the world, with Boston–Cambridge and other New England hubs already hosting globally scaled pharmaceutical, medtech, and digital health ecosystems. This proximity creates advantages in terms of access to capital, specialized suppliers, and experienced executives, but it also heightens the need for Rhode Island to differentiate rather than imitate much larger, more mature clusters. In practice, this means focusing on translational niches where the state's assets are genuinely distinctive—such as neuroscience driven therapeutics, medtech product development tied to industrial design strengths, and clinically embedded solutions for aging and behavioral health—while positioning Rhode Island as an environment that can complement, rather than directly compete with, neighboring ecosystems.

In Rhode Island, these broad pathways for life sciences translation are increasingly coalescing around three such differentiated application areas where the state already demonstrates some level of critical mass in either its research or industry base (or both): biotherapeutics discovery and development, product development for medtech and other bioinstrumentation, and digital health solutions with a focus on aging populations and neuropsychiatric conditions. Academic strengths at Brown and URI in neuroscience, molecular therapeutics, RNA biology, biomedical engineering, and health services research provide an upstream discovery engine, while existing design firms with life sciences expertise and emerging ventures such as Ocean State Labs, NEMIC's

medtech accelerator, and hospital embedded digital health pilots offer downstream environments where devices and drug candidates can be engineered into manufacturable products, tested in clinical workflows, and refined based on patient outcomes

**Figure 10.**
Emerging Areas of Focus and Critical Mass in Rhode Island's Life Sciences Ecosystem that Span the Technology Commercialization Cycle




**Source:** TEConomy Partners, LLC

As shown in Figure 10, the three emerging life sciences opportunity sub-domains that align with institutional strengths and potential for near-term commercial opportunity in Rhode Island are currently rooted at different points in the typical life sciences commercialization life cycle. These include:

- **Biotherapeutics Discovery and Development,** which focuses on the upstream discovery, optimization, and clinical translation of novel therapeutic compounds and biologics—ranging from small-molecule drugs and RNA-based therapeutics to antibodies, cell therapies, and regenerative medicine approaches—targeting neurodegeneration, cancer, immunological disorders, aging-related conditions, and other disease areas with significant unmet clinical need. This domain integrates fundamental research in molecular biology, genetics, and cell biology with translational research in animal models and clinical research infrastructure to move promising candidates from discovery through regulatory approval into clinical use. The research-to-product pathway typically involves 10-15 year development timelines and substantial capital requirements ($1-2.6 billion from discovery through regulatory approval for novel therapeutic entities [1]), necessitating a specialized ecosystem including academic discovery platforms, contract research organizations (CROs), specialized financing mechanisms, and experienced regulatory

1 Tufts Center for the Study of Drug Development; Mulcahy A, Rennane S, Schwam D, Dickerson R, Baker L, Shetty K. Use of Clinical Trial Characteristics to Estimate Costs of New Drug Development. JAMA Netw Open. 2025

expertise. In Rhode Island, discovery and development is tied to thematic areas of excellence in the university research base, which include applications in:

  - **RNA-based Therapeutics,** which focus on designing and delivering nucleic acid–based drugs (e.g., mRNA, siRNA, circRNA) that modulate gene expression or protein production to treat cancers, infectious diseases, and genetic disorders with high specificity.

  - **Biologics for Regenerative Medicine** develop engineered cells, tissues, and biologic scaffolds (such as collagen matrices and growth-factor–loaded constructs) intended to restore or replace damaged organs, cartilage, bone, and other tissues in orthopedic, cardiovascular, and neurological indications.

  - **Gerosciences** investigates the molecular and cellular mechanisms of aging such as senescence, genomic instability, and altered metabolism to identify interventions that delay, prevent, or reverse age associated diseases and extend healthy lifespan.

  - **Neurotherapeutics** target central and peripheral nervous system disorders by advancing small molecule drugs, antibodies, gene and cell therapies, and neuromodulatory approaches aimed at modifying disease pathways in Alzheimer's, Parkinson's, epilepsy, psychiatric illness, and substance use disorders.

- **Medtech and Bioinstrumentation Product Development** spans the engineering, design, and commercial development of medical devices, diagnostic instruments, monitoring systems, and related hardware that enable better diagnosis, treatment, and disease management. This domain encompasses a wide set of potential treatment modalities such as neuromodulation devices for pain and movement disorders, implantable systems for cardiac and orthopedic applications, biosensors and point-of-care diagnostics, as well as next-generation surgical and imaging tools. The medtech sector requires integration of materials science, electrical and mechanical engineering, biocompatibility expertise, and design acumen, often coupled with regulatory pathways (FDA approval) that are less capital-intensive and faster than pharmaceutical drug development. Medtech products frequently serve as platform technologies, enabling adoption across multiple clinical applications and geographies once regulatory approval and clinical validation are achieved.

- **Digital Health Solutions for Aging and Neuropsychiatric Conditions** represents a fast-growing segment within life sciences, encompassing software platforms, mobile health applications, wearable monitoring systems, and clinical decision-support tools designed to improve diagnosis, prevention, treatment, and management of chronic conditions, particularly dementia, neurodegenerative disease, behavioral health, and age-related functional decline. Digital health technologies bridge clinical data (from electronic health records), continuous monitoring (from wearables and environmental sensors), artificial intelligence algorithms (for risk stratification and decision support), and patient engagement interfaces to create integrated care solutions. This domain integrates software engineering, human-computer interaction design, health services research, clinical informatics, and data science to create products with comparatively rapid deployment timelines (1-3 years) and lower technical regulatory burden than pharmaceuticals or traditional medical devices, while simultaneously addressing substantial market demand driven by healthcare cost pressures and aging demographics.

Taken together, these three domains outline the emerging themes for Rhode Island's near-term life sciences opportunities to drive economic development, as each maps directly onto areas where the state already has deep academic strength, emerging company activity, and differentiated clinical or industrial demand, and where targeted investments can credibly move the needle on translation and firm formation. At the same time, this framing is not exhaustive or permanent; rather, it establishes an initial set of differentiated footholds for the state within a much broader life sciences landscape, with the expectation that opportunities will continue to emerge and must also be incorporated into Rhode Island's innovation identity over time.

## Market Outlook and Growth Dynamics

The life sciences sector is in the midst of a global structural transition as advances in biology, data science, and clinical practice reshape how diseases are understood, detected, and treated. For Rhode Island, this transition is particularly salient: population aging, high prevalence of behavioral health and chronic disease, and the state's emerging startup base mean that global shifts in therapeutics, medtech, and digital health represent determinants of which emerging capabilities can scale into durable industry clusters.

Several key market dynamics have the potential to impact the growth of the state's life sciences ecosystem as they unfold:

- **Disease burden, aging, and behavioral health are pushing health systems toward earlier intervention and continuous management.** Rising rates of dementia, frailty, and multi-morbidity, combined with entrenched substance use and mental health challenges in New England, are forcing payers and providers to prioritize tools that delay disease onset, maintain function, and manage complex patients outside of high-cost acute settings. This dynamic is directly aligned with digital platforms that support aging in place and behavioral health care coordination.

- **Platform technologies in genomics, RNA, and cell engineering are redefining how therapies are discovered and tailored.** Routine sequencing, functional genomics screens, and programmable modalities such as mRNA, siRNA, and engineered cells now allow investigators to move from target identification to mechanism-based interventions with far greater precision, enabling first-in-class treatments for diseases that previously lacked disease-modifying options. Brown and URI's expanding work in RNA biology, regenerative medicine, and molecular therapeutics positions Rhode Island to participate in these modality shifts, particularly at the discovery and early translation stages.

- **Data-rich, software-intensive models are becoming integral to both R&D and care delivery.** Artificial intelligence and machine learning are being embedded across the value chain, from in silico target discovery and adaptive clinical trials to image interpretation, remote monitoring, and population risk stratification. Rhode Island's strengths in neuroscience, health services research, and an integrated hospital network create the potential conditions for developing and validating digital biomarkers, decision-support tools, and algorithm-driven care pathways that can be exported to larger markets.

- **Policy and funding environments are tilting toward translational, team-based science and startup formation.** Federal programs increasingly emphasize translational centers, clinical trial networks, and commercialization-oriented grants, while state-level initiatives such as the Rhode Island Life Sciences Hub and new incubator infrastructure are designed to move projects from labs into regulated products and companies. For a smaller state, this shift rewards tightly coupled academic/clinical/industry collaborations

and makes it feasible to compete in specific niches, even without a large incumbent industry base, if those collaborations are organized around clear therapeutic or technology themes.

- **Capital markets and corporate strategies are favoring focused, de-risked assets and credible regional pipelines.** Large pharmaceutical, medtech, and digital health companies are relying more heavily on external innovation, acquiring or licensing assets once technical and early clinical risk has been reduced, while investors increasingly concentrate on platforms and products with strong mechanistic rationale and measurable clinical endpoints. Some market contraction in recent years has placed even more emphasis on acquiring promising early-stage therapeutics, devices, and digital health platforms to augment internal pipelines and in-license proven technologies. This creates a tension between the need to support maturing high value assets and applied research to the point where they attract strategic partnerships or acquisition, while also ensuring that a meaningful share of associated R&D, manufacturing, and next generation company formation remains anchored in the state.

These headwinds create an imperative for regions to continue to build out supporting clinical and commercialization infrastructure to support upstream research, at the risk of promising assets being commercialized and scaled elsewhere with limited local job creation or tax base impact. Conversely, if the state can systematically tighten academic/clinical/industry linkages, deepen capital pools, and strengthen workforce and lab infrastructure, it has a credible opportunity to capture a larger share of the value created by its own research enterprise and to become a recognized node in the regional and national life sciences network.

## Why is this S&T Opportunity Area for Rhode Island?

Rhode Island has developed a concentration of research capabilities, clinical resources, and emerging commercial infrastructure positioned to support life sciences innovation across multiple domains. The state combines nationally-ranked academic research institutions with deep specialization in neuroscience, molecular therapeutics, and regenerative medicine, anchor healthcare systems providing clinical research infrastructure and patient populations, and strategic state investments in innovation infrastructure and support services. This combination provides a foundation for building a regionally-differentiated life sciences cluster that leverages distinctive research strengths to compete for investment and industry attraction within the broader New England and national biotech ecosystem.

On the industry side, however, Rhode Island remains at an earlier stage of cluster development. Beyond Amgen's advanced biologics manufacturing campus, which represents a significant anchor but primarily focuses on large scale production rather than early-stage discovery and R&D - the state has relatively few mid to large sized biopharmaceutical, medtech, or diagnostics companies, and no equivalent to the dense networks of contract research organizations, specialized suppliers, and serial entrepreneurs found in more mature hubs. Most private sector activity is concentrated either in hospital based research units, a small cohort of medtech and digital health startups, or service firms that support broader healthcare operations rather than core therapeutics development. This means that, while Rhode Island can offer industry partners strong scientific collaborators, clinical testbeds, and a growing emerging company ecosystem, it is still building the critical mass of firms, experienced management teams, and vertically integrated supply chains that characterize a fully formed life sciences cluster.

That said, in the past several years, major investments have begun to generate momentum in building an emerging life sciences cluster. The Rhode Island Life Science Hub (RILSH) has deployed significant state capital

into startup awards, coordinated programming, and the build out of Ocean State Labs—the state's first dedicated life sciences incubator, co located with the new state health laboratory in Providence's I 195 District and providing wet lab and office space for early stage firms. The Providence-located New England Medical Innovation Center (NEMIC) has also continued to mature as a healthtech venture hub, mentoring significant cohorts of medtech and digital health companies and demonstrating that Rhode Island can support device and software ventures from idea through regulatory planning, early clinical validation, and initial capital raises. In parallel, the new state public health lab and advanced molecular diagnostics facilities, together with Brown and Brown Health's life sciences and clinical expansion in Providence's Jewelry District, are increasing both specialized laboratory capacity and the density of scientists, clinicians, and entrepreneurs working in close proximity. While still early, these developments signal growing momentum toward a more vibrant, interconnected life sciences environment that, if sustained, could mature over time into a stable industry cluster.

## Highlights of Rhode Island's Market "Pull"

While still scaling to more mature breadth and depth, Rhode Island's life sciences ecosystem is characterized by several factors that create sustained market pull for therapeutic and digital health innovations:

- **Significant Healthcare System Scale and Clinical Research Infrastructure:** Rhode Island's integrated healthcare delivery networks anchored by Brown University Health and Care New England operate comprehensive clinical research infrastructure including clinical trial capabilities, patient populations spanning primary care, specialty care, and long-term care settings, and increasingly sophisticated electronic health record systems capturing clinical data. These health systems have actively invested in research partnerships with academic institutions and have demonstrated willingness

### An Emerging Center of Gravity for Rhode Island's Life Sciences Innovation Ecosystem

In Providence's I-195 District, a critical mass of life sciences infrastructure is taking shape that is beginning to function as the physical center of gravity for the state's emerging cluster. The new 150 Richmond Street life sciences building brings together the Rhode Island Department of Health State Health Laboratories and Ocean State Labs, the state's first dedicated life science incubator, in a 200,000-plus-square-foot facility that combines public health testing capacity, next-generation genomics sequencing, and flexible private lab space for early-stage companies. Ocean State Labs, which is powered by Portal Innovations with support from the Rhode Island Life Science Hub, the 195 District, and Brown University, has already selected an initial cohort of gene therapy, tissue regeneration, oncology, and surgical technology startups, and will offer them wet-lab suites, shared equipment, and specialized venture-building services in the heart of the district.

A short distance away, Brown University's William A. and Ami Kuan Danoff Life Sciences Laboratories are under construction in the Jewelry District, with 300,000 square feet of wet and dry research space, cores, a vivarium, and a ground-floor clinical trials suite that will house up to 75 principal investigators working across brain science, aging, immunity, cancer, bioengineering, and computational biology. Together, the State Health Lab, Ocean State Labs, Danoff Labs, and adjacent facilities such as the Warren Alpert Medical School and Point225/CIC create a compact urban zone where public health scientists, academic researchers, startup teams, and industry partners can collaborate in a dense innovation ecosystem.

to pilot novel digital health solutions and clinical care models. The co-location of major health systems with Brown University's medical school and affiliated teaching hospitals creates mechanisms for rapid translation of research findings into clinical applications and for embedding researchers within clinical environments.

The Brown Innovation and Research Collaborative for Health (BIRCH) is further evidence of the significant investment and focus was established in 2022 with a bold vision to bring together research administration and other central activities for Brown University's Division of Biology and Medicine, Brown University Health, and Care New England. Its goals are to align the three organizations' biomedical and health sciences activities, providing the resources, support, and strategic planning that allows research growth and innovation. That entails streamlining support, improving the researcher experience, diversifying the research portfolio, attracting patients to participate in research initiatives, and addressing barriers to innovation and commercialization. Through BIRCH, teams are being unified and processes are being standardized with the objectives of improving the biomedical ecosystem and ultimately, supporting the translation of research to improved patient care and improved patient outcomes.

- **Strategic State Investments and Hub Infrastructure:** The Rhode Island Life Sciences Hub, launched, created in 2023 and launched in 2024 with $45 million of initial funding for three years, represents a strategic commitment to catalyzing life sciences sector growth through coordinated support spanning research translation, company attraction and retention, incubator infrastructure, and targeted investments in priority research areas. The Hub's initial funding has been supplemented by additional state investments in life sciences infrastructure, incentive programs, and workforce development initiatives. These investments have funded the establishment of Ocean State Labs, a 30,000 square-foot dedicated life sciences incubator (opened late 2025) located in Providence's Innovation District with co-location of state public health laboratory facilities and Brown University research groups. In order for Ocean State Labs to continue to grow and scale the emerging industry sector, it will be critical to add an anchor industry tenant to the remaining 60,000 sq. ft. available on the upper two floors of 150 Richmond. State policy initiatives have also included business incentive programs, tax credits for qualified life sciences companies, and targeted recruitment programs aimed at attracting established biotech companies and experienced executives to the state.

- **Emerging Venture-Backed Life Sciences Ecosystem:** Rhode Island has seen significant growth in early stage digital health, medtech, and biotech startup activity concentrated within and around Providence's innovation district, and this activity is now reinforced by targeted company funding and attraction led by RILSH. Through successive business development rounds, RILSH and RI Commerce Corporation have invested non dilutive capital into more than a dozen health innovators, including several firms that are relocating or expanding operations into the state such as imaging, neurotechnology, and RNA therapy companies. Alongside this, NEMIC has deployed advisory support and curated programs, including accelerators, to a wide portfolio of medtech and digital health companies, with solutions that include neurostimulation devices, orthopedic and spine technologies, diagnostics, and software-driven clinical tools.

- **History of Medtech Design and Development Firms Anchored in the State:** An existing ecosystem of medtech design and engineering firms in Providence, built on the legacy of Ximedica and its integration into Veranex, provides concept-through- commercialization services that range from human centered industrial design and prototyping to design verification, manufacturing transfer, and post market support. These firms also serve as connections for local innovators to a national network of contract manufacturers and large device companies, creating ready market access and commercialization pathways for Rhode Island based medtech startups.

- **Need for Population Health Solutions Driven by Aging Population and High Disease Burden:** Rhode Island's aging demographic profile creates urgent clinical need and immediate market validation for innovations addressing age-related conditions. The state has particularly high prevalence of Alzheimer's disease and related dementias as well as elevated prevalence of chronic conditions including cardiovascular disease, chronic obstructive pulmonary disease, diabetes, and arthritis relative to national averages, creating patient populations with significant unmet need for improved therapeutics and disease management tools. Public health challenges, such as high prevalence of opioid use disorder, also create urgent need for medication-assisted treatment innovations and novel addiction pharmacotherapies. This disease burden translates directly into market opportunity for therapeutics and digital health tools developed in Rhode Island, where innovations can access proximate, representative patient populations for clinical validation while simultaneously addressing pressing local healthcare challenges.

## NEMIC's Role in Driving the Pipeline of HealthTech and MedTech Innovation

The New England Medical Innovation Center (NEMIC) has become a major source of healthtech and medtech entrepreneurship in Rhode Island, with more than 470 companies mentored and approximately $114.6 million raised by its fellows. Its cohort of companies span device, digital health, and care delivery ventures, and range across diverse medtech themes. Solutions include redesigned procedural tools and implants that improve safety and outcomes in pediatrics and orthopedics; biologic materials and gels for tissue repair and tumor ablation; noninvasive neuromodulation devices for neurological disease; smartphone based training and decision support tools for emergency care; and a growing group of digital platforms with service models that address behavioral health, maternal and women's health, and community based care for underserved populations.

By pairing these teams with seasoned advisors in clinical validation, regulatory affairs, intellectual property, and startup operations, NEMIC is building a diverse pipeline of clinically grounded, scalable ventures that can feed Rhode Island's emerging life sciences cluster.

- **Major Pharmaceutical Biomanufacturing Presence:** Amgen's advanced biologics production facility in West Greenwich brands Rhode Island as a credible location for downstream scale-up of therapeutics as well as other biopharmaceutical manufacturing operations that can leverage specialized talent pipelines provided by URI's pharmaceutical sciences programs. Beyond Amgen, smaller pharmaceutical and generic drug manufacturers maintain operations in Rhode Island, and recent company relocation announcements also indicate the ability to attract mid-size biomanufacturing operations to the state, such as the recent investment by Organogensis to develop operations in Rhode Island.

## Highlights of Rhode Island's Technology "Push"

Rhode Island's research enterprise in life sciences is anchored by distinctive institutional strengths in neuroscience, molecular therapeutics, and biomedical engineering, with supporting research capacity in public health, health informatics, and translational research infrastructure. The state's technology push is characterized by substantial NIH research funding, internationally recognized research leadership in specific disease areas, and emerging mechanisms for translating research discoveries into commercial ventures.

Key areas of research and innovation activity that anchor the state's emerging life science opportunities include, but are not limited to:

- **Rhode Island IDeA Network of Biomedical Research Excellence (RI INBRE):** RI-INBRE is a statewide network dedicated to building the biomedical research capacity of Rhode Island institutions. The RI-INBRE program encompasses all major academic research institutions in Rhode Island, including URI and Brown, as well as the state's primarily undergraduate institutions (PUIs): Salve Regina University, Roger Williams University, Providence College, Rhode Island College, the Community College of Rhode Island (CCRI), Johnson & Wales University, Bryant University, and the New England Institute of Technology (NEIT). INBRE Research spans a broad range of biomedical disciplines, including psychology, biomedical engineering, cancer, microbiology, microplastics, neurodegenerative diseases, cardiovascular health, and biomedical data science. RI-INBRE also has a strong focus on workforce development. Over its 25-year history, the RI-INBRE program has trained more than 2,300 students and postdoctoral fellows, and offers numerous training opportunities for students at all levels, with a strong emphasis on undergraduate education.

- **Nationally-Ranked Neuroscience Research and Brain Science Leadership across Rhode Island's Research Institutions:** Brown University's Carney Institute for Brain Science anchors comprehensive neuroscience research spanning cellular and molecular neuroscience, cognitive neuroscience, systems neuroscience, and clinical translation relevant to neurological and neuropsychiatric disease. The Institute's research portfolio addresses Alzheimer's disease and other neurodegenerative diseases, depression and anxiety disorders, addiction and substance use disorders, and movement disorders, with research approaches ranging from molecular mechanisms of neurodegeneration to neuroimaging biomarkers and clinical trials. Brown's research in cellular aging and senescence, led by internationally-recognized researchers, has generated intellectual property in cellular senescence targeting and aging-related interventions. The Carney Institute operates affiliated research centers, providing clinical research infrastructure for testing novel neurotherapeutics in patient populations and Brown's affiliated teaching hospitals (particularly Butler Hospital for psychiatric research) provide clinical research environments for behavioral health and addiction research. This concentration of neuroscience research leadership creates a distinctive intellectual asset and generates a pipeline of discoveries and trained scientists positioned to inform therapeutic development in neurological and neuropsychiatric disease areas.

  URI's George and Anne Ryan Institute for Neuroscience is dedicated to the prevention and treatment of neurodegenerative diseases, including Alzheimer's disease, amyotrophic lateral sclerosis (ALS), aging-related illness, and other central nervous system disorders. The institute conducts research that aims to solve neurodegenerative disease by exploring the under-studied biological mechanism of disease, investigating lifestyle and environmental modifiers of brain health, and by developing early detection and prevention strategies for neurological disorders. Research in the George and Anne Ryan Institute bridges basic science with translational goals including biomarkers, therapies, and diagnostics, and fosters interdisciplinary collaborations across scientific and clinical domains.

- **Significant Translational Therapeutics and Regenerative Medicine Research Infrastructure:** Brown University's Warren Alpert Medical School and Department of Molecular Biology operate research programs spanning molecular therapeutics (including genomics, immunotherapy, and gene therapy approaches), regenerative medicine and tissue engineering, and bioengineering. Collaborative research at Brown and the University of Rhode Island's College of Pharmacy addresses drug formulation, delivery technologies, and bioengineering approaches to creating therapeutic biologics and cell-based therapies. URI's College of Engineering hosts biomedical engineering research including biomaterials development and regenerative medicine approaches. The research community has generated multiple spinout companies, particularly in regenerative medicine and cell therapy areas, though the historical rate of commercialization of life sciences research has been lower than peer regions.

- **Growing RNA-Based Therapeutics Research and Infrastructure:** Recognizing the global shift toward RNA-based therapeutics (particularly following mRNA vaccine successes), Rhode Island academic institutions have made strategic investments in RNA science research and training. Brown University established a new RNA Center with five new faculty hires specifically focused on characterizing RNA function beyond traditional mRNA (including circRNA, RNA modifications, and non-coding RNA functions). URI has similarly invested in RNA-focused capabilities within its College of Pharmacy with new hires that are leaders in RNA anti-cancer therapies and vaccines. These nascent programs represent forward-looking institutional commitment to an emerging therapeutic modality with significant commercial potential. While the research base in RNA therapeutics is still developing, early-stage investments position Rhode Island to participate in what is projected to be a multi-billion-dollar therapeutic market opportunity.

## RNA Innovation as an Emerging Driver of Rhode Island's Life Sciences Identity

Brown University's Giuliani RNA Center has quickly become a focal point for next-generation RNA science in Rhode Island, with a mission to move from basic discoveries about how RNA molecules function to new ways of diagnosing and treating disease. Launched in 2023 and now supported by both a major private gift and an $11 million federal COBRE award, the center is assembling a critical mass of early-career and senior investigators whose work spans RNA chemistry, RNA epigenetics, non-coding RNAs, neurodegeneration, cancer biology, and computational biology, and it is helping lead global efforts such as the "Human RNome Project" to systematically catalog human RNAs.

Located in state-of-the-art laboratories near the Warren Alpert Medical School and the new Danoff Life Sciences Laboratories, the RNA Center sits physically inside the state's emerging life sciences hub and already collaborates with Brown's centers for Alzheimer's disease, brain science, and aging. Its focus on modalities like RNA editing, RNA-based vaccines, and siRNA therapeutics, together with regular convenings of industry and academic leaders, positions the center as a scientific and convening platform that can seed new therapeutics companies, attract external partners, and anchor Rhode Island's reputation as a place where frontier RNA science is translated into real-world applications.

- **Potential for Significant Medical Device Innovation Driven by Biomedical Engineering Research:** Brown University's engineering programs, including the School of Engineering and Department of Biomedical Engineering, conduct research relevant to medical device innovation including neuromodulation systems, biosensors, and minimally-invasive surgical technologies. Complementing these strengths, URI is actively expanding its biomedical engineering capacity through establishment of a new Biomedical Engineering department that includes bioinstrumentation, biomechanics, and biomedical artificial intelligence, designed to align education and training with emerging workforce needs in medtech, digital health, and data-driven biomedical innovation. Brown's industrial design program (in collaboration with RISD) contributes user-centered design capabilities to medical device development. Additionally, the design expertise in Rhode Island create distinctive capability in translating engineering innovations into manufacturable, user-centric medical devices. This combination of engineering research excellence and design capability is relatively uncommon and creates competitive advantage for Rhode Island medtech ventures in translating early-stage concepts into market-ready products.

- **Research Integration with Health Services and Digital Health:** Brown University operates research programs in health services research, health economics, and health informatics with particular emphasis on aging, long-term care policy, and healthcare quality improvement. URI has a Health Resources and Services Administration Gerontology Program, and Brown's IMPACT Collaboratory, representing a nationwide quality improvement program focused on Alzheimer's and dementia care, coordinates multi-site research and provides infrastructure for testing and scaling care innovations. Brown-affiliated Butler Hospital's Memory & Aging Program (MAP) operates as a nationally-recognized research center focused on Alzheimer's disease detection, treatment, and prevention, generating both clinical research findings and a testbed for digital health and clinical decision-support innovations. These research programs generate substantial research funding and create infrastructure and patient populations for testing digital health interventions in real-world clinical settings.

## Highlights of Talent Pipeline

Rhode Island's educational institutions produce a substantial pipeline of trained scientists, engineers, and health professionals in life sciences disciplines. However, stakeholder engagement and labor market analysis indicate that this talent base faces several constraints and misalignments relative to emerging industry needs:

- **Research and Translational Science Talent:** Brown University and URI generate a substantial annual cohort of PhD students and postdoctoral researchers specializing in molecular life sciences, neuroscience, and biomedical engineering, which is generally high-quality and well-trained in contemporary research methods. However, stakeholders report that historical incentive structures within academia have discouraged commercialization-focused research and that many scientists transitioning from academic postdoctoral positions to industry roles require substantial training in industry regulatory processes, product development cycles, and commercialization strategy. The relatively limited presence of mature, revenue-generating biotech companies with internal R&D operations in Rhode Island has reduced opportunities for scientists to gain industry research experience before founding or joining ventures, creating gaps in practical knowledge of industry-scale operations.

- **Biomedical Engineering and Design Talent:** Brown and URI's biomedical engineering programs produce trained engineers with relevant expertise for medical device development, while RISD's industrial design program contributes specialized design talent relevant to medtech product development. These programs generate a talent pipeline aligned with regional medtech needs, however, the relatively small scale of these programs relative to national peers means that regional supply of talent may be constrained relative to demand from expanding medtech companies.

- **Biomanufacturing and Laboratory Operations Talent:** With growth in Amgen operations and expansion of wet-lab capacity in Providence, demand for skilled laboratory technicians, bioprocess engineers, and quality control specialists has increased substantially. URI's College of Pharmacy and other academic programs have begun offering biopharmaceutical manufacturing curriculum and certificates, and workforce development programs are helping to expand the technician pipeline. However, stakeholders report that current training throughput remains below emerging demand, particularly for GMP-certified technicians and bioprocess specialists. The presence of Amgen has helped define industry-expected competencies and has created some direct recruiting relationships with academic programs, but scaling formal apprenticeships or cohort-based training programs linked to specific employer requirements remains an opportunity for development.

- **Digital Health and Software Talent Supporting Healthcare Applications:** Brown and URI offer strong computer science and data science programs generating trained software engineers and data scientists. However, digital health-specific training combining software engineering with health services knowledge and regulatory awareness is less developed. Companies developing digital therapeutics and clinical decision-support systems report that finding talent with combined software engineering and healthcare domain knowledge requires either recruiting from outside the region or conducting substantial internal training. The emergence of interdisciplinary programs is beginning to address this gap.

- **Life Sciences Industry Executive and Leadership Talent:** A critical gap identified by stakeholders is the relative scarcity of experienced biotech executives, regulatory affairs professionals, and venture-backed company leaders in Rhode Island. Unlike other mature biotech hubs where there is a substantial population of serial entrepreneurs, experienced R&D executives, and regulatory specialists, Rhode Island has limited depth of experienced leadership talent available to lead scaling ventures. This creates challenges for company founders seeking experienced co-founders or board members and for companies seeking to recruit Chief Scientific Officers, Chief Medical Officers, regulatory affairs leaders, and other specialized executive roles. State initiatives and organizations like NEMIC attempt to connect emerging Rhode Island companies with external mentors and advisors to partially offset this gap, but the relative scarcity of local experienced talent remains a structural constraint.

- **Talent Retention and Regional Competition:** Stakeholders indicate that while Rhode Island successfully produces talented scientists and engineers, historical retention rates have been suboptimal, with many PhDs and advanced degree holders leaving the state for career opportunities in Boston, New York, California, or other major biotech hubs. With expansion of the life sciences ecosystem in Rhode Island, retention of local talent is improving but remains a conscious priority. Regional competition from Boston-area institutions and companies, combined with higher cost of living in Massachusetts and Connecticut, creates pull factors that can attract Rhode Island talent to neighboring regions. State initiatives including fellowship programs targeting new graduates and mentorship connecting emerging scientists with local startup opportunities attempt to improve retention, but ongoing competition from larger regional hubs remains a factor.

# Line-of-Sight Market Applications for Rhode Island

Within each of the three principal life sciences domains identified above, Rhode Island is positioned to develop distinct competitive advantages in specific therapeutic and product areas aligned with institutional research strengths, clinical infrastructure, and emerging commercial activity.

Within **Biotherapeutics Discovery and Development,** specific market opportunities include:

- **Neurotherapeutics for Alzheimer's disease, Parkinson's disease, and other neurodegenerative conditions,** aligned with research strengths found at Brown's Carney Institute, URI's George and Anne Ryan Institute, and URI's College of Pharmacy, and driven by high regional disease prevalence, clinical research infrastructure (including Butler Hospital's MAP program), and emerging companies in the space. Market opportunities span small-molecule drugs (targeting disease-modifying pathways), monoclonal antibodies (targeting pathologic protein aggregates), and emerging cell and gene therapy approaches.

- **Psychopharmacology and addiction medicine innovations,** including novel medication-assisted treatments for opioid use disorder and new classes of antidepressants and anxiolytics, building on Brown and URI's substantial research base in behavioral health, addiction research, and psychiatry. The clinical need within Rhode Island creates natural testbed for interventions and validation market.

- **Regenerative medicine and cell therapy platforms,** leveraging Brown and URI research in tissue engineering, stem cell biology, and regenerative medicine. Specific opportunities include therapies for spinal cord injury, cartilage regeneration, and other tissue engineering applications. Several Rhode Island companies are already active in this space, and the research base continues to generate intellectual property.

- **RNA-based therapeutics,** focused on new classes beyond mRNA platforms including siRNA approaches for rare genetic diseases and circRNA-based therapeutics and diagnostics. The nascent but strategically positioned RNA research programs at Brown and URI create opportunity to participate in what is projected to be one of the fastest-growing therapeutic modalities.

- **Cancer immunotherapy and targeted oncology,** building on research in immunotherapy mechanisms and tumor immunology at Brown and URI and on emerging companies developing novel immunotherapies.

Within **Product Development for Medtech and Bioinstrumentation,** specific market opportunities include:

- **Neuromodulation devices for chronic pain, movement disorders, and psychiatric conditions,** leveraging Brown's neuroscience research on mechanisms of brain stimulation and the emerging medtech companies active in this space. Applications span spinal cord stimulation, deep brain stimulation, and peripheral nerve stimulation.

- **Orthopedic and spine implants with integrated drug or biologic components,** addressing the large orthopedic market while leveraging emerging research in regenerative medicine and materials science. Technology opportunities include scaffold materials, drug delivery systems, and biologics integration.

- **Biosensors and point-of-care diagnostics** for disease detection and monitoring, including wearable sensors for continuous monitoring of biomarkers relevant to aging and chronic disease. Applications span cancer biomarkers, cardiovascular risk assessment, and neurological disease monitoring.

- **Medical imaging and visualization technologies,** building on research strengths in image analysis, AI-based image interpretation, and emerging applications in surgical guidance and intraoperative imaging with opportunities in both hardware development and software-based AI analysis tools.

- **Surgical robotics and minimally-invasive surgical guidance tools,** extending from existing Rhode Island strengths in robotics and biomechanical engineering to address the rapidly-growing surgical technology market.

- **Bioinstrumentation and laboratory automation** for genomics, proteomics, and bioanalytic workflows, aligned with emerging startups and upstream research needs. The market for laboratory automation and analytical instrumentation serving life sciences research and biopharmaceutical manufacturing is a multi-billion-dollar sector with ongoing growth.

Within **Digital Health Solutions for Aging and Neuropsychiatric Conditions,** specific market opportunities include:

- **Early detection algorithms and digital biomarker platforms for Alzheimer's disease and other neurodegenerative diseases,** building on Brown's research in cognitive assessment, brain imaging, and biomarkers and URI's expertise in Alzheimer's disease detection with retinal imaging. Technology approaches include AI-based analysis of digital cognitive tests, brain imaging biomarkers, and integrated risk prediction models. Early detection represents a critical bottleneck in neurodegenerative disease care given that disease-modifying treatments are now emerging but depend on identifying patients in early disease stages.

- **Caregiver support and care coordination platforms** for dementia and neuropsychiatric conditions, building on URI's expertise in gerontology, addressing the substantial burden on family caregivers and integrating coordination between clinical care teams, community resources, and informal caregivers. Opportunities include both software platforms and integrated care service models.

- **Behavioral health digital interventions and digital therapeutics** for depression, anxiety, substance use disorders, and other conditions, leveraging research in behavioral health and mental health services. Applications include guided digital therapeutics, teletherapy platforms, and mood/symptom tracking tools.

- **Wearable and continuous monitoring systems** for aging populations and chronic disease management, integrating physiologic sensors (heart rate, blood pressure, activity level, sleep) with machine learning algorithms and clinical decision-support supporting applications such as span fall prediction, medication adherence monitoring, and early warning for acute complications.

- **Population health analytics and risk stratification platforms** that integrate electronic health record data, claims data, and genomic data to identify high-risk populations and direct targeted interventions. These platforms serve integrated health systems and are increasingly demanded as mechanisms for managing population health.

- **Precision medicine platforms** including genotype-to-phenotype mapping, treatment response prediction, and personalized dosing algorithms, relevant across oncology, psychiatry, and other therapeutic domains.

- **Telehealth and remote monitoring platforms** specialized for geriatric or neuropsychiatric care, including virtual cognitive assessment, remote psychiatric consultation, and integrated remote monitoring with in-person specialist consultation.



## Global Life Science Markets: Ongoing growth provides opportunities for Rhode Island to continue scaling its opportunities, including specific applications such as:

- Estimated global market for RNA sequencing and characterization applications of $4.3 billion in 2024 with CAGR of 19 percent through 2029, with projected market for RNA analysis and transcriptomics technologies of $13 billion in 2026.
- Estimated global market for disease-modifying therapies for Alzheimer's disease of $236 million in 2024 with CAGR of 68 percent through 2030.
- Estimated global market for advanced orthopedic technologies and regenerative products (with focus on biologic and tissue repair solutions) of $66 billion in 2023 with CAGR of 4.1 percent through 2028.
- Estimated global market for neurotech devices (neurostimulation, neuroprostheses, neurosurgery, and neurorehabilitation applications) of $13.6 billion in 2023 with CAGR of 14.4 percent through 2027.
- Broader global market for emerging medical devices requiring early-stage product development and scale up estimated at $133 billion in 2023 with a CAGR of 10.4 percent through 2029.
- Estimated global market for patient monitoring and digital health devices of $34 billion in 2024 with CAGR of 8.7 percent through 2030.
- Significant market for development of healthcare IT solutions of $410 billion in 2024, scaling to $2.3 trillion by end of 2030.

Source: BCC Market Research

# What is Still Needed to Realize/Maximize the Opportunity

While Rhode Island has developed substantial research assets and is making strategic investments in life sciences infrastructure and support services, substantial structural gaps remain that constrain the rate at which research-stage innovations are commercialized and translated into lasting regional company growth. To build a sustainable, differentiated life sciences cluster capable of competing regionally while capturing outsized returns on state research and infrastructure investments, strategic interventions are required across the following dimensions:

- **Academic-to-Industry Translation and Commercialization Mechanisms:** Despite substantial NIH research funding and emerging institutional commercialization efforts, Rhode Island's academic institutions have historically underperformed relative to peer research universities in translating discoveries into spinout companies and maintained lower licensing activity and option revenue relative to comparable institutions. Stakeholder interviews and analysis of prior ecosystem assessments highlight that systemic barriers include limited incentive alignment (faculty incentives around publishing and grant funding rather than commercialization), incomplete translation infrastructure (limited pre-clinical development resources for de-risking discoveries before company formation), and relatively thin venture capital and angel investor community specifically focused on early-stage life sciences opportunities. Several peer institutions have addressed these barriers through institutional structures including dedicated technology transfer offices with substantive venture capital and business development expertise, pre-clinical development funding mechanisms that support interim R&D between discovery and company formation, equity-based incentive structures for faculty, and formal entrepreneur-in-residence or visiting practitioner programs that bring successful biotech executives into academic settings. Rhode Island institutions have begun implementing some of these mechanisms, but scaling and sustained resourcing remain important priorities.

- **Venture Capital and Growth-Stage Financing Gaps:** Stakeholder interviews and capital flow analysis consistently identify a critical financing gap for Rhode Island life sciences companies, particularly at the seed/Series A stage and for capital-intensive hardware and manufacturing ventures. While traditional venture capital can successfully fund software and digital health companies with modest capital requirements and rapid path to revenue, early-stage therapeutic development and medtech companies require longer time horizons before achieving profitability or exit, creating challenges for venture investors. Rhode Island venture capital firms and out-of-state investors have demonstrated interest in specific opportunities, but the capital available for fundamental biotech R&D and therapeutic development remains more constrained. While the Life Sciences Hub has deployed some growth-stage capital, opportunities exist to expand dedicated early-stage mechanisms, enhance SBIR/STTR matching programs, and coordinate state capital deployment to de-risk emerging companies at critical transition points.

- **Clinical Research Infrastructure and De-Risking Mechanisms for Digital Health and Clinical Innovations:** While Rhode Island's health systems have research infrastructure and willingness to partner with academic researchers, opportunities exist to more systematically leverage clinical infrastructure for accelerating validation of emerging digital health and clinical innovations. Peer regions with mature biotech ecosystems often have established mechanisms for rapid clinical trial enrollment, pragmatic trial design, and real-world evidence generation that support venture-backed companies in validating products in real patient populations. Rhode Island's integrated health systems create potential for such infrastructure, but formalized pathways for startup companies to access clinical data, enroll patients in trials, and conduct real-world validation studies remain underdeveloped.

- **Workforce Development and Talent Retention:** While Rhode Island generates talented researchers and biomedical engineers, labor market signals indicate both talent retention and skills development gaps. Biopharmaceutical manufacturing has expanded demand for GMP-certified technicians and bioprocess engineers, but training throughput remains below regional demand. Digital health and software development also face talent constraints as companies seek individuals with combined software engineering and healthcare domain knowledge. Leadership and executive talent with prior experience scaling biotech ventures remains limited. Addressing these gaps requires coordinated action across education, retention incentives, and selective recruitment of experienced talent from outside the region to lead scaling ventures and provide mentorship to emerging entrepreneurs.

- **Translational Infrastructure and Shared Research Resources:** While Ocean State Labs and other incubators provide early-stage wet lab space, bottlenecks remain in access to specialized equipment, animal research facilities, and contracted services required for biopharmaceutical development. Academic institutions maintain core facilities providing access to shared equipment, but pricing and availability constraints can be prohibitive for early-stage companies. Additionally, bottlenecks in access to contract manufacturing organizations (CMOs) and contract research organizations (CROs) for specialized services (analytical chemistry, preclinical toxicology, regulatory consulting) can slow company development timelines and lead to relocation of companies to other ecosystems providing these services.

- **Ecosystem Coordination and Cross-Sector Integration:** While Rhode Island has developed multiple initiatives supporting life sciences innovation (RILSH, NEMIC, RI Bio, university technology transfer offices), stakeholder feedback indicates that coordination and integration among these actors remains incomplete. Companies report that navigating available resources and identifying appropriate partners requires substantial effort, and alignment among academic institutions, support organizations, and investors on strategic priorities and resource deployment is imperfect. More mature biotech ecosystems have developed formal coordination mechanisms including shared strategic planning, integrated resource directories and navigation services, and deliberate cross-organization mentorship and knowledge-sharing.

# RESILIENCE AND RISK MANAGEMENT TECHNOLOGIES:

## AN OPPORTUNITY TO GROW A NEW S&T AREA

**Rhode Island has the opportunity to grow a new science and technology-led cluster rooted in the development and deployment of advanced technologies designed to predict, prevent, withstand, and recover from disruptive events ranging from industrial accidents to natural disasters and climate-driven hazards.**

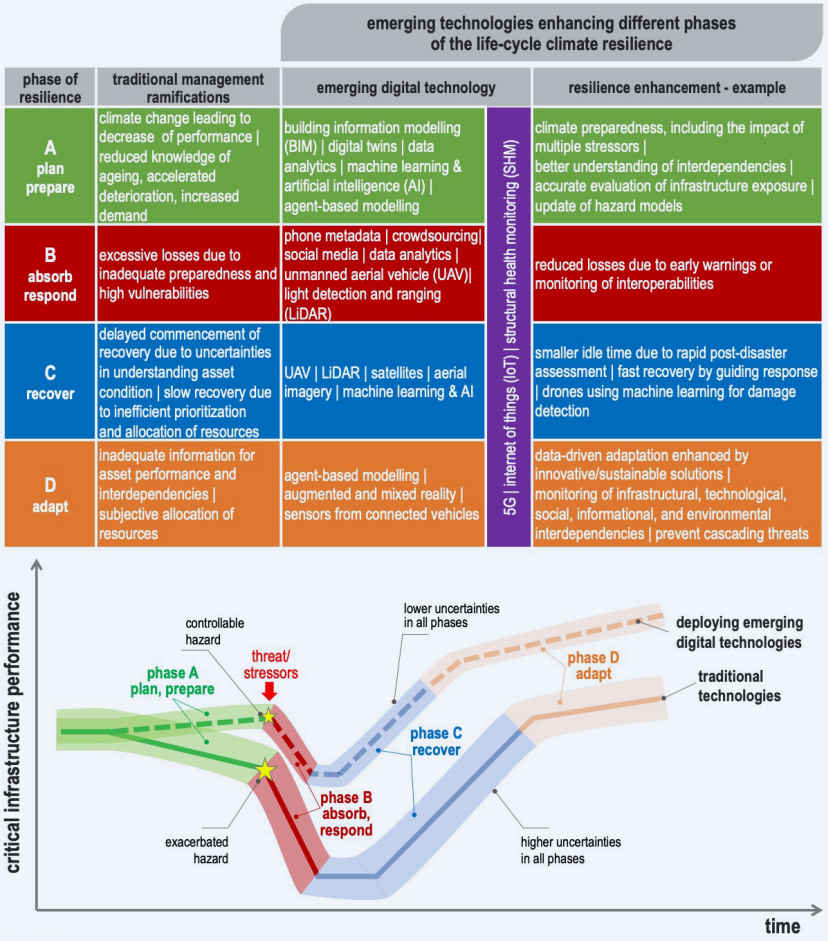
Spanning a portfolio of technologies, this space integrates diverse fields including civil and ocean engineering, sensor networks, data analytics, and materials science to create solutions that safeguard critical infrastructure, commercial assets, and communities. The strategic importance of this sector is underscored by the escalating frequency of extreme weather events and interrelated tightening of operational risk standards driven by global insurance markets, creating a surge in demand for "climate adaptation" and "loss prevention" technologies.

By making investments in the necessary innovation infrastructure, Rhode Island is uniquely positioned to capture this growth by leveraging its concentration of insurance-driven R&D alongside a deep academic base specializing in coastal dynamics and environmental modeling. This convergence of industrial loss prevention expertise and coastal resilience science creates a rare ecosystem capable of addressing a more comprehensive spectrum of risk management, and, similarly to the state's legacy in maritime and naval technologies, providing an integrated early stage research and real-world prototyping and testbed environment.

# What is Resilience and Risk Management Technologies?

Resilience and Risk Management Technologies are driven by a wide range of engineering and data-centric applications that are integrated to mitigate physical and financial loss. While related, this space is distinct from "cleantech" or environmental science sectors in that it focuses specifically on the protection and continuity of critical assets and systems. At its core, it harnesses interdisciplinary development and engineering, simulation modeling, and detailed data collection and analysis processes to drive new potential solutions, which must then be validated in real-world hazard environments.

**Figure 11.**
Example of Integration of Emerging Digital Technologies into Climate Resilience Applications Demonstrating Interdisciplinary S&T Drivers of Impactful Resilience Technologies




**Source:** Sotirios A. Argyroudis et al, Digital technologies can enhance climate resilience of critical infrastructure, Climate Risk Management, Volume 35, 2022.

Across a complex interplay of scientific and market drivers, three primary domains emerge as key pillars for solutions in this space. Each of these leverage capabilities and benefits from the integration of research and innovation from the others:

- **Environmental and Coastal Resilience:** a rapidly expanding technological domain that involves the modeling, design, and construction of systems to manage natural hazards, particularly flooding, storm surge, and coastal erosion. This market segment encompasses predictive hydrodynamic modeling software, resilient building materials, and engineered coastal defense structures to develop solutions. Applications also rely heavily on environmental data science and civil engineering to predict how infrastructure will perform under extreme climate stress. Research efforts in this area often focus on modeling storm surge impacts, designing erosion-resistant shorelines, and developing materials that withstand saltwater corrosion, with applied R&D directly feeding into both civil engineering markets but also the maritime and ocean economy where offshore platform developers and port operators require technologies to ensure their assets survive hostile marine environments. The transition from pure academic research to commercial application is visible in the growing demand for private-sector flood risk assessment tools and resilient infrastructure design services.

- **Industrial and Commercial Loss Prevention:** a longstanding market for resilience technologies focuses on the precision engineering of systems that suppress fires or other catastrophic events, detect hazards using new types of sensing, and prevent industrial accidents. This sector involves the integration of advanced hydraulics, sensor-activated suppression systems, and chemical engineering for fire resistant materials amongst many different system types, with solutions often custom-engineered to specific environments or customer needs. The engineering complexity is significant - modern industrial facilities require automated systems capable of detecting and suppressing specific hazards (e.g., chemical fires, electrical faults) within seconds to prevent catastrophic loss. Unlike general manufacturing, this domain is heavily regulated and driven by certification standards (such as third party certification and approvals), creating high barriers to entry that favor regions with established technical expertise. A significant technological transition is underway in solutions provided by industrial IoT vendors and insurance industries toward "smart" products that integrate IoT sensors, edge computing, and cloud-based analytics to drive predictive rather than reactive insights. These systems are anticipated to shift industrial loss prevention from discrete event suppression to continuous operational intelligence, and replacement or updating of aging legacy hardware to new systems is a significant driver of cost-effective, innovative solutions.

- **Risk Analytics, Assessment, and "Digital Twin" Models:** a third critical domain focuses on the digital quantification of risk. This involves the development of catastrophe modeling software, risk assessment platforms, and digital twins that allow insurers and asset owners to simulate potential losses. Modern business models are predicated on data-driven and engineering-based risk mitigation, driving demand for sophisticated algorithms that can predict fire spread, structural failure, or flood damage based on built environment or individual facility characteristics. This domain leverages high-performance computing and AI to process vast datasets ranging from satellite imagery to sensor readings to assign precise risk profiles and enable dynamic pricing of premiums and other coverage types. Innovations in this space are moving toward real-time "situational awareness" platforms that alert facility managers to emerging threats (e.g., freezing pipes or rising water levels) before damage occurs, driving cost savings across a range of variables.

Critically, effective applied R&D in this space often requires unique environmental characteristics (such as mixed coastal/urban environments), capital-intensive testing and demonstration facilities, and the ability to deploy potential solutions in "living labs" to demonstrate efficacy and gather certification data. Few regions can offer the combination of these elements in proximity while also hosting aligned research centers and labs with a critical mass of thought leaders in specialized resilience and risk assessment fields. As a result, Rhode Island is well-positioned across its current set of research and industry anchors to play a leading role in developing a unique value proposition for translating innovation to market.

## Market Outlook and Growth Dynamics

The global market for resilience and risk management systems is undergoing a profound structural expansion driven by the convergence of accelerating climate volatility, rapid digital transformation, and intensifying corporate and government pressures to quantify and mitigate physical risks. This shift represents a fundamental transition from static, compliance-based safety investments where facilities install equipment to meet minimum standards to dynamic, data-driven resilience strategies that continuously monitor conditions, predict emerging threats, and deploy protective measures in real time.

The expansion of resilience technology markets is driven by multiple reinforcing dynamics. Fire protection systems represent a mature market undergoing substantial modernization, with developed economies experiencing a significant retrofit cycle as aging infrastructure must be upgraded with smart, networked safety systems capable of integration with broader facility management and security networks. Simultaneously, climate adaptation technologies—encompassing flood defenses, predictive modeling systems, and resilient infrastructure design—represent a rapidly emerging market where demand is outpacing the supply of qualified technologies and service providers. The combined investment opportunity across both industrial loss prevention and climate resilience is substantial, reflecting the scale of infrastructure at risk and the capital intensity of protective investments.

Several specific and reinforcing trends are shaping market dynamics in this space:

- **Insurance-Mandated Technology Adoption:** Global commercial property insurers have fundamentally shifted their underwriting approach, increasingly requiring policyholders to install and maintain verified loss prevention technologies to qualify for coverage at standard rates. This shift effectively creates a guaranteed market for certified resilience hardware and software, as coverage denial or premium penalties create powerful financial incentives for adoption. Insurers themselves are investing heavily in validation infrastructure to certify technologies that reduce loss frequency, creating formal pathways for new solutions to achieve market acceptance.

- **Regulatory "Hardening" of Infrastructure:** Government authorities worldwide are revising building codes, land-use regulations, and infrastructure standards to account for climate-adjusted hazard projections, including elevated flood plains, increased wind design loads, and extended wildfire zones. This regulatory shift creates sustained, multi-decade demand for advanced materials (such as impact-resistant composites and flood-proof coatings), certified engineering design services, and retrofitting of noncompliant existing stock.



- **Corporate Disclosure and ESG Pressures:** New regulatory requirements, including SEC climate disclosure rules and international standards such as the TCFD (Task Force on Climate-Related Financial Disclosures), mandate that public companies quantify and disclose their exposure to physical climate risks. This requirement has compelled corporations across sectors to invest in risk quantification and modeling tools to assess vulnerability of their facilities, supply chains, and operations to climate hazards.

- **Escalating Climate and Disaster Risks to Critical Infrastructure:** The increasing frequency and intensity of extreme weather events, combined with the geographic concentration of critical infrastructure (power generation, telecommunications, water systems, transportation networks, financial services), has elevated infrastructure resilience from a peripheral concern to a central priority for government and industry. Utilities, telecommunications providers, and energy companies are investing in hardening of substations, deployment of microgrids and distributed backup power, and predictive monitoring systems to reduce service interruptions. Government agencies responsible for emergency management and critical infrastructure protection are similarly investing in early warning systems, surge protection, and rapid recovery capabilities.

- **Convergence of Cyber and Physical Risk:** As facility safety, fire suppression, flood barriers, and power systems become increasingly networked and software-controlled, the boundary between physical security and cybersecurity has effectively dissolved. A compromised building management system could disable fire suppression or divert flood barrier deployment; a cyber-attack on a power grid could cascade into loss of cooling in data centers, chemical facilities, or hospitals. This convergence drives demand for "cyber-physical" resilience solutions that ensure critical protective systems cannot be rendered inoperative.

# Why is this S&T Opportunity Area for Rhode Island?

Rhode Island's coastal geography and long-standing concentration of ocean, climate, and hazard modeling research create an unusually deep resilience R&D base relative to the state's size. URI's ocean engineering and coastal institutes together with Brown's environmental science and data analytics strengths collectively provide advanced capabilities in storm surge modeling, shoreline dynamics, and infrastructure performance under extreme conditions, supported by specialized observing systems and testbeds in Narragansett Bay and adjacent offshore waters. Alongside this context, global industrial research leaders such as FM (formerly FM Global), which are anchored in the state have the ability to function as high-impact testing and validation partners for new resilience technologies, using their large-scale loss-prevention laboratories and global client base to translate both existing applied research and new solutions signaled by corporate markets into deployable products, standards, and engineering practices for broader markets.

## Potential to Grow Rhode Island's Market "Pull"

Rhode Island's market pull for resilience and risk management technologies has the potential to serve customers that span insurers, industrial firms, coastal infrastructure owners, and municipal governments that increasingly require integrated, certified solutions rather than isolated products. This multifaceted demand can, over time, create the basis for a more formal industry cluster of science and technology-driven companies that can design, certify, and deploy technologies across industrial loss prevention, coastal resilience, and data-driven risk analytics, in turn drawing on the state's research assets and validation infrastructure to differentiate their offerings.

Today, the state has a collection of research and innovation assets applicable to this area, but more limited corporate presence outside of a signature industry anchor. As a result, the generation of market "pull" requires more forward-looking actions and must leverage existing anchors to grow and attract technology-led companies in conjunction with several major market dynamics that include:

- **Potential to Access Customer Base to Seed a New Industrial and Commercial Resilience Technologies Cluster:** The presence of FM exerts a powerful international market pull, as the company has a direct business interest in validating and deploying new loss prevention technologies and setting engineering-based standards for industrial and commercial facilities across its client base. Technologies that pass rigorous testing often become industry benchmarks, creating a pathway for local innovators to access a global customer base of industrial clients seeking lower premiums and safer facilities. This in turn underpins the opportunity to build out a cluster of local companies focused on technology development, component manufacturing, and certification services for industrial and commercial loss prevention applications, ranging from advanced fire suppression hardware to smart monitoring and control systems.

- **Escalating Climate and Disaster Risks and Demand for Integrated Coastal Solutions and Planning Services:** As the "Ocean State" Rhode Island faces immediate threats from sea-level rise, storm surge, and extreme precipitation, driving local demand from municipalities, port authorities, and state agencies for coastal resilience solutions. These risks also make Rhode Island an attractive first mover market for integrated solutions for coastal properties and installations, including site-specific risk assessment, resilient facility design and construction, and ongoing asset management. Ongoing climate risks also generate demand for municipal and regional resilience planning services and implementation support, as communities require specialized partners to translate climate scenarios into capital projects, zoning changes, and operational plans.



- **Growth of Maritime, Offshore, and Other Critical Infrastructure:** The ongoing buildout of offshore platforms and associated energy and port infrastructure off the New England coast creates a new category of resilience needs, which have the potential to position the state as a regional hub for innovation in this space. These critical assets require robust remote monitoring systems, corrosion-resistant materials, and autonomous inspection tools to survive in harsh marine environments, as well as project-level risk assessments and certifications that satisfy both regulators and insurers. Rhode Island's early mover status in offshore energy and its research strengths in ocean engineering positions it to define and export integrated packages that combine engineering design, monitoring technologies, and compliance services tailored to offshore and coastal energy installations.

- **Industrial Continuity Demand and Resilience Support Services and Monitoring:** Local manufacturers and defense contractors have extremely limited tolerance for unplanned downtime, creating a steady internal state market for advanced risk mitigation, environmental monitoring, and business continuity systems. There is the potential for the integration of specialized support-service providers that plug into insurance-driven R&D and risk engineering workflows, including firms supplying sensors, data acquisition systems, and environmental monitoring for hazard assessment, as well as analytics and consulting services that help facilities meet insurer or federal operational requirements. Together, these service and technology providers can form an interconnected ecosystem that supports continuous improvement in risk assessment loss prevention across the industrial base and anchors scaling companies in the state as they expand to broader national and international markets.



## FM's Research Campus: A World-Class Asset for Resilience Innovation

FM's Research Campus in West Glocester, Rhode Island, is described by the company as the largest and most advanced property loss prevention research facility in the world, spanning 1,600 acres and representing the single largest investment the company has made in R&D infrastructure. Opened in 2003 with an initial investment of $78 million and expanded multiple times since—including a $16 million Electrical Hazards and Gas Detection Laboratory opened in 2019—the campus houses four specialized laboratories conducting full-scale, real-world testing. The centerpiece Fire Technology Laboratory covers 108,000 square feet and includes a 33,600-square-foot large-burn test area—the largest fire testing facility of its kind globally—with movable ceilings adjustable from 15 to 60 feet and a 20-megawatt fire products collector capable of evaluating fire behavior in warehouse-scale environments. Complementing this are the 72,000-square-foot Natural Hazards Laboratory, which can simulate hurricane-force winds up to 175 mph (Category 5), earthquake vibrations on a full-scale shake table, hailstorms, and UV radiation exposure, and the Hydraulics Laboratory, which replicates industrial fire protection systems to validate sprinklers, couplings, valves, and other components under operational conditions.

Similarly, the Electrical Hazards and Gas Detection Laboratory tests industrial-grade equipment for use in explosive and hazardous atmospheres, certifying products as explosionproof and flameproof under extreme conditions, capabilities that no other facility has combined at this scale. This concentration of full-scale testing infrastructure enables FM and its certification arm, FM Approvals, to conduct multiple large-scale experiments daily, generating empirical data on structural failure, fire spread, suppression effectiveness, wind damage, and equipment performance that directly inform both FM's proprietary engineering standards and broader industry codes. The campus also maintains a Cooperative Research and Development Agreement with Sandia National Laboratory for advanced fire diagnostics and modeling, further extending its technical reach. For Rhode Island, this asset represents a globally unique anchor for resilience and risk management innovation, serving as a proving ground where new materials, sensors, modeling tools, and suppression technologies can undergo the rigorous, full-scale validation required to set industry standards and access international markets.

## Potential to Grow Rhode Island's Technology "Push"

Rhode Island's technology push in resilience and risk management is anchored in an unusually rich combination of university research strengths, industrial test facilities, environmental geography, and niche manufacturing capabilities that collectively span the full pipeline from hazard science to certified products. Existing assets already generate solutions that address clearly articulated market needs ranging from fire suppression and wind resistant structures to grid resilience and advanced hazard modeling but are not coordinated at meaningful scale. There is an opportunity to more deliberately link university researchers, FM's large scale testing campus, specialized manufacturers, and emerging companies so that innovations in modeling, materials, and systems design can be iteratively validated, certified, and transitioned into commercial loss prevention platforms for global markets.

Several key themes of Rhode Island's research and innovation enterprise to build on include, but are not limited to:

- **University-Driven Innovation in Hazard Modeling and Coastal Resilience:** Researchers at URI and Brown already maintain strong capabilities in environmental hazard modeling, storm and wind loading on structures, and climate-informed risk assessment. These capabilities can be more systematically oriented toward applications such as flood protection and coastal resilience technologies for commercial, industrial, and municipal infrastructure, as well as storm- and wind-resistant building systems and energy-grid protection solutions.

- **Existing Nodes of Applied Research for Energy Grid and Critical Infrastructure Protection:** Existing pockets of excellence at Rhode Island universities in power systems, coastal engineering, and cyber-physical systems provide a foundation for advanced risk assessment and protection applications focused on the energy grid and other critical infrastructure. Coordinated projects that couple this research with full-scale testing and with industrial partners could yield new standards and technologies for grid hardening, substation protection, and resilient facility design.

- **Ability to Leverage World-Class Industrial Research Infrastructure:** FM's research campus, including its large-scale fire technology and electrical hazards laboratories, provides a unique environment for developing and certifying new solutions in industrial and commercial property protection. By leveraging this asset as a key R&D partner, Rhode Island can accelerate innovation in broader loss-prevention platforms, including sustainable replacement and retrofit of legacy systems that must meet stringent performance and reliability standards.

- **Providence–Narragansett Bay as a "Living Lab" for Integrated Modeling and Product Development:** Environmental hazard modeling and risk assessment capabilities at URI and Brown, combined with Providence's coastal urban setting and nearby working waterfronts, create a real-world testbed where flood, storm, and infrastructure models can be validated against observed events and pilot deployments. The potential for a research-driven "living lab" environment is attractive to industry research partners to co-develop and field-test software tools, decision-support platforms, and engineered resilience solutions in operational settings—generating performance data, refined analytics, and demonstrable case studies that de-risk commercialization. There are also potential complements to new AI initiatives at the state level that can harness real-time coastal and infrastructure data streams to train, validate, and continuously improve risk models, which have the ability to translate to market.

# Line-of-Sight Market Applications for Rhode Island

If the state can better link its existing research base to key anchor industry partners, Rhode Island has several distinct opportunities to develop resilience applications and into new tech-based economic development drivers, including:

- **Development of New Fire Suppression and Other Industrial and Commercial Property Protection Platforms:** Rhode Island's existing cluster of fire protection manufacturers and FM's large scale testing campus provide direct ability to commercialize new technologies to markets such as warehouses, data centers, and high hazard industrial facilities that require next generation sprinklers, valves, and smart suppression systems validated against rigorous performance standards.

- **Innovation in Flood Protection/Mitigation and Coastal Resilience Technologies For Commercial, Industrial, And Municipal Infrastructure:** URI and Brown's coastal hazard modeling, combined with local experience protecting ports and coastal communities, can be translated into engineered flood barriers, deployable gates, and site specific design services that are piloted in Rhode Island and then marketed to other vulnerable coastal cities and industrial waterfronts.

- **Storm and Wind Resistant Building Systems:** Research on wind loading, materials, and structural performance (including research linked to offshore wind and coastal engineering work) creates opportunities for Rhode Island firms to supply storm rated facades, roof systems, and fastening technologies for buildings, logistics hubs, and energy infrastructure that must meet tightened wind and hurricane codes across the Atlantic and Gulf coasts. Similarly, the state's manufacturing base can leverage boatbuilding material science expertise to produce specialized, corrosion-resistant composite materials for use in seawalls, flood gates, and offshore wind foundations.

- **Sustainable Replacement/Refit of Legacy Loss Prevention Systems:** The state's expertise in both traditional fire protection hardware and smart sensing can support retrofit offerings that upgrade aging sprinkler, alarm, and monitoring systems in existing commercial and industrial buildings, helping owners meet new insurance and code requirements while reducing water use, corrosion, and maintenance costs.

- **Energy Grid and Critical Infrastructure Risk Assessment and Protection/Resilience Applications:** Emerging partnerships around smart grid deployment and coastal hazard modeling position Rhode Island to develop assessment tools, design standards, and protective technologies such as substation flood hardening packages, microgrid concepts, and monitoring solutions that can be demonstrated locally with utilities and ports and then exported to other regions facing similar grid and critical infrastructure resilience challenges.

- **Coastal Hazard Prediction Platforms and Industrial Risk Analytics Services:** Either in complement to hardware systems or as standalone products, there are opportunities for commercialization of academic storm surge models into SaaS products for municipal planners, real estate developers, and port operators to assess property-level flood risk. Similarly, emerging focus on AI applications can feed into this area for development of "Risk-as-a-Service" platforms that aggregate sensor data from various modalities to provide real-time predictive risk assessments to insurers and other liability industries.

- **Autonomous Infrastructure Inspection:** Deployment of aerial and underwater drones to inspect bridges, dams, and wind turbines for structural damage after storm events, speeding up recovery times



**Global Resilience and Risk Management Technology Markets:** There are major opportunities to serve existing commercial and industrial client-facing markets in resilience applications today while also developing technologies for future markets, including:

- Estimated global market for fire suppression equipment and consumables across several segments, including commercial markets valued at $9.4 billion in 2023 with CAGR of 4.3 percent through 2028, data center and tech facility markets valued at $3.1 billion in 2023 with CAGR of 7.1 percent through 2028, manufacturing markets valued at $1.9 billion in 2023 with CAGR of 6 percent through 2028, and other industrial markets (e.g. energy) valued at $1.1 billion in 2023 with CAGR of 4 percent through 2028.
    - Additional industrial loss prevention markets in flood risk and other natural disaster mitigation also projected as multibillion dollar opportunities.
- Estimated global market for IoT sensors, in particular embedded IoT sensing for intelligent monitoring and predictive analytics, for smart cities and environment of $3.7 billion in 2024 with CAGR of 30.6 percent through 2026.
- Estimated global market for environmental sensing and monitoring technologies for weather and climate forecasting of $10.8 billion in 2024 with CAGR of 6.2 percent through 2029, estimated market for smart cities and smart buildings applications market of $747 million in 2024 with CAGR of 7.2 percent through 2029.
- Estimated global market for climate-resilient design and planning technologies for cities of $125 billion in 2025.

Source: BCC Market Research

## What is Still Needed to Realize/Maximize the Opportunity

Rhode Island already has many of the ingredients required for a nationally significant resilience and risk management technology cluster, but those ingredients are not yet organized into a coherent innovation pipeline. FM, URI, Brown, and a niche base of industrial firms collectively generate world class research, real world test data, and specialized hardware, yet the mechanisms that routinely translate this capacity into new companies, scalable products, and supplier recruitment remain thin relative to more mature clusters such as maritime and naval systems. As a result, opportunities for translation and company formation too often remain confined to academic projects or proprietary internal programs rather than becoming the basis for investable ventures and exportable solutions.

Closing this gap will require intentional investment and institutional architecture that links fundamental research, large scale testing, demonstration projects, and commercialization support. Key priorities include creating more structured on ramps into FM's unique research infrastructure and client base, establishing a visible statewide focal point for climate resilience and loss prevention research, and deploying state-backed instruments that can absorb early technical and market risk. Together, these efforts would transform Rhode Island's current collection of assets into a more integrated "living lab" and launchpad for resilience technologies that have a validated market need and readily available customer base.

Specific areas where investment and programmatic intervention is required to further develop this opportunity include:

- **Buildout of ecosystem around R&D and testing infrastructure:** FM's research campus represents a globally differentiated asset, but current linkages to the broader innovation community are ad hoc and selective. A deliberate ecosystem strategy could formalize pathways for Rhode Island universities, startups, and established firms to access appropriate parts of this facility for pre competitive testing, code validation, and joint method development. Similarly, buildout of capacity around ocean engineering and other resilience-related labs is needed at URI as well as integrated deployment and piloting sites within the Providence region itself to provide the demonstration and validation infrastructure needed to advance technologies in this area.

- **Signature research collaboration with RI universities:** At present, resilience relevant research is dispersed across Brown's climate and environmental programs, URI's coastal engineering, marine affairs, and oceanography groups, and other units working on materials, sensing, and data science. A formal joint institute or center of excellence focused on this opportunity would align these efforts around a common applied mission and provide a unified "front door" for federal agencies, insurers, and infrastructure owners seeking partners. Such a center could also coordinate multi disciplinary projects while also managing shared data repositories and modeling tools. By explicitly linking academic work to industrial use cases—including those emerging from FM, utilities, and coastal municipalities—a potential center would create clearer visibility from research funding to commercial deployment and provide a recognizable brand for Rhode Island's resilience expertise in national competitions and consortia.

- **State backed public private partnership:** Even with strong research and testing capabilities, early stage resilience technologies face substantial technical, regulatory, and market adoption risk that can deter private investment. A dedicated state backed public private partnership focused on resilience and loss prevention could help absorb these risks through a mix of matching grants, challenge programs, and structured pilot deployments. For example, the partnership could sponsor competitive calls for solutions addressing specific state needs and then provide both funding and access to state or municipal assets as testbeds. Successful pilots would generate the real world performance data and reference customers that are often prerequisites for scaling into national markets, while anchoring intellectual property, supplier relationships, and specialized jobs in Rhode Island. Over time, such an entity could also coordinate with existing programs to ensure that resilience focused ventures have access to specialized technical assistance, procurement channels, and follow on capital.

# AG AND FOOD INNOVATIONS:

## AN OPPORTUNITY TO GROW A NEW S&T AREA

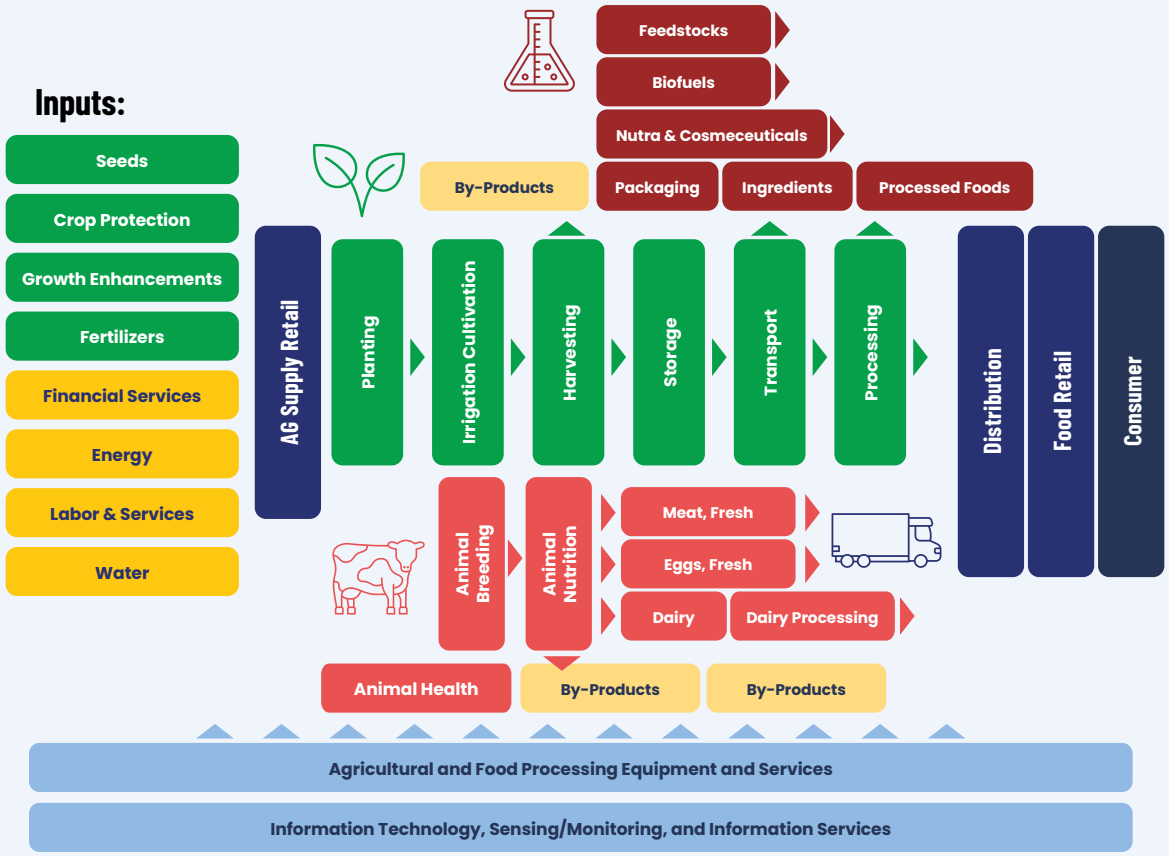
**Rhode Island's agriculture and food innovation ecosystem incorporates elements of research and innovation strength across a fragmented agri-food value chain, ranging from production aquaculture, land-based farms, and commercial fisheries, through processing and product development, to culinary innovation and market access. Unlike more vertically integrated agricultural regions, Rhode Island's current landscape spans several individual value chain segments that could be developed into a differentiated innovation offering.**

The state's severe geographic constraints necessitate technology-intensive production systems while there is also the potential for uniquely specialized pockets of aquaculture researchers, food entrepreneurs, clinical investigators, and product designers who could collaborate to develop novel innovations within the context of a more broadly integrated food system. This structural characteristic—distributed excellence across value chain components combined with the potential for small-state coordination advantages—positions Rhode Island to evolve from its current role as a culinary entrepreneurship hub into a more significant science-backed agri-food innovation cluster where individual strengths can compound synergistically. Emerging research themes from state institutions highlight the potential for a developed ecosystem to advance market-relevant technologies, ranging from smart agriculture technologies optimizing constrained production capacity, marine-derived functional foods or bio-inspired compounds addressing health markets, sustainable packaging solutions leveraging design and advanced materials expertise, and supply chain optimization models scalable to similarly constrained Northeast urban foodsheds. Realizing this integrated value proposition requires strategic investments that bridge currently siloed or undersized capabilities through shared research infrastructure, cross-institutional R&D programs, industry partnership models engaging anchor companies as co-developers, and talent integration mechanisms enabling interdisciplinary collaboration across food production science, culinary science, clinical nutrition, product design, and commercialization expertise.

# What are Ag and Food Innovations?

Ag and Food Innovations encompasses the integration of agricultural science, aquaculture technologies, culinary sciences, and food product development to create value-added specialty products and advanced production systems (Figure 12). This opportunity area bridges Rhode Island's coastal agricultural environment with its demonstrated capacity for design-to-manufacture innovation and emerging research strengths in marine food systems. At its core, Ag and Food Innovations represents the technical application of biological sciences, materials engineering, process optimization, and digital agriculture to sustainably produce, process, package, and distribute food products with enhanced nutritional, environmental, or market performance characteristics.

**Figure 12.**
The Complex Agri-Food Value Chain




**Source:** AgStart

The sector spans several domains that reflect Rhode Island's capabilities and potential to bring applied innovation to bear on industry-relevant applications:

- **Sustainable aquaculture and marine food systems** leverage the state's coastal geography and oceanographic research infrastructure to advance shellfish cultivation, finfish production, aquaculture, and marine bioprospecting. Rhode Island's aquaculture industry produced $8.8 million in value in 2024 with 89 active sites across 392 acres primarily focused on Eastern oyster production.[2] The integration of hatchery science, grow-out operations, value-added processing, and direct-to-consumer distribution creates a vertically integrated supply chain that positions Rhode Island as a leader in sustainable shellfish production relative to its geographic scale. In addition, outside of its role in food production, aquaculture research and "blue biotechnology" as a field is a rich source of innovations, including pharmaceuticals fertilizers, bioproducts, and other environmental innovations, such as carbon removal solutions.

- **Specialty food product development and culinary innovation** represents a second domain anchored by Johnson & Wales University's College of Food Innovation & Technology (CFIT) and Rhode Island's established food entrepreneurship ecosystem centered at Hope & Main in Warren. This segment emphasizes the transition from artisanal concept to commercial-scale production, with particular strengths in culinary science, product formulation, and small-batch manufacturing. Hope & Main has launched over 500 food businesses since its founding, demonstrating Rhode Island's capacity to incubate early-stage food ventures.

- **Advanced food packaging and process innovation** constitutes a potential innovation-led opportunity to leverage Rhode Island's advanced materials manufacturing base and design expertise to address sustainability, shelf-life extension, and supply chain efficiency challenges in food systems. Rhode Island's existing strengths in precision plastics manufacturing, advanced composites, and industrial design create potential for specialized applications in modified atmosphere packaging, films and coatings, and supply chain monitoring systems.

These areas of activity are often underpinned by enabling technologies and scientific techniques that address production and quality challenges that span the ag-food value chain, including:

- **Controlled environment agriculture (CEA)** provides precision control over growing conditions through hydroponics, vertical farming, and greenhouse systems—a technology particularly relevant to Rhode Island's land-constrained coastal environment. Rhode Island's planned Agricultural Innovation Campus at URI positions the state to demonstrate industrial-scale CEA applications integrating automation, energy efficiency, and crop optimization. Roger Williams University's Aquatics Diagnostics Lab and commercial-scale Shellfish Hatchery and Farm along with the industry-led Matunuck Shellfish Hatchery, in partnership with URI, create optimal environments for bivalve research and species protection innovations.

- **Marine bioprospecting and functional ingredients** extraction from marine organisms represents an emerging intersection of Rhode Island's oceanographic research capacity and food innovations potential. URI's natural products group in the College of Pharmacy, the Graduate School of Oceanography, and the Center for Economic and Environmental Development (CEED) at Rogers Williams University (RWU) provide

2 Rhode Island Aquaculture Industry – 2024, Costal Resources Management Council.

infrastructure for investigating bioactive compounds, polysaccharides, and novel proteins from marine sources—applications spanning nutraceuticals, functional foods, and specialty ingredients.

- **Smart agriculture** (also known as smart farming or precision agriculture) is an innovative approach to farm management that uses modern technology to increase efficiency, productivity, and sustainability. It involves integrating advanced Information and Communication Technologies (ICTs) into agricultural practices to collect data, automate operations, and enable data-driven decision-making, rather than relying solely on traditional methods or intuition.

- **Precision food processing** technologies including sensor networks, machine learning for process optimization, and traceability systems constitute cross-cutting capabilities that enhance both production efficiency and regulatory compliance across food manufacturing.

The convergence of these technical domains with Rhode Island's geographic and institutional assets creates potential for differentiated value propositions in specialty aquaculture products, health-oriented functional foods, sustainable packaging solutions for seafood and perishable goods, and demonstration-scale CEA systems. However, realizing this potential requires addressing fundamental gaps in processing infrastructure, applied research capacity, and market access mechanisms that currently constrain the sector's ability to capture value from early-stage innovation.

## Market Outlook and Growth Dynamics

The global ag and food innovation sector is experiencing converging pressures from climate adaptation requirements, consumer demand for sustainable and health-oriented products, supply chain resilience imperatives, and technological advances enabling precision agriculture and automated food processing. This transition creates market opportunities across production systems, value-added processing, and enabling technologies where Rhode Island's specialized capabilities can generate competitive advantage.

Given its coastal geography, Rhode Island has been able to develop specialized maritime food production and processing industries. Within aquaculture specifically, global demand for sustainably produced seafood continues to expand as wild fisheries face harvest limitations and climate-driven species migrations. The U.S. seafood trade continues to experience significant deficits, creating domestic market pull for expanded aquaculture production. Rhode Island's commercial fisheries generate significant economic impact, but face ongoing challenges from quota restrictions, climate change impacts including ocean acidification, and offshore development conflicts. These constraints on fisheries accelerate demand for controlled aquaculture production systems that provide supply predictability and environmental sustainability credentials increasingly required by premium restaurant and retail buyers.

Across the broader food innovation landscape, several specific trends are continuing to drive market expansion:

- **Plant-based and alternative protein growth:** While Rhode Island currently lacks significant plant-based protein manufacturing, the state's food science capabilities and proximity to Northeast consumer markets create potential entry points for specialty formulations, particularly those integrating marine-derived functional ingredients or regionally-adapted crops from CEA systems.

- **Functional foods and nutraceuticals expansion:** consumer demand for products delivering specific health benefits beyond basic nutrition drives growth in functional ingredients, fortified foods, and dietary supplements. Rhode Island's research strengths in nutrition, aging, and behavioral health at Brown University create potential for clinical validation of functional food formulations targeting cognitive health, metabolic function, and age-related conditions—applications where marine-derived compounds show promising bioactivity.

- **Shift towards local and regional food system development:** National and international food strategies increasingly emphasize regional self-reliance, shorter supply chains, and resilience to climate and geopolitical shocks, driving investment in local production capacity, aggregation hubs, and institutional procurement from nearby producers. This trend is accelerating deployment of year-round production systems such as controlled environment agriculture, expansion of small and mid-scale value-added processing, and modernization of storage infrastructure to support regional distribution of perishable, differentiated product.

- **Ongoing sustainable packaging innovation:** Regulatory mandates, extended producer responsibility schemes, and corporate decarbonization commitments are pushing food companies toward recyclable, compostable, and reduced-plastic packaging formats. Within this shift, technologies such as biodegradable and bio-based films, active packaging with antimicrobial or oxygen-scavenging functions, and smart packs incorporating sensors or data carriers for traceability are advancing particularly quickly as brands seek to balance shelf life, safety, and environmental performance.

- **Precision agriculture technology and automation adoption:** Persistent labor shortages, cost pressures, and climate variability are accelerating uptake of sensor networks, data driven decision tools, automated environmental control, and robotic or semi autonomous field and harvest equipment across both open field and indoor production. Rapid growth in controlled environment agriculture reflects broader movement toward tightly managed, high density growing systems that optimize water, nutrient, and energy use while enabling production in urban, peri urban, and climate constrained regions.

- **Cold chain and distribution infrastructure modernization:** Stricter food safety requirements, carbon reduction targets, and the expansion of e commerce and direct to consumer channels are driving upgrades to cold storage, temperature controlled transport fleets, and monitoring technologies from farm through last mile delivery. Emerging solutions include IoT enabled refrigeration assets, data logged time temperature indicators, and integrated logistics platforms that improve traceability, reduce spoilage and waste, and support differentiated handling requirements for premium, perishable, and specialty food products.

These market drivers create heterogeneous growth opportunities rather than driving impacts across all food sectors. Rhode Island's competitive positioning favors high-value specialty products (premium oysters, artisanal foods, functional ingredients), demonstration and validation platforms (CEA systems, packaging innovations), and enabling technologies (sensors, process control systems, traceability solutions) over commodity food production or large-scale processing operations where the state cannot achieve competitive cost structures.

However, market access remains contingent on addressing infrastructure constraints and commercialization gaps. The absence of mid-scale facilities often creates a "valley of death" where successful incubator-stage companies must relocate to access large-scale commercial production capacity. Limited cold storage infrastructure also constrains seafood processors and can prevent coastal regions from capturing value-added processing opportunities for regionally-landed catch.



## Hope & Main: Rhode Island's Cornerstone Food Innovation Incubator

Hope & Main, established in Warren, Rhode Island, operates as the state's premier culinary business incubator, providing critical commercialization infrastructure for early-stage food and beverage entrepreneurs. Housed in a 17,500-square-foot facility, the organization offers low-risk access to shared commercial kitchen space, business development services, and market connections for companies navigating regulatory requirements and production scale-up challenges. Since its founding, Hope & Main has launched over 500 food businesses, with approximately 45 percent remaining operational, an impressive survival rate in a sector where most startups fail within three years. Members receive 24/7 kitchen access, equipment training, licensing assistance, cold and dry storage, shipping infrastructure, pricing consultation, and direct connections to over 80 buyers spanning restaurants, retailers, and institutional accounts. The organization's Downtown Makers Marketplace expansion to in Providence extends market visibility for member companies while creating a retail outlet showcasing Rhode Island's specialty food products.

Hope & Main represents a critical node in Rhode Island's food innovation ecosystem, bridging the gap between culinary ideation at institutions like Johnson & Wales University's College of Food Innovation & Technology and commercial-scale manufacturing. However, capacity constraints limit the organization's ability to support companies transitioning beyond small-batch production as the facility lacks intermediate-scale processing equipment, specialized infrastructure for regulated product categories, and sufficient square footage to accommodate companies reaching growth stages requiring dedicated production runs. Successful graduates frequently must relocate to Massachusetts or Connecticut to access co-packing facilities capable of meeting retailer order minimums, resulting in innovation leakage from Rhode Island's ecosystem in this area. This "missing middle" infrastructure gap between incubator-stage small-batch capability and full commercial co-packing operations represents a critical constraint on Rhode Island's ability to retain and scale food innovation companies, underscoring the strategic importance of expanding mid-scale processing capacity to capture greater economic value from the state's demonstrated entrepreneurial strengths in specialty food product development.

# Why is this S&T Opportunity Area for Rhode Island?

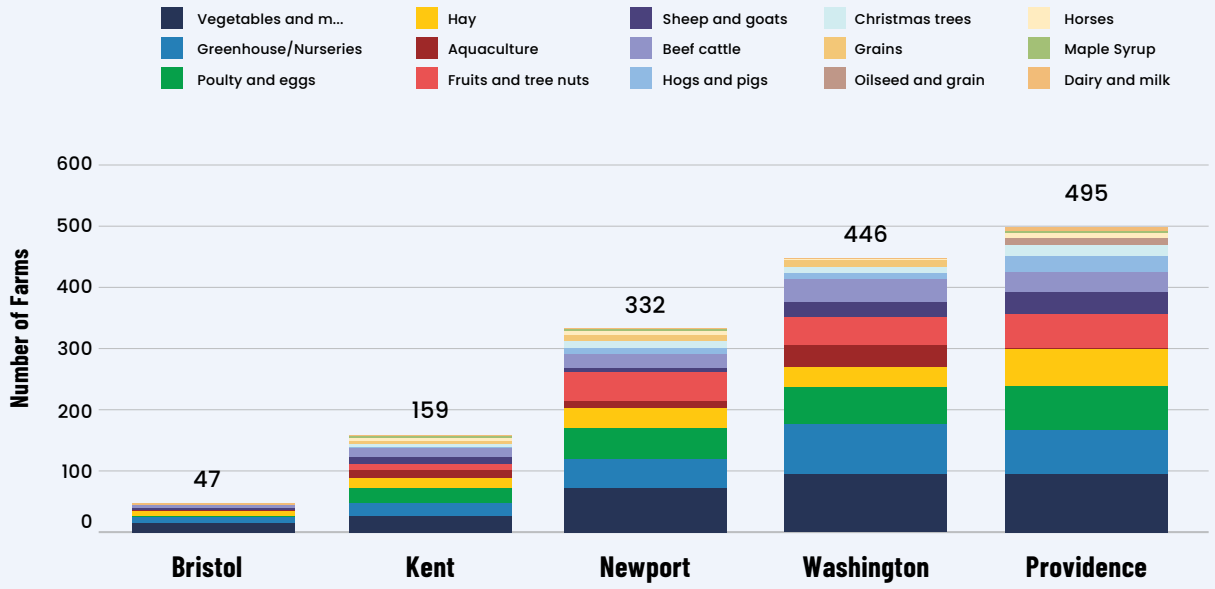
Rhode Island's potential for growing the impact of its ag and food industries is driven by the interaction of its coastal geography, constrained land base, and existing early-stage research and entrepreneurial infrastructure. The state's limited farmland and high land costs make large-scale commodity agriculture impractical, pushing opportunities toward high-value, technology-intensive production systems such as aquaculture, controlled environment agriculture, and value-added processing where innovation and design quality drive competitiveness. At the same time, extensive coastline, productive coastal ponds, and access to Narragansett Bay provide advantaged conditions and real-world testbeds for shellfish farming, marine bioprospecting, and deployment of sensing and monitoring technologies in working aquaculture operations.

These geographic advantages are reinforced by a maturing innovation ecosystem that links science, product development, and entrepreneurship. URI's ocean and aquaculture programs, seawater research facilities, and emerging controlled environment agriculture initiatives supply domain expertise in marine food systems and sustainable production. As part of RWU's emphasis on Blue Economy at a local, regional, national, and global level, the Center for Economic and Environmental Development (CEED) is a center for research in marine sciences, with a focus on aquaculture and blue biotechnology research, industry support, marine education, public outreach, engagement, and extension. Johnson & Wales University's College of Food Innovation & Technology (CFIT) contributes complementary strength in culinary science, product formulation, and food entrepreneurship supported by specialized labs and an applied graduate program in Food Innovation & Technology. The College's position has been further strengthened after its Ecolab Center for Culinary Science was named by the Food & Drug Administration (FDA) as a Process Authority Product Verification site, the only site in Rhode Island where food products, especially acidified or low-acid ones, can be tested to ensure their safety by scientifically validating recipes and processes, determining if they are shelf-stable or require specific thermal treatments, and providing documentation (like a Processing Authority Letter) that is required by regulators for licensing and compliance. Prior to this designation, the nearest site for companies to obtain this designation was Cornell University. Finally, commercialization assets such as Hope & Main's culinary incubator indicate growing, though still incomplete, capacity to move ideas from lab and test kitchen to market, underscoring both the promise of this opportunity area but the corresponding need to address remaining gaps in mid-scale processing, co-packing, and industry-facing translational support.

## Potential to Grow Rhode Island's Market "Pull"

In 1920, Rhode Island had an estimated 331,600 acres in farmland. As of the 2022 Census of Agriculture, Rhode Island was estimated to have 59,076 acres in farmland. The average price per acre of farmland in Rhode Island is over $20,000. This is the highest average price per acre in the country. The national average for 2024 was $4,170 per acre. Rhode Island has the most expensive farm real estate values due to its small land area and development pressure. This requires higher value-added production to ensure a positive return. This is, in part, why greenhouses/nurseries/floriculture accounted for 21.9 percent of farms and 63.8 percent of sales in 2022, with most of the sales increase due to greenhouse/nursery/ floriculture sales (Figure 13).

**Figure 13.**
Number of Farms in Rhode Island by County and Primary Activity, 2022.




**Source:** USDA Census of Agriculture

Demand for ag and food innovations in Rhode Island reflects a combination of established commercial production and emerging industry partnerships, though with substantial opportunity for scale expansion and supply chain integration to capture greater value within the state economy:

- **Potential for expanding production base and vertically integrated supply chains in aquaculture:** there is capacity to increase shellfish output, diversify into species such as kelp and finfish, and build vertically integrated models that capture more of the value chain within the state via linking hatcheries, farms, processing, and direct-to-market channels, using the state's aquaculture research and seawater facilities as engines for continuous husbandry, genetics, and climate-adaptation innovation.

- **Potential to develop value-added innovation for existing food manufacturing cluster with established companies and supply chain linkages:** Established processors in soups, prepared meals, cured meats, and beverages provide platforms for collaborative R&D on cleaner labels, functional formulations, and new product lines, particularly where JWU's culinary science and URI's nutrition and food systems expertise can de risk reformulation and scale up.

- **Exploring potential blue-biotech and functional ingredient development:** Marine bioprospecting and processing of seaweed, shellfish byproducts, and other ocean biomaterials could underpin a new subcluster in functional foods, nutraceuticals, and specialty ingredients, drawing on RWU's marine biology and biotechnology and URI's ocean sciences, pharmacy, and materials capabilities and creating downstream demand for specialized extraction and formulation services.

- **Continued buildout of an "incubator" cluster of artisanal and specialty food product developers that attracts larger producers and distributors to source innovation:** The growing base of Hope & Main and CFIT-linked startups can function as a discovery pipeline for larger brands and retailers, especially if complemented by mid-scale co-packing, regulatory support, and market access programs that allow promising concepts to graduate without leaving the state.

- **Packaging innovation opportunity with potential to leverage state advanced materials sector:** Food companies and national brand owners are seeking sustainable, higher-performance, and smart packaging solutions, creating an opportunity to align academic materials research and the state's plastics, textiles, and composites firms around food-grade films, coatings, and sensor-enabled formats.

- **Controlled environment agriculture and urban food systems:** The planned agricultural innovation campus and interest from commercial CEA operators create a market for integrated technology solutions covering lighting, climate control, crop management, and energy optimization that can be developed and validated in Rhode Island and then exported to urban and climate constrained markets.

## Potential to Grow Rhode Island's Technology "Push"

Rhode Island's research and innovation capabilities in ag and food sciences are anchored by marine food systems and culinary sciences strengths, emerging activity in controlled environment agriculture and precision agriculture, and enabling digital and materials technologies, but these assets are not yet organized into a cohesive technology and innovation platform advancing applications with relevance to industry. There is an opportunity is to deliberately build out multi-institution, industry-facing innovation areas that link URI, RWU, JWU, and other partners around a set of complementary research thrusts that can seed new ag and food clusters while upgrading existing ones. Several potential opportunities to grow the scale and depth of applied research include, but are not limited to:

- **Build on university marine food systems research leadership** by leveraging URI's aquaculture, fisheries, and ocean sciences programs and seawater facilities, RWU's shellfish hatchery and aquaculture farm, and other state assets as a backbone for innovation in advanced husbandry, genetics, climate-resilient production, disease-resistant bivalves and marine systems engineering that directly feed new commercial ventures in aquaculture, seafood processing, and blue-biotech.

- **Grow new agricultural innovation domains such as CEA and marine bioprospecting** using the planned Agricultural Innovation Campus, other URI Bay Campus assets and the state's shellfish hatcheries as integrated testbeds for controlled-environment production systems and for discovery, characterization, and pilot-scale processing of bioactive compounds and functional ingredients derived from seaweeds, shellfish, and marine microbes.

- **Leverage existing culinary innovation and food product development expertise** by systematically connecting JWU and incubator stage companies with URI, RISD, and industry R&D around reformulation, functional foods, sensory science, and process design so that culinary creativity is coupled with rigorous product development, food safety, and scale up capabilities.

- **Build around JWU's CFIT as an anchor for placemaking and talent pipelines** by positioning CFIT and its Food Innovation Design Lab, graduate programs, and entrepreneurship platforms as the visible hub for a broader ag and food innovation community, integrating student talent, faculty research, and startup support with industry sponsored projects, shared pilot facilities, and joint commercialization initiatives.

- **Build on food packaging leveraging materials innovation research capability** via Brown University's materials science programs and URI's polymer chemistry research, which provide foundational capabilities in packaging materials innovation, though systematic engagement with food packaging industry applications remains limited. Brown faculty research in biodegradable polymers, nanocomposite films, and surface chemistry creates potential for food packaging applications requiring advanced materials properties.

## Line-of-Sight Market Applications for Rhode Island

Within the ag and food innovation domains identified above, Rhode Island's research assets, industry capabilities, and market positioning create specific opportunities for technology development, product innovation, and industry growth where the state can achieve differentiated competitive advantage.

Within sustainable aquaculture and marine food systems applications, priority market applications could include:

- **Premium shellfish production with integrated processing and distribution.** Building on Rhode Island's established oyster farming success, opportunities exist for species diversification (bay scallops, hard clams, mussels), value-added processing (shucked meats, smoked products, prepared shellfish dishes), and direct-to-institution sales channels capturing margin currently captured by distributors. Integration of farm-to-restaurant traceability systems using blockchain or RFID technology could command premium pricing from restaurants emphasizing provenance and sustainability.

- **Recirculating aquaculture systems (RAS) for finfish production.** Land-based RAS facilities producing striped bass, black sea bass, or hybrid striped bass for regional markets could leverage Rhode Island's proximity to premium restaurant markets, available industrial sites with adequate water and power infrastructure, and URI's RAS research expertise.

- **Kelp and seaweed cultivation for food and specialty ingredient markets.** Rhode Island's seaweed farming, currently producing modest volumes, could scale substantially to serve expanding markets for snacks, seasoning blends, and functional ingredients. Integration with shellfish farms or other operations in integrated multi-trophic aquaculture (IMTA) configurations could help drive innovative demonstration sites. Incentives for partnerships among private commercial farms and experimental research farms, such as the RWU Farm, may accelerate method development and innovation.

- **Marine-derived functional ingredients and bioactive compounds.** Extraction and characterization of fatty acids, peptides with blood pressure-lowering properties, or other valuable compounds from Rhode

Island aquaculture species and wild-harvested seaweed could create high-margin ingredient sales to nutraceutical and functional food manufacturers and has close synergy with Rhode Island's life sciences sector. However, this application requires substantial bioprocessing scale-up, regulatory navigation, and clinical validation investment.

Within specialty food product development and culinary innovation, market applications could include:

- **Health-oriented functional foods leveraging marine ingredients.** Product formulations incorporating Rhode Island oyster extract, seaweed-derived compounds, or fish-derived proteins targeting specific health outcomes aligned with clinical research at Brown University. Partnership with JWU for formulation and sensory optimization and URI for ingredient characterization creates differentiated products with science-backed health claims.

- **Artisanal and specialty prepared foods for regional distribution.** Expansion of Hope & Main's successful model for launching specialty food companies, with focus on products emphasizing Rhode Island identity, sustainable sourcing, and premium quality—categories where small-batch producers can compete against national brands. Enhanced co-packing infrastructure would enable successful incubator graduates to scale production while maintaining Rhode Island operations.

Opportunities for forward-looking target applications in advanced food packaging and process innovation could include:

- **Sustainable packaging solutions for seafood and perishable foods.** Development of compostable packaging for oysters, clams, and prepared seafood replacing containers currently used by many retailers. Development of antimicrobial coatings extending shelf life for fresh fish fillets or other perishable goods represents just one potential opportunity for applied research collaborations with materials sciences research programs as well as an opportunity to diversify the current advanced materials industry base.

- **Smart packaging with integrated sensors for supply chain visibility.** Prototype development of "smart" packaging communicating time-temperature history, location tracking, and product authenticity for premium Rhode Island food products sold through regional distribution networks. Initial applications could include high-value oysters or other artisanal products where shrinkage reduction and provenance verification justify technology cost premiums.

**Global Ag and Food Innovation Markets:** As R&D-driven innovation in food and agriculture continues to provide potential commercialization opportunities in Rhode Island, there are several significant global markets that provide paths to grow and scale the industry base:

- Growing market for aquaculture food products, noted in USDA 2023 Census of Aquaculture as encompassing nearly $2 billion in U.S. sales with an overall market growth of 3.8 percent from previous sales levels in 2018.
- Estimated global market for active, controlled, and intelligent packaging for food and beverage products estimated at $37.8 billion in 2023 with CAGR of 9.2 percent through 2028.
- Estimated global market for food additives (novel flavors, sweeteners, preservatives, enzymes, etc.) of $77.2 billion in 2023 with CAGR of 5.8 percent through 2029.
- Global market for functional foods valued at $216.4 billion in 2022 with CAGR of 8.4 percent through 2027.
- Estimated global market for food safety testing solutions projected to reach $27.1 billion in 2026.
- Estimated global market for IoT-based smart aquaculture technologies of $1.8 billion in 2025 with CAGR of 11 percent through 2027.
- Estimated global market for precision farming valued at $11.1 billion in 2024 with CAGR of 10.6 percent through 2030.

Source: BCC Market Research, USDA National Agricultural Statistics Service

## What is Still Needed to Realize/Maximize the Opportunity

While Rhode Island possesses genuine assets supporting ag and food innovation, systematic gaps in infrastructure, commercialization support, and industry coordination constrain the sector's ability to convert research capabilities and entrepreneurial energy into sustained economic value and employment growth. Scaling the opportunity to a more significant traded sector economic driver will require addressing several key ecosystem needs:

- **Need for mid-scale food processing and co-packing infrastructure to bridge commercialization gap.** The most frequently cited barrier to food company growth involves the transition from small-batch production in incubator kitchens to commercial-scale manufacturing. Hope & Main's facilities accommodate early-stage product development and testing but lack equipment and capacity for production runs meeting retailer or distributor minimum order quantities. Conversely, contract manufacturers require minimum production volumes exceeding many specialty food companies' near-term sales projections, creating a "missing middle" in processing infrastructure. Establishment of intermediate-scale processing facilities—potentially through Hope & Main expansion, conversion of existing underutilized food processing space, or purpose-built co-packing infrastructure—would enable successful incubator graduates to scale production while maintaining Rhode Island operations. Such facilities require specialized equipment (industrial mixers, commercial ovens, filling/sealing equipment for various package formats), food safety infrastructure (segregated allergen handling areas, sanitation systems, environmental monitoring), and operational expertise (HACCP-trained supervisors, regulatory compliance staff, maintenance technicians) that is capital-intensive.

- **Fragmented coordination and limited strategic alignment across ag and food system stakeholders.** Rhode Island's ag and food innovation ecosystem comprises numerous organizations and initiatives, and stakeholders consistently identify lack of systematic coordination and absence of unified strategic vision as constraining collective impact. Ecosystem fragmentation creates information asymmetries, duplicative programming, and missed opportunities for leveraging complementary capabilities. Establishment of a dedicated food and agriculture innovation coordination entity or significantly-enhanced role for an existing organization could address coordination gaps through systematic stakeholder convening, resource mapping, gap identification, and collaborative program development.

- **Limited commercialization pathways and industry engagement mechanisms connecting research to markets.** Despite URI, RWU, and JWU's research capabilities, systematic mechanisms for identifying commercial applications, matchmaking industry partners with relevant researchers, and supporting technology transfer remain underdeveloped. URI's Technology Transfer Office handles intellectual property licensing but lacks specialized expertise in food and agriculture sectors and capacity for proactive business development to food companies. Neither institution operates dedicated food innovation incubators nor provides gap funding for proof-of-concept development bridging academic research and commercial validation.

- **Inadequate risk capital and non-dilutive funding for capital-intensive ag and food ventures.** Food and agriculture startups, particularly those developing production infrastructure (aquaculture farms, CEA facilities) or conducting regulatory validation (FDA food additive approvals, clinical trials for health claims), require substantial capital for extended periods before generating revenue. However, Rhode Island's venture capital ecosystem shows limited ag-food sector focus, with most investment concentrated in software, fintech, and ocean tech applications rather than agriculture or food processing.

# FOUNDATIONAL AREAS OF CROSS-CUTTING CAPABILITY

**Cross-cutting science and technology capabilities represent the underlying core competencies, expertise, and innovation infrastructure that enable multiple growth areas to advance simultaneously, serving as a foundation rather than a single market on their own. In Rhode Island, capabilities such as industrial design, advanced materials, AI and cyber applications, and ocean sciences provide the connective fabric between research institutions, federal labs, and companies, supporting both existing growth opportunity areas but also serving as the enablers of new opportunities that arise in response to changing market demands or ecosystem dynamics.**

Because these capabilities are embodied in long-lived R&D assets such as specialized faculty, testbeds, cyber ranges, and shared equipment, their strength or weakness directly influences whether Rhode Island can adapt to evolving technologies, capture dual-use markets, and attract investment over time. Maintaining and expanding these cross-cutting R&D bases is therefore not just an academic priority but a strategic requirement for keeping the state's flagship research competencies and industry clusters competitive, resilient, and differentiated across a national and global landscape.

# Advanced Materials

Capabilities in advanced materials applications link materials chemistry, mechanical engineering, and manufacturing science to produce components that are lighter, stronger, more durable, and increasingly "smart." It supports and differentiates multiple clusters—including defense, marine trades, offshore wind, and medtech—by enabling performance that off-the-shelf materials cannot deliver.

In Rhode Island, this area is defined by major industry subsectors that actively advance innovation and serve as direct or indirect suppliers of high performance materials:

- Engineered composites and polymers for marine, aerospace, and energy structures.
- Performance textiles and functional materials (e.g., e-textiles, protective fabrics).
- Precision metals manufacturing and advanced machining for critical components.

The composites sector includes approximately 80 firms generating nearly $300 million in annual sales, historically focused on high-performance boatbuilding but increasingly diversified into turbine blades, architectural components, defense systems, and structural retrofits. Marine composites companies in Rhode Island have translated commercial boat building expertise into large, high-precision composite structures for both commercial and military customers. Textiles, once dominated by commodity apparel, have shifted toward technical and performance applications. Around 70 textile manufacturers employ over 2,500 workers supplying military gear, engineered fabrics, medical textiles, industrial membranes, and specialty knit structures. Firms in the state work closely with designers and engineers to produce conductive fabrics, protective composites, and sustainability-focused materials. In parallel, the precision metals and machining base is heavily integrated into the Electric Boat and aerospace supply chains and delivers high-tolerance components, specialty alloys, and complex assemblies that are indispensable for submarines, medical devices, turbines, and instrumentation.

In more fundamental research, Brown University leads foundational work in materials chemistry, nanoscience, and soft matter, with applications ranging from energy storage electrolytes to advanced coatings and soft robotics. URI complements this with applied R&D in marine-grade polymers, composite fabrication, and structural health monitoring, often geared toward undersea vehicles, ship structures, and coastal infrastructure. NUWC conducts mission-driven research in acoustic dampening materials, corrosion-resistant alloys, and high-pressure structures, creating a steady pull for applied materials innovations.

The last five years have seen new bridging infrastructure that ties this research into use-inspired development. The 401 Tech Bridge innovation campus was established specifically to connect composites, textiles, and undersea sensor research with Navy and industry needs, providing shared prototyping equipment and structured collaboration programs. The Rhode Island Textile Innovation Network (RITIN) and the Composite Alliance of Rhode Island (CARI) convene state university and industry stakeholders to co-develop next-generation fabrics and composite systems, including electronic textiles, adaptive membranes, turbine components, and embedded-sensor structures.

As a result of deeply integrated supply chains and demand for ongoing advancement of fundamental materials performance, development of advanced materials is a foundational enabler for Rhode Island's identified growth opportunities. The Maritime and Naval Systems opportunity area, in particular, relies on specialized metals, composites, and coatings for submarine hulls, undersea vehicles, and ocean infrastructure; the state's advanced materials R&D and cluster infrastructure are already deeply embedded in Electric Boat's

supply chain and NUWC's S&T portfolio. Offshore wind and broader energy infrastructure projects require corrosion-resistant composites and advanced coatings that can withstand ocean conditions, creating direct demand for Rhode Island's composites and textiles capabilities. In medtech and life sciences, bioinert polymers, engineered surfaces, and textile-based sensors have potential to underpin new device platforms—areas where Brown and URI research is strong, but local commercialization is still nascent. Continued investment in cross-domain materials facilities, application-focused research centers, and scale-up support can continue to allow Rhode Island to move from being primarily a contract manufacturer to being a source of proprietary, higher-margin materials technologies that differentiate its industrial base.

## Artificial Intelligence and Cyber Applications

AI and Cyber Applications present a forward-looking area where ongoing rapid evolution of capabilities necessitates ongoing investment in R&D and innovation capabilities as a fundamental driver of applications across all major science and technology fields. This capability extends beyond generic software development; it focuses on deploying data-driven models and secure architectures in mission-critical, often sensor-rich environments—naval platforms, power grids, financial systems, and health networks. As such, it functions as an overlay that enhances the performance, autonomy, and resilience of physical assets and industrial processes.

For Rhode Island, emerging sub-themes across the research and innovation ecosystem include:

- AI model development and data science, with emphasis on explainability and operation in constrained or adversarial environments.
- AI applications tailored to industry use-cases such as autonomous systems, predictive maintenance, and health analytics.
- Cybersecurity platforms and practices for protecting cyber-physical systems, critical infrastructure, and sensitive data.

Rhode Island's research institutions have begun to build notable strengths in both AI and cybersecurity, especially where they intersect with physical systems. Brown University's computer science and applied math departments, together with planned and newly funded data science and AI institutes, are pursuing research in explainable AI, complex systems modeling, and advanced machine learning methods. URI, through its digital forensics and cybersecurity programs and innovation-campus investments, has concentrated on cyber-physical security, secure software, and autonomous systems. Similarly, Rhode Island's colleges also contribute hands-on cyber training infrastructure through dedicated cyber ranges at institutions like Rhode Island College's Institute for Cybersecurity & Emerging Technologies, where students and partners simulate real-world attacks and defense scenarios on controlled networks.

Federal partners reinforce the critical need for these capabilities. NUWC and the Naval War College operate research programs in undersea autonomy, secure command-and-control, wargaming, and cyber policy that bring together AI algorithms, data analytics, and cybersecurity for naval applications. Smaller institutions including Bryant, Rhode Island College, and Providence College have launched AI labs, data science hubs, and cybersecurity institutes to expand the talent pipeline and applied project capacity.

While AI and cyber capabilities are now being integrated across industries, defense and undersea sectors provide a particularly strong market pull: NUWC contracts, submarine supply-chain cybersecurity requirements, and federal programs related to autonomous underwater systems have created demand for signal-processing

algorithms, autonomy software, and secure communications tailored to marine environments. Financial institutions, insurers, and digital health firms headquartered or operating significant centers in Rhode Island also supply additional use cases in risk analytics, fraud detection, and remote-monitoring platforms.

Given the broad scale of potential transformative impact for industry, AI and Cyber capabilities are central to nearly every identified S&T growth opportunity area. In Maritime and Naval Systems, AI provides the decision-making core of autonomous underwater vehicles and unmanned surface vessels, while cybersecurity ensures the integrity of communications and control networks in contested environments. Ocean sciences and Blue Economy initiatives increasingly rely on machine learning to interpret large volumes of sensor data, detect environmental anomalies, and support climate resilience modeling. In the Life Sciences and digital health opportunity spaces, AI and data science underpin bioinformatics, image analysis, population health analytics, and precision medicine applications; cybersecurity frameworks are critical for protecting patient data and medical-device networks. For advanced manufacturing and materials, machine learning supports predictive maintenance, adaptive process control, and quality monitoring, with cyber-physical security necessary to safeguard plant operations and IP.

Continued investment in AI and cyber research centers, talent programs, and testbeds linked to real-world domains, especially in undersea systems, health, and critical infrastructure applications, will position Rhode Island's digital capabilities to support both current and emerging growth opportunities as these technologies continue to evolve.

## Industrial Design and Product Development

Industrial Design and Product Development functions as a key differentiator for Rhode Island's commercialization ecosystem that translates Rhode Island's research and engineering into integrated, manufacturable products by coupling human factors, digital interfaces, materials, and production methods. Historically rooted in design-intensive industries like jewelry and consumer products, it now underpins innovation in areas such as medtech and defense systems, where user-tested prototypes are rapidly refined and scaled for regulated, high-performance applications.

Key areas of specialized innovation for Rhode Island within this capability include:

- Design-to-manufacture and prototyping for regulated products (e.g., medical devices, defense systems)
- Human-centered interface and experience design for complex physical–digital systems
- Sustainable and biomaterial-driven product and packaging design

From a research and innovation perspective, Rhode Island's design strength has long been anchored by the Rhode Island School of Design (RISD), which has steadily expanded its work at the interface of design, engineering, and materials science. RISD's Nature Lab and textiles programs have been used as platforms for experimentation in biomaterials, digital fabrication, and sustainable product concepts, often in collaboration with Brown and URI engineering faculty. Cross-institution studios and hackathons have produced early-stage medtech concepts and visual tools for translating complex scientific data.

Notably, the state's Innovation Voucher program has become an important mechanism for embedding design into applied R&D. Several vouchers have explicitly paired small manufacturers with design firms or RISD-led teams to develop functional prototypes for defense and marine clients and medical devices, modernize

products, and incorporate user feedback, and develop functional prototypes for defense and marine clients. Industrial design and product development has coalesced into a specialized cluster that spans independent studios, embedded design teams in manufacturers, and full-service firms. Rhode Island's employment base in design services stands at more than twice the national concentration, reflecting the outsized influence of RISD alumni and of companies like Ximedica/Veranex, Octo PD, and numerous boutique firms that export design services nationally. Providence-based product development firms help global clients navigate the path from concept through risk analysis, human factors engineering, and manufacturing transfer—activities that rely on close ties to local precision plastics, textiles, and electronics suppliers. In defense and maritime markets, Rhode Island design firms support NUWC, Electric Boat, and smaller marine suppliers with ergonomic control layouts, functional prototypes for harsh environments, and test rigs. At the same time, design capabilities remain deeply embedded in legacy jewelry, consumer products, and emerging lifestyle brands, providing a creative workforce that can be redirected toward higher-value technical applications.

Design and product development capabilities are central to Rhode Island's ability to convert its core research strengths into differentiated, market-ready offerings and offer a layer of specialized innovation that represents a competitive advantage. Maritime and naval systems depend on advanced human–machine interface design for submarine command centers, unmanned vehicle control, and data visualization—areas where RISD and local product and industrial design firms already collaborate with NUWC and suppliers. In Life Sciences and digital health, user-centered design is essential for creating medical devices and software that fit seamlessly into clinical workflows and meet regulatory and reimbursement requirements, making RISD–Brown collaborations and firms like Veranex critical cross-enablers.

Looking ahead, continued investment in design research, design-for-manufacturing capabilities, and collaborative infrastructure will be critical for translating Rhode Island's scientific advances into products that can be produced at scale within the state. Strengthening this capability ensures that cross-sector initiatives can move more quickly from lab bench or digital model into real-world deployment and are more attractive to outside investors and corporate partners.

## Ocean Sciences and Technology

Ocean Sciences provides a foundational environmental and biological systems capability for Rhode Island's maritime, defense, energy, and climate-resilience opportunities. Whereas Maritime and Naval Systems focus on engineered solutions operating in the ocean, Ocean Sciences concentrates on understanding the ocean as a complex, dynamic system—its physics, biogeochemistry, ecosystems, and interactions with human activity. This knowledge is essential both for sustainable resource use and for technical performance: vessel acoustics, offshore structures, fisheries management, and coastal adaptation all depend on R&D capabilities in this area.

As a leader in ocean sciences research, Rhode Island's institutions have specialized across several key themes including:

- Coastal and physical oceanography, including circulation, hazards, and sea-level dynamics.
- Marine ecology, fisheries, and aquaculture science.
- Ocean observing systems, data integration, and "digital ocean" modeling.
- Ocean engineering of structures and systems.
- Emerging blue biotechnology and biogeochemical research.

Rhode Island is a nationally distinctive node in ocean science, with a research enterprise that spans basic discovery and use-inspired applications. The University of Rhode Island's Graduate School of Oceanography (GSO) and associated coastal programs lead research in ocean circulation, coastal hazards, marine ecology, and geoscience, supported by a fleet of research vessels, coastal laboratories, and a modernizing Bay Campus with new ocean robotics and testing facilities. Federal installations, including NOAA and EPA coastal science units, add additional capacity in water-quality, ecosystem, and climate-related research, making Narragansett Bay a heavily instrumented living laboratory.

Over the past five years, Rhode Island has secured major multi-institution awards that intertwine ocean science with technology and commercialization. The Ocean Exploration Cooperative Institute, headquartered at URI, advances seafloor exploration, sensor development, and responsible resource management. The state's designation as an EDA Ocean Tech Hub and related ONR-funded initiatives are explicitly designed to turn ocean-science insights and infrastructure into new tools, platforms, and companies. EPSCoR, Sea Grant, and other networked grants link ocean science with environmental health, climate resilience, and workforce development across institutions.

The Blue Economy and defense cluster in Rhode Island is deeply intertwined with scientific capabilities in this space. Offshore wind deployment, commercial fisheries, aquaculture, marine tourism, and port operations all depend on sustained environmental monitoring, baseline data, and impact modeling derived from local ocean-science expertise. Ocean science also feeds a growing segment of "ocean intelligence" and robotics startups. Companies working on low-cost sensor systems, portable AUVs, data analytics platforms, and environmental services often emerge from or work closely with URI and NUWC researchers, using Narragansett Bay and nearby offshore waters as testbeds. Aquaculture enterprises collaborate with scientists on breeding, disease management, and multi-species cultivation (e.g., integrated oyster, scallop, and seaweed farms); while consulting and engineering firms leverage URI and federal data for coastal risk assessments, habitat-restoration projects, and siting of infrastructure.

As a result, this space is a foundational enabling capability for multiple Rhode Island growth opportunities. For the Maritime and Naval Systems opportunity area, knowledge of ocean acoustics, currents, and seabed properties directly informs sonar performance, undersea communications, and vehicle design; NUWC's applied R&D builds on and feeds back into this scientific base. For offshore wind and broader marine energy, oceanographic and ecological studies determine site selection, foundation and cable design, and environmental mitigation strategies.

In fisheries, aquaculture, and food innovation, ocean and coastal sciences guide sustainable harvest levels, new species cultivation, and responses to warming waters and acidification, while in climate resilience and coastal infrastructure planning, sea-level and storm-surge modeling grounded in local data informs zoning, insurance, and major capital projects. As global demand for climate adaptation solutions and marine environmental intelligence grows, Rhode Island's ability to integrate ocean science, engineering, and policy positions the state to export not only products but also differentiate itself as a subject matter expert ecosystem providing knowledge and decision-support services. Continued investment in observing systems, modeling capacity, collaborative institutes, and translational mechanisms will ensure that this core competency remains a durable comparative advantage and a cross-cutting enabler for the state's long-term economic and environmental strategies.

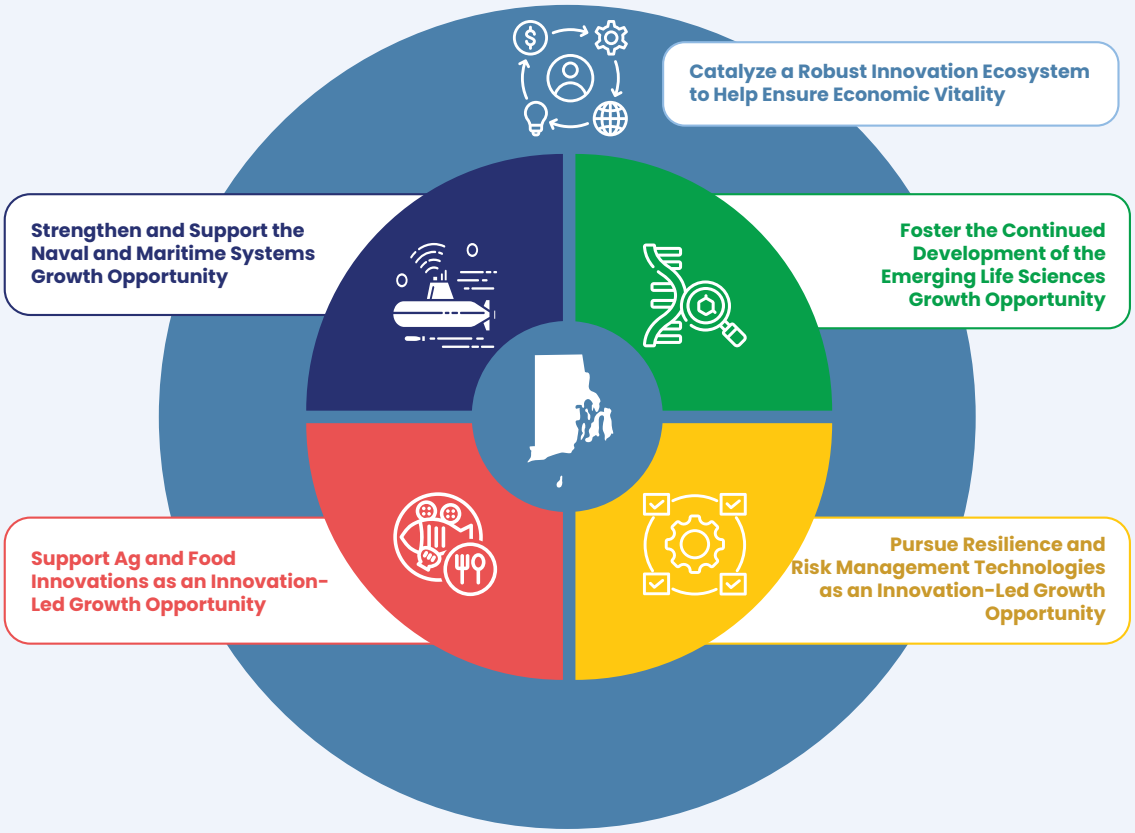
# RHODE ISLAND'S S&T FRAMEWORK

**"Business-as-usual" will not be sufficient if Rhode Island is to fully convert its research strengths, place-based advantages, and entrepreneurial energy into sustained growth in high-quality jobs and rising living standards.**

The Ocean State's small scale and dense networks can be a strategic advantage—but only if they are organized to move faster from discovery to deployment, and from pilot to scale. Rhode Island already has many of the essential building blocks of an innovation economy: strong research institutions, active cross-sector partnerships, federally supported research and training platforms, and state investments intended to accelerate translation and commercialization. What is needed now is a coordinated strategy that strengthens the "connective tissue" of the ecosystem—so that market-relevant innovations consistently traverse the innovation continuum and reach significant markets with the workforce, capital, and infrastructure required to scale.

Rhode Island's science and technology leadership is increasingly expected to do more than convene; it must also coordinate, align, and demonstrate impact. STAC was created to make science and technology innovation central to Rhode Island's leadership agenda and is charged with helping ensure that research and technology development are leveraged for commercialization, innovation, economic development, and jobs. At the same time, Rhode Island's role in national competitiveness programs such as NSF EPSCoR is evolving—shifting toward deeper expectations for jurisdiction-wide coordination, ecosystem analysis, and alignment to a current statewide S&T plan. These realities underscore a central point: innovation outcomes do not happen automatically. They are the result of intentional design choices, sustained investment, and disciplined execution across institutions and sectors as illustrated in Figure 14.

**Figure 14.**
Rhode Island's S&T Framework




**Source:** TEConomy Partners, LLC

This S&T Framework applies a line-of-sight approach to identify, design, and prioritize Rhode Island's most actionable growth opportunities where there is a clear pathway to significant markets, thereby enabling Rhode Island to differentiate itself nationally and create the conditions for sustained commercialization, productivity growth, and new-venture scale.

The strategies and actions that follow are designed to strengthen Rhode Island's innovation ecosystem in ways that are selective, focused, and measurable. They build directly on STAC's mission to increase R&D impact, encourage entrepreneurship, and enable innovation through an environment rich in talent, capital, and ideas. They also reflect the practical realities of building a modern innovation economy: translation requires more than great research—it requires predictable commercialization pathways, cross-institution coordination, risk-capital readiness, supportive infrastructure, and continuous workforce development aligned to priority innovation areas.

To accelerate innovation-led growth and ensure Rhode Island's identified growth opportunity areas translate into scalable market impact, the S&T Framework lays out five strategies and an associated set of 16 actions to leverage and complement existing strengths, overcome existing challenges, and help catalyze long-term economic growth across the state (Table 1). To guide investments, this S&T Framework is intended to be both an actionable but amendable document, with a wide range of proposed short-, mid-, and long-term actions.

**Table 1.**
Rhode Island S&T Framework

| Strategy | Targeted Actions to Pursue |
|---|---|
|  **Strategy 1: Strengthen and Support the Maritime and Naval Systems Growth Opportunity** | **Action 1.** Establish a Maritime and Naval Innovation Advisory Council. |
| | **Action 2.** Develop an Integrated Maritime Testing and Prototyping Infrastructure Network. |
| | **Action 3.** Expand and Diversify Collaborative Technology Development Programs Focused on Dual Use Maritime Technologies. |
| | **Action 4.** Establish Sector-Specific Financial Resources to Support Capital-Intensive Early-Stage Ocean and Maritime Technology Companies |
| | **Action 5.** Expand Maritime-Focused Advanced Manufacturing Supply Chain and Workforce Development Programming |
|  **Strategy 2: Foster the Continued Development of the Emerging Life Sciences Growth Opportunity** | **Action 6.** Coordinate Neurosciences and Aging-Related Research Clusters Into Focused Tech Transfer "Brand" for the State's Life Sciences Innovation Ecosystem. |
| | **Action 7.** Expand Support for Translation Activity in Life Science Research. |
| | **Action 8.** Expand Economic Development Support for Life Sciences Industry. |
|  **Strategy 3: Pursue Resilience and Risk Management Technologies as an Innovation-led Growth Opportunity** | **Action 9.** Establish a Signature Loss Prevention and Resilience Technology Commercialization Initiative. |
| | **Action 10.** Develop Environment for Rhode Island to Serve as Regional Hub for Resilience Technology Companies. |
|  **Strategy 4: Support Ag and Food Innovations as an Innovation-led Growth Opportunity** | **Action 11.** Create a Specialized Ag and Food Innovations Translational Research Initiative. |
| | **Action 12.** Establish Second-Stage Manufacturing Infrastructure and Additional Intermediate Processing Capacity. |
| | **Action 13.** Increase the Amount of Innovative Research Conducted in Rhode Island Around "Smart" Agriculture and the Agri-Food Nexus. |
|  **Strategy 5: Catalyze a Robust Innovation Ecosystem to Help Ensure Economic Vitality** | **Action 14.** Create a Robust, Proactive Commercialization System to Build a Pipeline of Deal Flow in the Growth Opportunity Areas. |
| | **Action 15.** Ensure Industrial Engagements are Advanced between Academic Institutions and Corporate Partners in each of the Growth Opportunity Areas. |
| | **Action 16.** Invest in Entrepreneurial Support within Rhode Island's Academic Research Institutions Focused on Growth Opportunity Areas. |

**Source:** TEConomy Partners, LLC.

Taken together, these strategies aim to ensure Rhode Island's innovation economy is not defined by isolated wins, but by a repeatable system—one that turns research strengths into commercial outcomes, raises productivity in existing industries, and builds inclusive pathways to high-wage opportunity. In the pages that follow, the recommended actions translate this intent into a practical S&T Framework: clarifying what must be built, what must be aligned, and what must be measured to make Rhode Island's S&T ecosystem globally competitive and locally beneficial.

# **STRATEGY 1:** STRENGTHEN AND SUPPORT THE MARITIME AND NAVAL SYSTEMS GROWTH OPPORTUNITY



## *Rationale*

Rhode Island's Maritime and Naval Systems opportunity area represents one of the state's most significant and distinctive economic assets, yet current organizational fragmentation presents a potential challenge to its ongoing capacity to drive comprehensive state-level economic outcomes. The scale and strategic importance of this sector makes it essential for justifying coordinated investment and intervention, as the industry cluster anchors Rhode Island's economy with unparalleled economic impact. The Naval Undersea Warfare Center (NUWC) Newport Division alone represents $1.2 billion in funded contracts and $618 million in civilian payroll and labor in 2024, constituting a sizeable anchor to the state's economy. Similarly, the defense and maritime manufacturing cluster is comprised of firms supporting defense contracts across the full value chain, from research and development through production and systems integration, and contributes an estimated $4.1 billion to the state economy with an additional $3.5 billion supported by military defense infrastructure, totaling $7.6 billion in economic output and supporting 34,068 jobs (6.9 percent of state employment). This represents nearly 11 percent of total state economic output, a remarkably concentrated contribution from a single industry cluster.[3]

However, the cluster faces a critical inflection point: extraordinary growth opportunities driven by Navy modernization programs create demand pressures that threaten to overwhelm existing capacity unless addressed proactively, while at the same time innovative companies seek to pursue diversification strategies into new dual use markets. Defense primes are expanding operations at Quonset Point with plans to hire 1,500 additional workers, while the broader supplier ecosystem must simultaneously upgrade capabilities to meet evolving defense requirements including DCSA Cybersecurity Maturity Model Certification (CMMC) compliance and advanced manufacturing standards. Navy procurement cycles extending over decades create stable, predictable demand, but only if the state maintains technological leadership and supply chain competitiveness.

Rhode Island's research infrastructure provides the foundation for this leadership. Significant ocean and marine sciences research spending, concentrated in URI's Graduate School of Oceanography (consistently characterized as a "crown jewel" for undersea technology), NUWC Newport's Advanced Research Directorate, Brown University's materials science and AI capabilities, RWU's Bristol blue economy research, and RISD's advanced design programs create the "technology push" capability to maintain innovation leadership in undersea systems, autonomous vehicles, advanced materials, and associated AI/ML applications. This research

3 The Economic Impact of the Defense Cluster in New England, SENEDIA, May 2023.

base is not easily replicated and represents decades of institutional investment and unique geographic positioning with coastal environment access.

However, there are some vulnerabilities to the state's competitive position. The cluster suffers from organizational fragmentation across multiple initiatives (401 Tech Bridge, SENEDIA, Ocean Tech Hub, UTIC, Navy partnership programs) operating with unclear strategic coordination, duplicate efforts, and insufficient integration of research, commercialization, workforce development, and capital formation. This fragmentation dilutes the impact of investments, delays technology transition, and undermines potential for even larger state-level economic impact. Simultaneously, the cluster faces an acute workforce crisis, with technician and skilled trades workers constrained by aging populations and insufficient pipeline development, deep engineering expertise distributed across SMEs with more limited capacity to attract and retain, and a supplier ecosystem requiring substantial modernization investment.

Beyond traditional submarine and undersea warfare systems, dual-use maritime technology represents an emerging high-growth opportunity critical to Rhode Island's long-term competitiveness. Autonomous underwater vehicles, unmanned surface vessels, underwater infrastructure robotics for offshore wind installation and subsea cable repair, and advanced marine sensors for climate observation and resource management constitute rapidly expanding commercial markets that can leverage existing defense-funded research and manufacturing capability. These technologies require substantial capital for prototype development, in-water testing, and manufacturing scale-up representing investment thresholds beyond traditional venture capital models designed for software companies. The emerging companies commercializing these technologies are competing for capital and talent in national and international markets, and without Rhode Island establishing targeted capital formation mechanisms and integrated testing infrastructure these companies may relocate to regions with more developed innovation ecosystems, representing a permanent loss of economic opportunity and entrepreneurial leadership in commercial "blue tech" markets.

Without coordinated intervention, Rhode Island exposes itself to risks to its leadership position as a coastal hub for marine and ocean technologies across multiple avenues: technology leakage as companies relocate to defense hubs with better-integrated ecosystems, failure to transition Navy-funded research into commercial dual-use opportunities, reducing return on flows of federal R&D investment, workforce supply constraints limiting submarine manufacturing expansion and supplier scaling, and supplier modernization failures that compromise supply chain reliability during critical military production cycles. The next generation of defense contracts focused on autonomous maritime systems, AI-enabled undersea capabilities, advanced marine materials is likely to flow to regions demonstrating integrated innovation ecosystems that address these risks.

This strategy addresses these challenges through five coordinated actions establishing unified industry coordination, integrated testing infrastructure, collaborative technology development pathways, targeted capital formation mechanisms, and comprehensive supply chain and workforce modernization. Collectively, these actions create the organizational architecture and resource mobilization necessary to modernize Rhode Island's research and industrial assets and maintain a sustained competitive advantage, supporting the state's research enterprise while also generating thousands of jobs and reinforcing the state's role as a global center for maritime and naval systems innovation.

## **Action 1:** Establish a Maritime and Naval Innovation Advisory Council

Rhode Island's fragmented support infrastructure lacks unified strategic coordination, resulting in redundant efforts, unclear industry access pathways, and unrealized potential for even greater economic impact. An independent, industry-led Maritime and naval Innovation Advisory Council would establish a centralized coordination mechanism to address this gap.

The Advisory Council should comprise representatives from defense primes in the state (for example, General Dynamics Electric Boat, Raytheon Technologies, Lockheed Martin), commercial maritime companies and infrastructure operators (e.g. ports, offshore wind), small and medium suppliers, Navy program management, innovation organizations (401 Tech Bridge, Ocean Tech Hub), private investors, workforce development organizations (SENEDIA), and state economic development. Structured with leadership roles and dedicated staff, the Advisory Council would develop annual strategic plans establishing cluster growth objectives, identify key barriers and mitigation strategies, align priority research and technology development areas with Navy requirements, assess workforce pipeline gaps, and coordinate competitive positioning. Notably, the Council would not include members of university leadership but would closely coordinate and communicate findings to research and tech transfer leadership across the state's institutions. This structure helps preserve the Council's role as an unambiguous industry voice to state and federal partners, while structured liaison channels with research and tech transfer offices ensure that academic priorities and capabilities are still fully reflected in its recommendations.

As a part of its functions, the Advisory Council should establish priority working groups addressing workforce pipeline coordination across career technical education and universities, supply chain modernization and cybersecurity compliance, dual-use technology commercialization pathways, and capital formation solutions. Most critically, the organization would operate a centralized single point of entry enabling companies to access supplier opportunity databases, connect with NUWC research capabilities and partnership pathways, access university research and facilities, understand workforce training resources, and navigate available capital programs. Dedicated staff would ideally manage this "concierge" function and develop experiential knowledge of the state's maritime and naval ecosystem to serve as an ongoing resource. Recent DoD strategies explicitly recommend creating such "single entry-point" constructs for existing and non-traditional vendors that provide entry-to-exit guidance from initial R&D through production, highlighting the need for staffed functions to scale defense innovation (particularly in non-traditional or dual-use areas).

The Advisory Council should execute strategic communications partnerships with Rhode Island Commerce to develop unified messaging around Rhode Island's maritime innovation position, establish thought leadership branding and marketing at key events and forums, support talent attraction efforts, and advocate for supportive policy environments for maritime and naval technology commercialization. As a part of its outreach strategy, the organization could produce technology road maps that outline the state's assets and how they align with both mission-driven and commercial market needs. This unified voice to state government, Navy leadership, and industry stakeholders would coordinate messaging and implementation of strategic initiatives across a currently more fragmented approach and provide consistent direction for cluster investment.

## Case Studies/Best Practices:

**New Jersey's Office of Strategic Defense Investment.** On September 3, 2025, Governor Phil Murphy announced the launch of the Office of Strategic Defense Investment (OSDI), which is designed to strengthen New Jersey's defense ecosystem and support long-term industry growth. Housed within the New Jersey Economic Development Authority (NJEDA), OSDI centralizes strategy, advocacy, and coordination across state, federal, military, and industry partners to advance missions at New Jersey's premier installations and safeguard the competitiveness of the state's defense sector. The Governor framed the initiative as both an economic and national-security imperative, placing the defense sector "on par with the state's other key industries" while leveraging New Jersey's world-class bases and contractor network to accelerate cutting-edge military technologies.

**Ohio Aerospace and Aviation Council.** The Ohio Aerospace & Aviation Council is a state-wide industry driven economic development organization designed to 1) attract and retain key growth oriented companies and 2) work collaboratively as industry leaders to strengthen and grow Ohio's Aerospace & Aviation industry, including related federal, academic, and non-profit installations and assets. The Council, reporting to the Governor's Office, is comprised of industry and military base leaders in an effort to define development initiatives that will drive Ohio's economy and increase global competitiveness.

## **Action 2:** Develop an Integrated Maritime Testing and Prototyping Infrastructure Network

Rhode Island possesses globally unique testing and prototyping capabilities including NUWC Newport's advanced underwater facilities (shock, vibration, survivability, acoustic testing), URI's Ocean Robotics Facility and Narragansett Bay testing infrastructure, Quonset Point deep-water port access, and commercial waterfront facilities at Providence and Newport that distinguish the state competitively.

Industry stakeholders note that the unique Narragansett Bay environment contains multiple unique environments of interest to prototyping and demonstration of maritime and naval systems located in proximity to one another, making the state's coastal geography a key "natural resource" for emerging company attraction and ongoing innovation. However, these assets today exist largely as individual nodes, underutilized due to limited visibility and unclear access procedures and insufficiently coordinated to support industry innovation or attract external companies seeking marine technology testing capability.

The state should develop an integrated "Ocean Tech Testing Corridor" consolidating these assets into a unified system with transparent access, standardized cost agreements, and coordinated scheduling. The first component requires facility coordination through detailed asset mapping to document physical capabilities (depth capacity, vessel support, security classification levels, environmental control), access mechanisms, and unique advantages. Working with NUWC, URI, and commercial operators, the state can develop standardized intellectual property and facility use agreements that protect institutional interests while reducing transaction costs for qualified companies through tiered security models, published pricing, and transparent scheduling.

At the same time, the state can develop a waterfront site identification service providing requirement assessment, facility matching recommendations, and access facilitation. This function could identify Quonset Point, Providence Port, and Newport Harbor optimization initiatives for maritime technology testing zones with supporting infrastructure for autonomous systems, sensors, and robotics companies and coordinate vessel support services, logistics, and security infrastructure ensuring capabilities align with security and defense requirements.

Finally, there is a need to develop a set of coordinated in-water testing zones leveraging the Ocean Tech Hub's test range network structure, with shallow water areas for autonomous systems and sensors, medium depth zones for underwater vehicle validation, and deep water offshore corridors for submarine and deep-sea technology testing. Supporting infrastructure investments can include real-time monitoring systems capturing performance data, communications systems enabling command and data transmission, partnerships with local universities for data analysis, and ongoing environmental monitoring. Required central coordination mechanisms would include scheduling systems preventing conflicts, unified safety protocols, data sharing agreements protecting intellectual property, and regulatory coordination with Navy, Coast Guard, and environmental agencies.

Beyond open water test ranges, the state also hosts a number of world class marine and ocean laboratories containing unique instrumentation and capabilities. As a part of the coordinated testing corridor, existing testing facilities at NUWC could provide access based on existing WFPP and CRADA mechanisms, while URI's new facilities could leverage standardized industry use policies or access packages that combine lab use with nearby in-water testing.

The Ocean Tech Hub, housed at RI Commerce as a consortium-led effort regionally, has proposed a Test Access and Test Range Network to be funded through the EDA, which would execute the goals of this Action. Securing funding for these programs and further expanding other programs like BlueTIDE could also integrate with this coordinating mechanism to provide corridor test time as an explicit eligible use.

Building out this testing corridor capability would also require dedicated support that could be either a part of the organization described in Action 1 or organized independently, specifically comprising:

- Joint liaison team housed within the corridor but co funded by OTH, NUWC, 401 Tech Bridge and URI, with named points of contact for:
    - NUWC facility access and CRADA structuring
    - URI lab access and student/researcher engagement, and
    - Ocean Tech Hub and Blue Robotics Lab connections.
- A standard "test planning clinic" offering quick-turn consultations to help firms design test campaigns that use tank, lab, and in-water assets efficiently, and map those campaigns to funding sources.

## Case Studies/Best Practices:

**Massport Blue Edge (Port of Boston).** Massport's Blue Edge initiative positions the Port of Boston's historic Fish Pier as a flagship blue-economy campus, combining rehabilitated waterfront buildings with new floating infrastructure to support emerging maritime and climate-tech firms. The program will provide flexible workspace for startups, direct dock and berthing access, and a dedicated floating platform that can host in-water prototypes and demonstrations, all within a working commercial port environment that also includes seafood processors and logistics operators. By overlaying innovation infrastructure on top of an active maritime district, the development creates and environment where entrepreneurs can test technologies such as marine robotics, sensors, and low-carbon port solutions in realistic operational conditions, side-by-side with end users.

Strategically, Blue Edge is designed to anchor Boston's newly designated MarineTech Hub by concentrating blue-tech companies at a single, highly visible node linked to the region's universities, research institutions, and offshore energy and fisheries supply chains. Massport envisions the Fish Pier and associated harbor assets as a gateway for federal and private investment into pilot projects, workforce programs, and commercialization activities that advance climate resilience, port decarbonization, and sustainable ocean industries.

**Port of San Diego Blue Tech Bay and Blue Economy Incubator.** The Port of San Diego's Blue Economy initiative treats the working waterfront as a blue-tech campus, using tidelands, berths, and pilot zones to host real-world demonstrations of sustainable maritime and coastal technologies. Through its Blue Economy Incubator and aquaculture pilot programs, the Port issues competitive calls, provides access to waterfront sites, and structures limited-term demonstration agreements so startups and emerging firms can test innovations such as shoreline protection, water quality solutions, and low-carbon port technologies in an operational harbor setting. This stance actively positions the bay as a living lab where innovators work alongside cargo, cruise, recreation, and environmental uses.

The Port uses the Blue Economy platform to position itself as an active convenor and early customer for blue-tech solutions, aligning pilots with regional climate, resilience, and economic-development priorities. By linking access to infrastructure with technical, regulatory, and community engagement support, the initiative helps de-risk first-of-a-kind deployments and concentrate private and federal investment into the region's blue-economy firms.

**Port of Los Angeles AltaSea.** AltaSea at the Port of Los Angeles represents a campus-scale investment across a 35-acre, 450,000-square-foot ocean research and blue-tech innovation district built on a historic pier with deep-water dockage, 50,000 square feet of wharf space, circulating seawater systems, and flexible labs and high-bay workspaces for ocean innovators. Its Center for Innovation at Berths 58–60 co-locates modular offices, labs, and direct berth access for startups and established firms, while the planned Center for Education and Engagement at Berth 57 will add 45,000 square feet of research labs, K-12 and public education, and exhibit space, linking commercialization with workforce and outreach.

## **Action 3:** Expand and Diversify Collaborative Technology Development Programs Focused on Dual Use Maritime Technologies

NUWC Newport's world-leading capability in undersea warfare systems, advanced sensors, and autonomous vehicle technologies has been traditionally optimized for Navy applications. However, significant commercial and dual-use opportunities exist: autonomous maritime systems (ferries, offshore wind support vessels, infrastructure inspection), marine sensors and data systems (ocean monitoring, climate observation, aquaculture management), advanced materials (composites and coatings for marine environments), AI/ML applications (autonomous decision-making, predictive maintenance, environmental forecasting), and undersea robotics (infrastructure installation and repair, deep-sea exploration, scientific research). Historically, commercialization pathways from NUWC research to such dual-use industries have been more limited, with innovations either remaining classified or requiring entirely new commercial development without leveraging government-funded research.

Structured collaborative technology development programs would better maximize Navy R&D investment return by enabling civilian applications, creating new revenue streams for Rhode Island companies, accelerating innovation by leveraging existing Navy-funded research, strengthening the defense industrial base, and further differentiating Rhode Island as a leading dual-use maritime innovation ecosystem.

Building on existing mechanisms, including 401 Tech Bridge's tech challenges, NUWC cooperative research and development agreements (CRADAs) with universities, and Ocean Tech Hub initiatives, the state should expand collaborative research mechanisms to specifically focus on autonomous and unmanned systems (underwater vehicle autonomy and decision-making, autonomous surface vehicles, multi-vehicle cooperative systems, AI/ML integration for decision support, cybersecurity for autonomous systems), marine sensor technologies (advanced undersea sensor architectures, real-time data transmission and processing, sensor fusion and information extraction, distributed sensor networks for ocean observation), and dual-use technology development (technologies transferable from defense to civilian applications, commercial licensing of unclassified Navy innovations).

Potential programmatic initiatives these organizations can explore to accelerate a focus on dual-use technologies include:

- **Expand competitive research challenge funding for events such as BlueTIDE and complement them with early-stage development accelerators that engage university partners modeled after other regional examples.** This should include a standing, sector-specific challenge program that issues focused problem statements in undersea autonomy, sensing, materials, and cyber-physical systems, provides small but fast-moving awards to teams that pair companies with URI, Brown, or RISD labs, and culminates in test-ready prototypes demonstrated through the Ocean Tech Testing Corridor. Challenge winners should automatically qualify for a follow-on accelerator track that offers structured technical mentoring, business model support, access to URI and NUWC facilities, and help packaging results into SBIR/STTR proposals or OTAs, drawing on models used by programs such as MassChallenge Defense or Defense Innovation Unit's accelerator-style cohorts.

- **Develop a CRADA and other cooperative research agreement facilitation and gap funding mechanism that can serve as an "on-ramp" to engagement with universities and private companies.** Many small firms lack the legal capacity, time, or early funding needed to navigate NUWC and university partnership agreements, even when technical fit is strong. A dedicated facilitation service should provide template CRADAs, pre-negotiated IP and data-rights clauses for common collaboration types, and technical assistance to complete required documentation. Paired with this, a small gap-funding pool should cover initial scoping work so that promising collaborations can progress from idea to formal project without waiting for a full contract or grant cycle. This "on-ramp" would be especially valuable for dual-use projects where early joint experiments are needed to prove feasibility before Navy or private investors will commit larger sums.

- **Expand public private "technology scouting" and Entrepreneur-in-Residence-like programs to position additional experienced commercial technology leaders as interfaces between NUWC, universities, and industry.** Building on efforts already underway through 401 Tech Bridge and the Ocean Tech Hub, the state should fund a cadre of embedded technology scouts and entrepreneurs-in-residence who split their time between NUWC technical divisions, key university labs, and the broader supplier/startup base. Their role would be to survey ongoing government and academic research for commercial potential, identify unmet capability needs in the defense and commercial maritime markets, and actively match problems to teams, facilities, and funding tools. Individuals serving this function would need to be carefully selected for specific experience in productization, regulatory strategy, capital raising, and ability to translate between Navy program managers, faculty researchers, and small companies that are not yet familiar with defense acquisition norms.

- **Establish additional pathways for SME defense contractors and startups to participate as research partners alongside NUWC and major primes.** Current collaborative vehicles often favor large primes or established performers, leaving many smaller firms confined to build-to-print supply roles. The state should explore more explicit mechanisms for SMEs to enter upstream research, which could include mechanisms like structured subcontracting slots for small firms on National Institute for Undersea Vehicle Technology (NIUVT) and other NUWC-aligned projects, and SBIR proposals where a "consortium" of primes, universities, and local startups bid together on relevant topics. Coupled with corridor access to facilities and the CRADA on-ramp described above, these pathways would allow smaller Rhode Island firms to move from purely manufacturing roles into design, integration, and technology development work, building deeper technical capabilities and higher-value positions in the undersea systems supply chain.

## Case Studies/Best Practices:

**Defense Technology Accelerator (DTA)** hosted by 757 Collab/ NavalX's Mid-Atlantic Tech Bridge (Norfolk–Hampton Roads). The Defense Technology Accelerator (DTA) run by 757 Collab in the Norfolk–Hampton Roads region serves as a structured on-ramp for dual-use startups seeking to become viable Navy and DoD suppliers, with a natural emphasis on maritime and shipbuilding applications given the local base and yard presence. Delivered as an 11-week hybrid accelerator, the program recruits early-stage and growth-stage companies with technologies in autonomy, sensing, advanced materials, cyber, and other deep-tech domains, then immerses them in defense customer discovery, acquisition mechanics, and mission-focused mentorship. Cohort firms refine their value propositions around specific operational problems, develop procurement-ready pitch materials, and gain exposure to program managers, primes, and regional industry leaders who can validate requirements and help shape product roadmaps. This intensive structure moves companies beyond generic "GovTech interest" into concrete alignment with naval use cases while preserving their commercial trajectories.

DTA leverages Hampton Roads' dense concentration of Navy commands, shipyards, and maritime industrial base as a living lab and customer base for participants. The accelerator builds curated touchpoints with local stakeholders (e.g., waterfront facilities, fleet operators, ship repair and modernization firms) to facilitate site visits, technical deep dives, and early pilot discussions, translating classroom learning on SBIR/OTA, FAR, and budgeting cycles into real relational capital. Alumni companies emerge with clearer pathways to prototype demonstrations, teaming relationships with primes, and improved readiness for follow-on non-dilutive and private capital. Notably, major areas of emphasis for the program span a number of dual-use technology focuses such as unmanned vehicles, cybersecurity, and sensing/navigation tools.

**TMA BlueTech (San Diego).** TMA BlueTech in San Diego operates as a cluster-driven platform for dual-use maritime innovation, organizing a network of companies, universities, research institutions, and public agencies (including U.S. Navy, Defense Innovation Unit, Port of San Diego, Scripps Institution of Oceanography, NavalX, among others) around shared priorities in maritime security, smart ports, offshore energy, and ocean sustainability. Instead of a single accelerator, TMA runs a portfolio of programs: themed working groups, challenge calls, international trade and technology missions, and curated B2B/B2G matchmaking that collectively help firms discover and validate both naval and commercial use cases for their technologies. Member companies span undersea robotics, maritime domain awareness, advanced ocean sensing, vessel electrification, and environmental monitoring, giving the cluster a broad base of dual-use capability that can be matched to missions ranging from anti-submarine warfare to port decarbonization. The organization also partners with global counterparts to create cross-cluster opportunities, bringing foreign navies, ports, and corporates into the San Diego ecosystem and helping local firms scale beyond the regional market.

TMA's programming explicitly emphasizes dual-use pathways by convening defense and civilian buyers in the same conversations and framing problems (e.g., situational awareness, asset tracking, energy efficiency, infrastructure resilience) in cross-sector terms. This enables startups and SMEs to design solutions that can be fielded with navies, coast guards, ports, offshore energy developers, and environmental agencies, improving unit economics and resilience to budget cycles. The cluster also plays a soft-infrastructure role by aggregating market intelligence, mapping regional capabilities, and advocating for public investment in shared testbeds and innovation infrastructure that support both security and blue-economy objectives.

## **Action 4:** Establish Sector-Specific Financial Resources to Support Capital-Intensive Early-Stage Ocean and Maritime Technology Companies

Ocean, maritime, and advanced energy technology companies require fundamentally different capital structures than traditional software businesses. Prototype development for underwater vehicles, sensors, and systems involves expensive materials testing, pressure chamber validation, and in-water testing often requiring costs up to several million before achieving investment-ready proof-of-concept. Testing and regulatory validation costs create additional burden before commercial viability demonstration. Defense and maritime customer procurement cycles measured in years also require companies to sustain operations over long durations before securing initial contracts, and manufacturing scale-up requires substantial investment in specialized equipment, supply chain development, and workforce hiring beyond Series A venture funding.

As a result, traditional venture capital structures designed for software or other digitally-driven companies are not well-suited to hardware-intensive maritime technologies. This mismatch has historically resulted in Rhode Island companies securing out-of-state capital and relocating, insufficient early-stage capital availability for critical proof-of-concept stages, limited non-dilutive funding access, and difficulty attracting experienced management and technical talent due to limited local ecosystem support.

The state should establish a dedicated Ocean and Maritime Technology Fund with initial capitalization and professional venture management with relevant market expertise in ocean and naval technology commercialization. Consideration should be given when establishing the operational mechanism of the fund as to whether existing platforms (like the Slater Technology Fund with expanded resources) could manage the fund efficiently without duplication of efforts.

The fund could employ a co-investment model leveraging state capital with private sector matching to ensure market discipline while maximizing state resources. Investment strategy should address early-stage seed funding for promising technologies with limited traction, later-stage seed funding for companies demonstrating proof-of-concept and market validation, and growth stage capital for capital-intensive development and manufacturing scale-up. A specific investment focus should include dual-use technologies commercializing Navy innovations, autonomous maritime systems (underwater and surface vehicles, offshore infrastructure platforms), marine sensors and data systems (ocean observation, environmental monitoring, aquaculture management), advanced materials for marine applications (corrosion-resistant coatings, composites, extreme environment materials), and AI/ML for maritime applications (autonomous decision-making, predictive maintenance, vessel operations optimization).

Investment criteria should emphasize strong founding teams with domain expertise and execution capability, clear commercialization pathways (defense contracts, commercial customers, licensing), access to Rhode Island institutions and willingness to establish local operations, and potential for significant economic impact. The fund should employ professional venture management separate from government operations with rigorous investment guidelines, dual-use technology commercialization expertise, clear performance metrics and annual reporting, and accountable governance structures. Alongside the core fund, an associated 'first customer' program (potentially leveraging SupplyRI) should prioritize very early-stage dual-use technologies by providing small equity or convertible grants paired with initial procurement commitments from in-state anchors.

Complementary mechanisms should include expanded Rhode Island Innovation Vouchers with dedicated maritime and naval allocation supporting proof-of-concept development, testing, and regulatory validation as well as expansion of federal SBIR/STTR matching programs providing matching funds for awards to maritime and naval technology companies with proposal development support. The state can also seek to leverage the Ocean Tech Hub designation to access federal economic development funding or other programs aligned with federal opportunities that can specifically support dual use technology commercialization.

## Case Studies/Best Practices:

A number of states have created sector-specific financial resources, for which traditional venture financing is often not interested due to a smaller perceived return on investment, to support capital-intensive startups to help them grow and scale. Two examples are:

**Texas – Product Development & Small Business Incubator (PDSBI)** Funds. Established in the Texas Constitution (Art. XVI, §71) and administered by the Governor's Office, PDSBI provides asset-backed, below-market loans for capital purchases and working capital to develop and/or produce new or improved products. Preference is given to capital-intensive hardware companies focused on semiconductors, nanotechnology, and biotechnology/ biomedicine. Typical loans range between $1M–$5M, with terms up to 15–20 years in an effort to finance scale-up machinery and facility needs of early-stage industrial tech.

**New York – NYSERDA Commercialization & Manufacturing Scale-Up.** Through a number of grant opportunities and support services, NYSERDA deploys funds plus wrap-around commercialization support and manufacturing scale-up assistance explicitly helping hardware climate-tech startups de-risk manufacturing, build supply chains, and reach first customers. NYSERDA has invested $800M over 10 years to launch 450+ products that have been funded through its programs.

## **Action 5:** Expand Maritime-Focused Advanced Manufacturing Supply Chain and Workforce Development Programming

Rhode Island's maritime and naval manufacturing cluster growth has historically been driven by General Dynamics Electric Boat expansion and Navy modernization programs but has recently been augmented by emerging commercial maritime technology areas. This growth currently faces a critical bottleneck, with industry stakeholders consistently noting insufficient supply chain capacity and shortages of skilled workforce to meet demand. The cluster's supply chain comprises small and medium enterprises providing precision metalworking, composites fabrication, electronics integration, and engineering services facing constraints in technology modernization, cybersecurity compliance, and workforce availability. The incumbent workforce also faces significant challenges related to skills gaps in digital technologies as well as aging of significant cohorts of skilled production and technician worker segments.

Rhode Island possesses substantial workforce development infrastructure through career technical schools, community college advanced manufacturing training, university engineering programs, and existing apprenticeship programs. Recognizing the need for a modernized workforce, many of these programs have adopted specific skills-based training and career support efforts in recent years. However, infrastructure remains insufficient due to limited scale of trained worker cohorts, lack of coordination and information sharing across programs, curriculum lag relative to industry technology evolution, and sustainability challenges dependent on uncertain public funding.

As a result, there is a critical need to support this technology and STEM-intensive industry via comprehensive workforce development efforts that include:

- **Expansion of supplier modernization and technology adoption programs building on existing support initiatives** through technical assessments of supplier capabilities, automation and robotics skills support, cybersecurity compliance assistance, digital systems implementation (ERP, supply chain management, quality systems), and strategic planning services. These services can be coordinated through Polaris MEP and modeled after successful manufacturing assessment and modernization efforts in Midwest states. In particular, targeted interventions in precision metalworking, composites fabrication, advanced coatings, electronics integration, and supply chain management can be incentivized through competitive grants with matching requirements encouraging private sector investment.

- **Establishing comprehensive maritime-focused manufacturing apprenticeship programs combining classroom instruction with paid on-the-job training.** Priority technical areas should include composite manufacturing (materials science, fiber placement, resin infusion, quality control), marine systems integration (submarine and ship systems, mechanical and electrical integration, systems testing), underwater vehicle assembly (precision machining, subsystems integration, pressure testing, quality assurance), and project management (defense contracting compliance, project planning, quality and risk management). Programs can employ cohort-based models, provide supportive services, establish wage progression, and partner with unions and employers for job placement.

- **Create a Maritime Manufacturing Workforce Partnership that consolidates and coordinates the portfolio of existing workforce development stakeholders** integrating career technical education directors, community college leadership, university engineering programs, SENEDIA and Navy representatives,

employers (Electric Boat, suppliers, emerging companies), union representatives, and state workforce development. Partnership functions should include curriculum coordination ensuring program alignment, systematic employer input on skill requirements and career pathways, career pathway documentation showing progression from middle school through professional development, coordinated data tracking of graduate outcomes and employer feedback, and program evaluation against industry demand. Key outputs should include career pathway maps, competency models defining required skills at each career stage, stackable credentials ensuring cross-level applicability, and job placement coordination across employers.

- **Address incumbent worker development through advanced manufacturing skills training** in Programmable Logic Controllers (PLC) programming and industrial automation, advanced machining, robotics and automation integration, digital systems, and cybersecurity fundamentals. Delivery mechanisms should include short-form certificates, online and hybrid models for working professionals, employer-customized training, and tuition assistance.

- **Expand regional supplier readiness efforts around DCSA Cybersecurity Maturity Model Certification (CMMC) support and other defense contracting ecosystem requirements to position Rhode Island firms as first movers in a changing supplier ecosystem.** Activities might include expanded funding and coordination of assessment and planning, grants and matching funding for cybersecurity upgrades, peer learning groups facilitating compliance sharing, and professional certification support. Equally important is to expand defense contracting education programs (DoD procurement processes, FAR/DFARS compliance, security clearance requirements, contract types and pricing, proposal preparation) through community colleges or industry associations.

## Case Studies/Best Practices:

**Virginia ATDM Program (Danville).** Virginia's integration of the Accelerated Training in Defense Manufacturing (ATDM) program into state-recognized pathways offers an example for other short term defense manufacturing workforce development efforts. ATDM, based in Danville, delivers intensive, 16-week cohort programs in critical trades such as welding, machining, non-destructive testing, and quality control specifically aligned with submarine and shipbuilding needs. The program is now approved by Virginia's workforce agencies as an instruction provider and is being connected to registered apprenticeships and state manufacturing-future campaigns, effectively embedding a Navy-funded program into the state's credential and career-path infrastructure. This alignment allows students, including veterans and career-changers, to earn industry-recognized credentials in a short time frame and transition directly into high-demand roles at primes and suppliers while giving employers a predictable, standardized talent pipeline.

Virginia pairs ATDM with broader maritime industrial-base outreach and manufacturing-promotion efforts, positioning defense manufacturing as a flagship sector within state workforce and economic-development strategies. Events hosted by Virginia Tech and state partners highlight ATDM as part of a larger narrative about "growing Virginia's manufacturing future," and the state's customized training programs (e.g., Virginia Talent Accelerator) are used to tailor onboarding and upskilling for specific employers drawing from ATDM graduates.

## Case Studies/Best Practices:

**Connecticut Electric Boat-Focused Regional Workforce Initiatives.** Connecticut's Electric Boat–geared regional workforce initiatives illustrate how a state can develop efforts to address the submarine industrial base as a comprehensive workforce development priority. Facing demand to hire thousands of workers for new submarine programs, Electric Boat has partnered with AdvanceCT, state agencies, and higher-education institutions to build a multi-tiered pipeline that runs from technical high schools through community colleges to UConn and URI. Targeted programs include new and expanded certificate and associate pathways in advanced manufacturing and welding, summer "manufacturing academy" experiences for high-school students, and EB-aligned curricula at institutions like Three Rivers Community College, all designed to map directly onto EB job families and promotion ladders. These efforts are promoted through high-visibility hiring campaigns and signing-day events that brand submarine manufacturing as a premier career option.

Connecticut's model also emphasizes geographic and institutional diversification so that inland regions and nontraditional talent sources contribute meaningfully to the defense industrial base. Workforce initiatives intentionally reach into Hartford and other non-coastal communities, with EB recruiters, state workforce boards, and education partners coordinating outreach and training rather than competing. Rhode Island has its own similar successful Defense Partnership Program led by SENEDIA and sponsored by Real Jobs RI since 2016; the Connecticut example provides relevant context for how the existing program can continue to scale and be organized across a network of different stakeholders as a part of the broader New England Submarine Shipbuilding Partnership. Recent announcements of joint UConn–URI–Electric Boat workforce development programs also underscore a cross-state approach where curriculum design, applied research, and work-based learning are aligned to common employer needs and shared regional goals.

**North Carolina's Defense Manufacturing Community Support Program (NC DMCSP).**

North Carolina State University's Industry Expansion Solutions (IES) leads North Carolina's Defense Manufacturing Community Support Program (NC DMCSP), offering a comprehensive best-practice model for supplier modernization anchored in a university-based extension system. Through a $7.5 million DoD grant, IES is coordinating a multi-year effort to strengthen advanced textiles manufacturing for defense by integrating cybersecurity, artificial intelligence, microelectronics, biotechnology, and additive manufacturing into an "industrial production ecosystem." The program explicitly targets critical skills, facilities, R&D, and small-business support, positioning IES as the central convener for aligning technical assistance, innovation resources, and workforce development around defense-relevant capabilities.

The NC DMCSP consortium, managed by IES, brings together more than 20 partners—from Manufacturing USA institutes and the Wilson College of Textiles to MEP centers, venture accelerators, and the state Department of Commerce—to build out an ecosystem for smart textiles and wearable devices that enhance warfighter health and performance. This networked approach allows small and midsized suppliers to tap shared testbeds, design expertise, cyber and digital-manufacturing support, and commercialization resources via a single coordinated platform.

# **STRATEGY 2:** FOSTER THE CONTINUED DEVELOPMENT OF THE EMERGING LIFE SCIENCES GROWTH OPPORTUNITY



## *Rationale*

Significant recent state investment and emerging institutional capacity in Rhode Island's emerging life sciences cluster have created momentum that must be sustained and focused to continue to grow the industry base into an economically significant industry cluster. State universities were responsible for over $217 million in life sciences academic research expenditures in 2023, anchored by Brown University's nationally recognized research and translational centers in neurosciences, aging biology, and regenerative medicine, complemented by URI's George and Anne Ryan Institute for Neuroscience and URI College of Pharmacy's drug formulation, delivery, and bioengineering expertise. This research base, particularly Brown's Warren Alpert Medical School, Carney Institute for Brain Science, Center on the Biology of Aging, and emerging RNA Center focusing on non-coding RNA therapeutics, provides distinctive scientific capability in domains where Rhode Island can establish competitive differentiation amidst a dense and highly competitive New England biosciences ecosystem.

The state has made a major commitment through RILSH, with funding supporting cluster growth and ongoing development in the 195 Innovation District focused on life sciences infrastructure including Ocean State Labs incubator (planned opening January 2026), Brown Health lab facilities, and State Health Laboratories consolidation. This investment represents recognition that Rhode Island must build physical infrastructure, convening capacity, and commercialization support to translate research excellence into economic outcomes. Evidence of an emerging ecosystem includes local success stories such as EpiVax and Nabsys and an established cohort of concept-to-commercialization firms supporting medtech work including Veranex and NEMIC. Recent announcements also demonstrate growing momentum: VeinTech's move to Ocean State Labs developing minimally invasive vein treatment technology, Organogenesis expanding Rhode Island operations in regenerative medicine, and multiple digital health and neurotechnology startups emerging from Brown research programs.

However, Rhode Island's life sciences research assets have not historically been oriented toward technology transfer and commercialization, with both Brown and URI acknowledging systemic gaps in entrepreneurial culture, faculty incentive structures, and commercialization support infrastructure. The state must expand on recent investments and organizational capacity to grow life sciences as a true industry cluster backed by a unique value proposition based on focused differentiation in areas where research excellence, clinical partnerships, design and manufacturing expertise, and lower operating costs create distinctive advantages. The aging and neuropsychiatric health focus—combining fundamental aging biology research, translational neuroscience, integrated clinical networks through Brown University Health, and advanced design capabilities through RISD and established medtech firms—represents exactly this type of differentiated positioning. In order to scale this ecosystem, these value chains must be further coordinated and supported through ongoing programs.

Without strategic focus and continued investment in commercialization infrastructure, Rhode Island risks dissipating recent momentum through researcher and company migration to better-supported ecosystems, failure to convert applied research into IP and startups, insufficient lab and manufacturing space constraining company scaling, and lack of differentiated market positioning leading to perception as a satellite of other New England biosciences hubs rather than a distinctive cluster. Stakeholder conversations reinforced that strategy must address fragmentation across institutional boundaries, insufficient early-stage capital specifically tailored

to life sciences development timelines and capital requirements, limited entrepreneurial support infrastructure, weak connections between academic research and commercial needs, and ongoing demand for physical infrastructure for companies to establish and scale operations.

## **Action 6:** Coordinate Neurosciences and Aging-Related Research Clusters Into Focused Tech Transfer "Brand" for the State's Life Sciences Innovation Ecosystem

Rhode Island possesses nationally distinctive research capabilities in aging biology, neurosciences, and neuropsychiatric health, but these assets remain institutionally fragmented without unified commercialization strategy or coherent external market positioning. Brown's Center on the Biology of Aging, Brown's Carney Institute for Brain Science, and URI's George and Anne Ryan Institute for Neuroscience have synergistic missions and are fertile grounds for technology transfer. Additionally, Warren Alpert Medical School translational programs and Butler Hospital Memory and Aging Program constitute world-leading capabilities in Alzheimer's detection and intervention, dementia care innovation, cellular senescence and aging interventions, and behavioral health digital therapeutics. URI contributes complementary pharmaceutical sciences expertise in drug delivery, formulation, and bioengineering. Brown University Health's integrated clinical networks provide access to patient populations and real-world clinical environments essential for digital health validation and medtech development. The IMPACT Collaboratory, a nationwide Alzheimer's and dementia care quality improvement program, demonstrates Rhode Island's capacity to lead in translating research into clinical practice and care delivery innovation.

However, these capabilities operate largely independently, with insufficient coordination across institutions, limited joint commercialization capacity, and no unified external "brand" communicating Rhode Island's distinctive position to industry partners, investors, or entrepreneurs. A coordinated approach would establish Rhode Island as a nationally recognized center for aging, neurosciences, and neuropsychiatric health innovation, creating clear differentiation from other nearby life science markets. To accomplish this objective, the state should:

- **Establish a formal Aging and Neurosciences Innovation Consortium** integrating Brown research centers, URI 's Colleges of Environment and Life Science, Health Science, Pharmacy and Nursing, Brown University Health's clinical leadership, Butler Hospital, and other medical system stakeholders under unified commercialization strategy. The consortium should develop a shared technology pipeline identifying high-potential research suitable for translation, establish joint commercialization priorities aligned with market opportunities (early Alzheimer's detection algorithms and digital biomarker platforms, dementia caregiver support and care coordination platforms, cellular senescence interventions for aging-related diseases, behavioral health digital therapeutics, wearables for continuous monitoring in aging populations), and create coordinated external communication positioning Rhode Island's distinctive capabilities to pharmaceutical companies, medtech firms, digital health investors, and CMS innovation programs.

- **Create a joint industry partnership interface enabling single point of access for industry across fragmented life sciences institutional infrastructures.** This should include a dedicated industry liaison managing inbound inquiries and matching companies to appropriate faculty, facilities, and capabilities, standardized partnership agreements reducing transaction costs for sponsored research, licensing, and collaboration, and industry advisory boards for major research centers providing regular market feedback and identifying commercial opportunities aligned with research trajectories. The interface should identify and actively market specific technology areas where Rhode Island research is ready for industrial

partnership, including RNA therapeutics (leveraging Brown's new RNA Center), regenerative medicine biologics for spine and orthopedic applications, circulating biomarker diagnostics for early disease detection, and population health platforms leveraging integrated clinical networks.

- **Establish a joint faculty translational innovation fellows program** providing course release time, entrepreneurship training, and commercialization support to enable faculty to advance promising research toward commercial application. Fellows would receive teaching release for several years to focus on translational milestones (proof-of-concept in relevant disease models, prototype development, regulatory pathway definition, partnership or investment discussions), participate in structured entrepreneurship education covering customer discovery, intellectual property strategy, regulatory requirements, and business model development, and receive dedicated support from technology transfer professionals and experienced entrepreneurs-in-residence. The program should fund a cohort of fellows annually, focusing on projects aligned with the aging and neurosciences strategic focus where faculty have demonstrated scientific leadership but need time and entrepreneurial support to bridge the gap between academic publication and commercial viability.

## Case Study/Best Practice:

**Centre for Aging and Brain Health Innovation (CABHI) at Baycrest in Toronto.** The Centre for Aging and Brain Health Innovation (CABHI) at Baycrest in Toronto is a dedicated solution accelerator that treats aging and brain health as a single, branded innovation domain and positions itself as a global hub for "agetech" and dementia-focused solutions. Established in 2015, CABHI is structured as a multi-sector partnership that brings together Baycrest's research institute and long-term care campus, the University of Toronto, multiple hospitals and seniors' organizations, industry partners, and government funders, and focuses explicitly on helping older adults age safely in their setting of choice while maintaining cognitive, emotional, and physical well-being. Through programs such as Spark, the Researcher-Clinician Partnership Program, and the Mentorship, Capital and Continuation (MC2) fund, CABHI provides non-dilutive funding, access to testing capabilities, and hands-on commercialization support that move products from idea through design, validation, and adoption in themes like "aging at home," cognitive health, care coordination, and caregiver support.

CABHI also operates MC2 and Ignite cohorts that invest several million dollars at a time into early-stage agetech companies and then surround them with a curated network of distribution partners, expert coaches, and services for regulatory, legal, and market access, which positions the center not only as a funder but as a gateway into the broader aging and brain-health market. Through visible branding, thematic events, and platforms like AgeTech Insights and "Brain Bases," CABHI has developed Baycrest's geriatric and cognitive neuroscience expertise into a clearly articulated ecosystem identity that attracts innovators from multiple countries, provides a straightforward entry point for industry and health-system partners, and demonstrates how a focused aging and neuroscience innovation brand can be built around coordinated programs, shared testbeds, and measurable commercialization outcomes.

## **Action 7:** Expand Support for Translation Activity in Life Science Research

Rhode Island must systematically address infrastructure and support gaps that prevent promising research from reaching commercialization stages. Current limitations include growing demand for computational infrastructure to support AI-enabled drug discovery and diagnostics, limited industry commercialization and management expertise among scientific founders, and need for additional funds to de-risk technologies. The state can undertake a multifaceted approach to building out translational infrastructure aligned with core research strengths around the following focus areas:

- **Leverage findings from the state AI task force, establish joint-use computational infrastructure that support emerging efforts at Brown and URI in AI-enabled life sciences applications.** This could include high-performance computing clusters optimized for molecular modeling, drug-target prediction, genomics analysis, and medical imaging AI; cloud-based platforms enabling researchers and companies to access computational resources without major capital investment; and technical support staff with expertise in bioinformatics, computational biology, and AI/ML model development. Structured industry access agreements should enable both academic researchers and companies to utilize infrastructure, with tiered pricing supporting early-stage use while generating revenue from established firms. This infrastructure is particularly critical for Rhode Island's aging and neurosciences focus, where AI-enabled biomarker discovery, drug repurposing for neurodegenerative diseases, and digital phenotyping for behavioral health represent high-value commercial opportunities requiring substantial computational capability.

- **Invest in additional capital-intensive shared-use infrastructure based on critical technology areas identified through the Aging and Neurosciences Innovation Consortium.** Priority equipment could include advanced imaging systems, genomics and proteomics capabilities, cell culture and tissue engineering, and GMP-compliant manufacturing capability for early-stage biologics and cell therapy production. Equipment should be housed in accessible core facilities (ideally in proximity to ongoing activity and buildout in the 195 Innovation District) with professional management, standardized rate structures, and industry access agreements enabling companies to use equipment without purchasing, maintaining, or staffing expensive instruments.

- **Fund a dedicated life sciences concierge service increasing translation activity through systematic matchmaking, guidance, and partnership structuring.** The concierge should provide industry-academic matchmaking actively connecting companies seeking specific capabilities (assay development, animal models, biomarker expertise, clinical trial sites) with appropriate university researchers and core facilities, guidance on intellectual property strategy and licensing arrangements, regulatory pathway consultation, commercial partnership structuring and sponsored research agreements, and actively develop partnerships between Rhode Island researchers and larger pharmaceutical or medtech firms. This function should also conduct technology prospecting, systematically surveying research across Brown, URI, and hospital systems to identify commercially promising work and proactively engage researchers in commercialization discussions.

- **Generate greater levels of investment capital available to Rhode Island companies** by focusing on two efforts. First, attracting/developing relationships with institutional firms and introducing/networking them to the state's deal flow. Secondly, developing a state-based life science-specific investment fund run by a professional institutional investor to provide early-stage and follow-on funding to Rhode Island companies. This will require co-investment by the State of Rhode Island, academic institutions, Rhode Island's health systems, and RILSH.

## Case Study/Best Practice:

**Massachusetts Life Sciences Center (MLSC) 2035 Fund.** The 2035 Fund is a multi-program initiative from the Massachusetts Life Sciences Center (MLSC) designed to accelerate translational life-science research, close infrastructure gaps, and move discoveries from lab to real-world impact across the Commonwealth. It was launched in 2025 as part of MLSC's Life Sciences 3.0 strategy and in support of the Mass Leads Act. The fund specifically addresses barriers that often prevent promising research from reaching patients, such as lack of shared equipment and core facilities, limited access to disease-specific biobanks, and underfunding in key therapeutic areas. The 2035 Fund targets different parts of the translation pipeline through the following programs:

- **Accelerating Research through Collaboration (ARC Awards).** Supports collaborative translational projects that bridge basic science and real-world application. Notably, projects must include an industry partner making ARC a direct lever to move ideas into the market.
- **Research Infrastructure & Equipment.** Provides capital grants to expand statewide access to shared research assets.
- **Biobank.** Establishes disease-specific, accessible biobanks thereby breaking a persistent bottleneck in access to high-quality, diverse biospecimens for translational studies.
- **Frontiers Program.** Funds high-risk translational research in under-resourced areas where conventional, purely market-driven funding often falls short.
- **Women's Health Initiative.** Targets critical gaps in women's health by supporting research and translational projects in pregnancy-induced hypertension and perimenopause/menopause, among other priorities thereby embedding health-equity objectives into the translational agenda.

## **Action 8:** Expand Economic Development Support for Life Sciences Industry

Rhode Island must establish competitive economic development tools that enable the state to retain growing companies, attract external firms aligned with strategic focus areas, and engage anchor companies that could serve as industry partners, customers, or investors for emerging life sciences firms. To help address the need for enhanced economic development capabilities that position the state to scale its life sciences ecosystem, there are several actions that state economic development stakeholders can take:

- **Re-engage existing anchor companies through dedicated industry liaison roles with direct connections to university research centers and RILSH.** As one example, CVS Health's headquarters presence in Rhode Island represents a major but underutilized asset for the life sciences cluster as the company's interests in digital health, chronic disease management, pharmacy innovation, and integrated care delivery align closely with research strengths in aging, neurosciences, and population health. Similar liaison roles should more proactively connect with other potential anchor partners, including Amgen's manufacturing campus, device manufacturers (BD, Zoll), contract research organizations, and regional hospital systems.

- **Expand technical assistance programs providing "C-suite for hire" services addressing the management expertise gap cited by scientific founders.** Many Rhode Island life sciences startups are founded by faculty or students with deep scientific expertise but limited business, regulatory, or operational experience. This gap frequently leads to underrealized market opportunities or company relocations to access experienced management teams. Both RILSH and the New England Medical Innovation Center (NEMIC) are leading efforts in their respective technology areas of interest to help fill this gap in business acumen. Ongoing efforts to create a vetted network of experienced life sciences executives (CEOs, CFOs, regulatory affairs, clinical development, business development) should be both expanded as well as coordinated. Efforts should focus on convening talent available for mentorship or fractional and/or interim engagements by providing structured matching between companies and executives based on company stage, technology area, and specific needs enabling access to experienced management before companies can afford full-time salaries. This structure mirrors other successful programs where formal "executive loan" or "entrepreneur-in-residence" programs have demonstrably improved startup success rates by providing operational expertise during critical development stages.

- **Help catalyze an increase in physical capacity to meet the needs of firms that are "graduating"/ scaling.** As previously noted, Rhode Island and RILSH have deployed significant state capital to build out Ocean State Labs—the state's first dedicated life sciences incubator, co- located with the new state health laboratory in Providence's I-195 District, providing wet lab and office space for early-stage firms. As this emerging cluster grows, there will be a need to establish a strategic infrastructure readiness fund to provide grants or low-interest loans specifically supporting in-state life sciences facility buildouts, expansions, or specialized equipment purchases by companies demonstrating growth trajectories and employment commitments. This fund addresses a critical gap where early- and mid-stage companies need to invest in manufacturing scale-up, quality systems, or clinical capabilities but face difficulty accessing traditional financing for facility improvements because bio industrial speculative space is not available in the commercial market.

## Case Study/Best Practice

**Connecticut BioScience Facilities Fund.** At a time in the late 1990s when the State of Connecticut was hampered by the lack of wet lab space, it created the BioScience Facilities Fund to help finance the construction of wet-lab space. The BioScience Facilities Fund provided financing to qualified biotechnology companies already in Connecticut, or to firms thinking about moving to the state, for the construction of wet-lab and related space. The Fund was instrumental in assisting the startup and expansion of Connecticut biotech companies. Over an approximate 10 year period, the fund invested $33 million to facilitate the construction of more than 320,000 square feet of new laboratory and related space in the state. Funding was structured as equity, convertible debt, or debt with warrants depending on individual circumstances of the deal.

- **Position Rhode Island competitively through targeted attraction strategies focused on early-stage life sciences companies aligned with the state's research "brand".** Rather than attempting to compete for large pharmaceutical company facilities or broad-based biotech relocations, Rhode Island can target companies where the state's specific attributes create value such as:
    - Firms needing cost-effective lab space and design-to-manufacture services while maintaining access to regional investors, partners, and talent,
    - International life sciences companies establishing first U.S. operations where Rhode Island's lower costs, accessible management, and "soft landing" infrastructure provide advantages over other markets' scale and complexity,
    - Neurosciences and aging-focused companies seeking proximity to Brown research collaborations and access to clinical populations through Brown University Health,
    - Emerging regenerative medicine and RNA-based therapeutics/diagnostics companies aligned with key researcher expertise or university center funding, and,
    - Medtech firms leveraging Rhode Island's established design-to-manufacture ecosystem for product development and early production.

Marketing materials and site selection engagement should emphasize these specific value propositions, with particular attention to targeting first "entry point" domestic offices of foreign-based life sciences companies (particularly European and Israeli neurosciences and digital health firms), where Rhode Island's accessible scale, proximity to major funder networks, and focused support can attract initial U.S. operations.

## Case Study/Best Practice

**BioCrossroads, an initiative of the Central Indiana Corporate Partnership.** The Central Indiana Corporate Partnership (CICP) was formed in 1999 to align CEOs from major corporations, universities, and foundations around regional prosperity. In 2022, it launched its first initiative, BioCrossroads (initially the Central Indiana Life Sciences Initiative), to turn Indiana's disparate strengths into a collaborative cluster strategy. Founders from Eli Lilly and Company, Indiana's research universities, and civic partners organized BioCrossroads to be a neutral convener and capital catalyst for the state's signature sector. Over two decades it has matured from a coalition into a cluster builder with a clear remit: connect partners, mobilize capital, and stand up shared infrastructure that compounds the ecosystem's advantages.

BioCrossroads executes through a disciplined playbook:

- **Capital formation**—organizing fund-of-funds (Indiana Future Fund, INext) and Indiana Seed Funds I–III that have invested in 30+ startups and unlocked hundreds of millions in follow-on capital and notable exits.
- **Enterprise creation**—helping launch statewide assets such as the Indiana Health Information Exchange, Indiana Biosciences Research Institute, OrthoWorx, and anchoring partners inside the 16 Tech Innovation District.
- **Strategy and promotion**—publishing annual capital and industry reports and a 10-year Strategic Roadmap that targets national leadership in pharma manufacturing, medical devices, and fast-growing R&D niches.
- **Talent pipelines**—serving as the industry talent association for healthcare and life sciences, leading youth-apprenticeship (INCAP) and mentorship efforts. Recent place-based and federal wins (e.g., IU LAB at 16 Tech and the Heartland BioWorks Tech Hub award) further expand translational capacity, startup support, and biopharma manufacturing training.

The cumulative impact is measurable and compounding. Indiana's life-sciences economic activity grew from roughly $32B in 2002 to ~$100B in 2024. TEConomy's two-decade analysis ties BioCrossroads' collaboration and capital strategies to outsized job creation, rising academic R&D, and sustained competitiveness. The latest capital snapshot (2023) tallied $5.5B in sector capital, including $287.5M in venture, $3.5B in M&A, and $1.5B in facility investments adding 750 new jobs—evidence that attraction, expansion, retention, and startup formation are reinforcing one another.

# **STRATEGY 3:** PURSUE RESILIENCE AND RISK MANAGEMENT TECHNOLOGIES AS AN INNOVATION-LED GROWTH OPPORTUNITY



## *Rationale*

Rhode Island possesses distinctive assets enabling the state to establish a differentiated, forward-looking innovation cluster focused on resilience and risk management technologies, an area with demonstrated and growing market demand, clear commercial pathways, and natural advantages in research capability, testing infrastructure, and geographic positioning. FM's world-leading research facilities, IP portfolio, and direct market access to a global customer base of major corporations and institutions represents a near-term anchor and innovation catalyst, leveraging the company's applied research in fire suppression systems, flood mitigation, wind-resistant building systems, industrial process protection, and critical infrastructure resilience. This research generates significant intellectual property, identifies capability gaps, and creates demand signals for innovative solutions addressing customer needs that can directly lead to formation and growth of new Rhode Island-based companies.

Rhode Island's research base similarly includes distinctive capability in ocean engineering, coastal systems, and climate change hazard modeling distributed across URI and Brown. These research capabilities, while currently more focused on scientific research and less on commercialization, demonstrate the technical foundation and domain expertise necessary to scale innovation activity in resilience and loss prevention over time, particularly given demonstrated market demand from broader customer bases across municipalities, large-scale commercial and industrial property owners, and infrastructure operators facing rising flood, storm, and climate risks.

Rhode Island's coastal geography also creates both distinctive market demand and natural testing advantages. The state experiences direct exposure to hurricanes, nor'easters, storm surge, and precipitation-driven flooding and property owners, municipalities, and critical infrastructure operators face rising adaptation costs and insurance premiums. Simultaneously, this geography creates unmatched opportunity for real-world testing and validation of resilience technologies, where developers can rapidly iterate between controlled testing leading physical demonstration facilities and field trials at actual coastal properties and infrastructure facing genuine environmental hazards. Providence's position as a major commercial and civic center, with aging infrastructure, flood-prone neighborhoods, and active municipal government commitment to resilience, positions the city as an ideal "living laboratory" for demonstrating integrated resilience solutions across civic infrastructure, energy systems, and commercial property.

This opportunity aligns with sizable markets, where risk of losses from natural disasters and industrial incidents are driving demand for innovative loss prevention and risk analysis solutions from insurance companies, governments, and enterprises. Establishing Rhode Island as a hub for resilience and risk management technology innovation would enable the state to pursue a differentiated innovation identity that complements rather than competes with other regional innovation ecosystems while also providing the potential to further diversify existing industries into new markets.

## **Action 9:** Establish a Signature Loss Prevention and Resilience Technology Commercialization Initiative

Rhode Island should establish a public-private partnership entity specifically focused on bridging FM's research portfolio and testing capabilities with existing research excellence at state research institutions to identify, develop, and commercialize resilience and risk management technologies. The entity would function as an independent but closely coordinated intermediary, analogously to how the existing model at NUWC Newport enables transition of Navy-funded research into industrial application, elevating priority capability focus areas, coordinating technology development roadmaps aligned with market demand, and providing demand signals from industry partners to guide research investment.

The commercialization initiative's core functions should be to:

- Systematically evaluate and develop intellectual property emerging from Rhode Island's research strengths in coastal engineering, climate modeling, advanced materials, and related fields, while also drawing on the applied R&D portfolios of major industry research institutions such as FM to identify technologies with clear market potential, freedom to operate, and appropriate commercialization pathways.

- Actively identify and cultivate industry development partners by mapping technologies to potential customers, integrators, and acquirers in insurance, construction, infrastructure, and industrial markets leveraging, but not limited to, FM's customer and partner network to facilitate introductions and early pilots.

- Broker access to relevant testing and certification facilities (e.g., fire, flood, wind, and structural labs at university testbeds and industry research sites) so research teams and startups can progress from concept to validated solutions and standardize legal and partnership frameworks that lower transaction costs for collaborations with universities and industry labs.

- Support early-stage scaling by managing a small proof-of-concept fund capable of deploying rapid support to advance the most promising opportunities toward pilot deployment or investable readiness.

Importantly, the initiative should be staffed by specialists in resilience and commercial loss prevention technologies and business development who maintain close working relationships with university research leadership, FM, and other industrial partners.

To complement the core initiative, an associated accelerator program should also be created and hosted in Rhode Island specifically designed for resilience and risk management technology companies, providing compressed cohorts focused on technical validation, market definition, and fundraising readiness. The accelerator should provide structured mentoring from experienced entrepreneurs and industry executives with loss prevention and resilience backgrounds, access to FM testing facilities and technical expertise, introduction to potential customers and partners in insurance, municipal government, and corporate risk management, and support navigating regulatory requirements for products in this space.

This accelerator could be paired with an additional early-stage fund specifically capitalized to address development risks and provide bridge financing to address distinctive capital challenges in this market space:

technologies often require certification and proof-of-performance before customers will adopt them, but such validation work requires capital-intensive testing and engineering development. A dedicated fund addressing this gap providing grants or convertible notes for proof-of-concept development, testing, and certification would enable promising technologies to advance through validation stages and become attractive to larger-round institutional investors or corporate acquirers.

## Case Study/Best Practice:

**Duke-University of Georgia Center for Insurance, Risk and Climate Adaptation (CIRCAD).** Launched in October 2025, the Center for Innovation in Risk, Catastrophes, and Decisions (CIRCAD) represents a state-of-the-art model for university-industry collaboration in resilience technology. Operating as a National Science Foundation Industry-University Cooperative Research Center (IUCRC), CIRCAD partners Duke University and the University of Georgia with eight founding industry members that collectively contribute over $500,000 annually, complementing a five-year, $1.5 million NSF grant. The center explicitly positions insurers as central actors in advancing national resilience, bringing together Duke's RESILE initiative and UGA's Institute for Resilient Infrastructure Systems (IRIS) with insurance, reinsurance, and climate data industry leaders to co-develop climate risk models, parametric insurance products, and resilience valuation tools. CIRCAD's research portfolio addresses core industry needs including improved catastrophe modeling that incorporates local-scale risk mitigation measures, nature-based solutions for coastal protection, and standardized climate data platforms while serving as an impartial testing ground where insurers can pilot new strategies before large-scale implementation.

The center embeds professional training directly into its mission through joint courses, internships, and co-op programs that engage students at both universities with insurers, engineers, and policymakers, explicitly training "the next generation of leaders who understand both the science of climate risk and the economics of managing it." CIRCAD benefits from a dedicated industry liaison who ensures research priorities align with emerging industry opportunities, a structural feature highly relevant to a potential model for Rhode Island to emulate in partnership with FM. The center's governance model follows the NSF IUCRC framework, giving industry members formal voice in setting annual research priorities while maintaining academic rigor and independence, creating a sustainable structure for long-term collaboration that generates shared intellectual property, data platforms, and tools accessible to the entire membership.

## **Action 10:** Develop Environment for Rhode Island to Serve as Regional Hub for Resilience Technology Companies

In addition to seeding and developing innovation-backed companies in this space, it will also be important to establish Rhode Island as a geographically concentrated hub for resilience and risk management companies through targeted infrastructure development and strategic positioning of the state as a "living laboratory" for resilience innovation. This requires both physical spaces enabling company formation and growth and strategic branding emphasizing Rhode Island's distinctive advantages.

To rapidly anchor and scale the roots of a new industry cluster, it will be critical to identify and redevelop highly subsidized site locations targeted toward resilience technology companies, particularly at pre-seed and early-stage phases. Potential sites should feature proximity to a combination of research facilities and testing infrastructure enabling close technical collaboration, light industrial prototyping and manufacturing space supporting hardware development and limited production runs, waterfront access for companies developing marine infrastructure protection, flood mitigation for ports, or vessel-based systems, and easy access to both university research facilities and regional investors and talent. The Providence waterfront, with its proximity to both FM's Johnston headquarters and downtown research institutions, represents a particularly promising location for a resilience technology cluster. Available space can be redeveloped as preferentially zoned and infrastructure-supported for resilience technology companies by offering subsidized lease terms for early-stage companies committing to multi-year operations in Rhode Island and establishing clear pathways for companies to graduate from early-stage shared space into larger dedicated facilities as they scale.

It will also be important to work with municipalities, particularly Providence and other flood-prone coastal communities, to establish "living laboratory" partnerships enabling companies to pilot and validate resilience technologies in real-world environments. Rhode Island's coastal geography is exposed to flood, hurricane, and storm surge hazards and thus provides unmatched opportunity for companies to test technologies under actual conditions rather than only in controlled laboratories. As a result, the resilience technology initiative has the opportunity to engage municipalities in active partnership where city governments identify infrastructure challenges (flood-prone neighborhoods, aging stormwater systems, critical facilities vulnerable to flooding), provide property access and necessary permits for pilot installations, and participate in technology evaluation and feedback. These partnerships benefit municipalities by enabling cost-effective innovation while providing companies with authentic testing environments and validated case studies for commercial marketing.

To position the Providence region specifically as a resilience innovation hub, additional coordinated branding and stakeholder engagement efforts should be undertaken. Stakeholders can work with FM, emerging companies, municipal leadership, and economic development organizations to develop consistent messaging around Rhode Island's distinctive position as a center for resilience and risk management innovation. In coordination with state economic development groups, an annual "Rhode Island Resilience Technology Summit" could be developed convening industry leaders, municipal officials, insurance companies, researchers, and entrepreneurs around loss prevention and resilience challenges and innovations. Similarly, supporting research and demonstration projects that showcase Providence as a model for integrating resilience solutions across civic, energy, and commercial infrastructure attract media attention and signal to companies that Rhode Island is a serious innovation environment for this sector.

Finally, the state can support development of complementary infrastructure and services enabling resilience technology companies to operate effectively in Rhode Island. This includes connections to advanced manufacturing capability and precision machining services supporting product development and production, partnerships with design firms and system integrators that can support prototype development and demonstration projects, opportunities for new workforce training in areas like civil systems engineering, structural analysis, and climate resilience, and connections to capital and business development resources through the commercialization initiative and state economic development programs.

# **STRATEGY 4:** SUPPORT AG AND FOOD INNOVATIONS AS AN INNOVATION-LED GROWTH OPPORTUNITY

## *Rationale*

Rhode Island's ag and food innovation ecosystem represents a distinctive and under-leveraged asset for innovation-led growth. Unlike vertically integrated agricultural regions, Rhode Island's strengths are distributed across the agri-food value chain—spanning sustainable aquaculture, specialty food product development, and advanced packaging and process innovation—underpinned by enabling technologies in controlled environment agriculture (CEA), precision/smart agriculture, and marine-derived functional ingredients and bioactive compounds. This structural characteristic of distributed excellence across URI, JWU, and Brown's strong research base across creates the conditions to evolve from a successful culinary entrepreneurship hub into a differentiated, science-backed agri-food innovation cluster with line-of-sight to commercial pathways to similarly constrained urban foodsheds in the Northeast.

The economic and scientific foundation is real and growing. Rhode Island's ag and food sector is anchored by commercial fisheries, whose landings value has remained over $100 million in recent years. Rhode Island has also experienced steady growth in its aquaculture industry over the past 20 years, growing from 54 acres in 2002 to 384 acres in 2023 with sales topping $8.5 million.[4] Hope & Main has launched over 500 food businesses, evidence of a consistent pipeline of deal flow from concept to commercialization. Johnson & Wales University's College of Food Innovation & Technology (CFIT), which now serves as an FDA Process Authority Product Verification site, the only such facility in Rhode Island, is uniquely enabling regulatory validation helping to remove a bottleneck for scaling food ventures. At the same time, Rhode Island's constrained land base and high costs necessitate higher-value, innovation-intensive production. These conditions naturally favor the state's shift toward aquaculture, CEA, and value-added processing, where design, materials, and process excellence drive competitiveness more than scale.

Demand-side dynamics reinforce the opportunity. Converging pressures—climate adaptation, consumer demand for sustainable and health-oriented products, supply chain resilience imperatives, regulatory shifts in packaging, adoption of precision agriculture and automation, and cold chain modernization—are reshaping market requirements across production systems, enabling technologies, and distribution. Rhode Island is well positioned for high-value specialty products (premium oysters, artisanal foods, functional ingredients), demonstration/validation platforms (CEA systems, sustainable/active/smart packaging), and enabling technologies (sensors, process control, and traceability) rather than commodity production where the state cannot achieve cost advantages. This positioning is strengthened by URI's ocean and aquaculture programs and seawater facilities, RWU CEED's marine and aquaculture facilities, including an indoor recirculating finfish facility, indoor shellfish hatchery, algal production facility, and 1.7-acre experimental aquaculture farm, and Brown's materials, nutrition, and aging research strengths, CFIT's applied culinary science and regulatory verification capacity, and an entrepreneurial base ready to scale provided the right infrastructure, coordination, and capital mechanisms are established.

4 See: https://rifoodcouncil.org/data-dashboard/seafood-and-commercial-fisheries/

Yet, the cluster sits at a critical inflection point. Systemic gaps in mid-scale processing and co-packing infrastructure create a "missing middle" between incubator kitchens and contract manufacturers' minimum runs, forcing promising companies to relocate to scale production eroding local value capture and talent retention. Cold storage constraints limit seafood processors' ability to pursue value-added opportunities tied to regionally landed catch. Organizational fragmentation and limited strategic alignment among research stakeholders dilute impact and slow technology transition. Furthermore, commercialization pathways remain undersized relative to the potential, especially for functional food and marine ingredient ventures requiring bioprocessing scale-up and clinical validation.

Without coordinated intervention, Rhode Island may miss the chance to build a distinctive identity in high-value ag-food innovation that complements its maritime and life sciences opportunities, thereby undermining economic diversification and resilience goals. Conversely, decisive action can convert existing strengths into a cohesive, S&T-led growth engine with near-term wins and durable competitive differentiation.

## **Action 11:** Create a Specialized Ag and Food Innovations Translational Research Initiative

In an effort to convene Rhode Island's numerous assets, a Specialized Ag and Food Innovations Translational Research Initiative should be created. The initiative should be designed to be a state-backed, multi-institution program that bridges scientific discovery and culinary/product concepts in an effort to bring more products to market by coupling shared pilot infrastructure, sector-savvy regulatory enablement, industry co-development, and capital/talent pipelines with focus areas tailored to agri-food domains such as sustainable aquaculture, controlled environment agriculture (CEA), functional ingredients, advanced packaging, and precision/traceability technologies.

There are several line-of-sight applications that would be compelling and actionable for initial areas of focus:

- Premium shellfish production with integrated processing, direct-to-institution channels, and farm-to-restaurant traceability systems (RFID/blockchain) that command premiums for provenance and sustainability.

- Recirculating aquaculture systems (RAS) for finfish, leveraging URI and RWU expertise and regional market proximity for species like striped bass, supported by industrial sites with adequate utilities.

- Kelp and seaweed cultivation for foods and specialty ingredients, including integrated multi-trophic aquaculture (IMTA) demonstrations co-located with shellfish operations.

- Marine-derived functional ingredients and bioactives for nutraceuticals and functional foods—requiring bioprocessing scale-up, regulatory navigation, and clinical validation—aligned with Brown's strengths in aging and behavioral health.

- Health-oriented functional foods co-developed by JWU CFIT (formulation/sensory) and URI (ingredient characterization), validated through clinical and/or academic-industry partnerships, in which innovators can leverage expertise of Rhode Island's academic researchers to accelerate product development, creating Rhode Island-branded products with science-backed claims.

- Sustainable, active, and smart packaging for seafood and perishable goods—compostable formats, antimicrobial/oxygen-scavenging coatings, and sensor-integrated packs—leveraging Brown/URI materials capabilities and the state's precision plastics/composites base.

- CEA demonstration platforms that integrate lighting, climate control, crop optimization, and energy efficiency, serving as commercial validation sites and exportable solutions.

To realize the full potential of a Specialized Ag and Food Innovations Translational Research Initiative and expand the state's innovation-led growth, the initiative should pursue efforts such as:

- **Unified Coordination & Governance:** Establish or empower a dedicated food & agriculture innovation coordination entity to align the ecosystem—mapping assets, closing gaps, convening stakeholders, setting shared priorities, and integrating programs across research, commercialization, workforce, and capital formation.

- **Shared Pilot & Scale-Up Infrastructure:** Invest in pilot facilities by creating shared equipment, Hazard Analysis and Critical Control Points (HACCP) and regulatory compliance infrastructure, and other needed physical infrastructure.

- **Cross-Institutional R&D and Industry Co-Development:** Stand up multi-institution, industry-facing R&D programs (URI, RWU, JWU, Brown, RISD) with anchor company partnerships, focused on areas such as aquaculture CEA systems integration, marine bioactives, and advanced packaging—prioritizing translational research, pilot lines, and rapid tech transfer.

- **Commercialization Pathways & Regulatory Enablement:** Expand sector-savvy technology transfer, proof-of-concept, and regulatory support services (building on CFIT's Process Authority role) to accelerate market validation, reduce time-to-compliance, and de-risk private capital participation.

Collectively, these activities/initiatives will convert distributed strengths into a cohesive innovation cluster, capturing greater value within the state, scaling high-margin specialty products, and advancing enabling technologies with export potential. The result, overtime, will be a durable, differentiated growth area that complements Rhode Island's maritime and life sciences strategies, diversifies the manufacturing base into sustainable packaging and precision processing, and positions the state as a regional leader in science-backed ag-food innovation. With focused investment, governance, and translational support, Rhode Island can turn geographic constraints into a strategic advantage—demonstrating how a small coastal state can build a resilient, high-value food system that marries scientific rigor, product design excellence, and commercial execution.

## Case Studies/Best Practices:

**North Carolina Food Innovation Lab (NCFIL).** NCFIL is an FDA-regulated, cGMP translational program focused on plant-based food innovation, offering research and co-creation, process design and optimization (including extrusion and thermal processing), limited pilot runs, and client training/consulting that take products from ideation through commercialization with dedicated food science staff and structured industry engagement. The program was created through a state partnership (North Carolina State University, the North Carolina Department of Agriculture & Consumer Services, the Economic Development Partnership of North Carolina, and the North Carolina Research Campus) and leverages Golden LEAF Foundation support. The mission of NCFIL is to produce a collaborative environment where academic scientists will partner with industry, entrepreneurs, and government stakeholders to accelerate plant-based food research, development and commercialization in support of the entrepreneurial spirit within the state and enhance the direct recruitment of food industry to North Carolina. In the last year, NCFIL has spearheaded projects related to alternative proteins, product development with novel ingredients, and clinical trials.

**Oregon State University's Food Innovation Center (FIC).** FIC functions as a client-oriented translational program that helps companies move from idea to market through product and process development, sensory and consumer testing, marketing, shelf-life studies, and food safety/regulatory guidance (FSMA, HACCP, cGMP/GAP), delivered by food science professionals using structured project scopes tailored to commercialization outcomes. Partnerships are central to FIC's mission: the center is a joint collaboration between Oregon State University and the Oregon Department of Agriculture and works extensively with USDA and local foods partners to support producers and food businesses by linking technical services with business development to de-risk product launches and market access.

**Cornell Food Venture Center (CFVC).** CFVC provides a comprehensive translational pathway for food entrepreneurs and established brands—custom formulation, process development, safety/stability evaluation, and regulatory guidance—organized to ensure that pilot-validated methods are transferable to co-packers and manufacturing, with documented throughput of 668+ clients served (2022–2023) and 2,000 safety/stability samples analyzed in that period, and 40,000+ products brought to market since 2000. CFVC's program is strengthened by formal partnerships and philanthropy: a $10 million Seneca Foods Foundation gift endowed the pilot plant and director to expand work in both thermal and nonthermal processing; CFVC also coordinates with Cornell AgriTech and related entities such as the Center of Excellence for Food and Agriculture and the Food Innovation Laboratory to link technical services with business development and ecosystem support.

## **Action 12:** Establish Second-Stage Manufacturing Infrastructure and Additional Intermediate Processing Capacity

Hope & Main has launched more than 500 companies in a decade—roughly one in four of Rhode Island's consumer product good startups—creating a steady pipeline of scale-ready ventures. However, as Rhode Island's Food Strategy[5] explicitly warns, as small food businesses begin to scale, they lack access to intermediate food manufacturing/processing capacity, and as a result, many of these successful ventures are relocating to neighboring states. This lack of affordable, right-sized manufacturing and co-packing capacity is stalling Rhode Island's industrial growth in this sector. Hope & Main offers small-batch co-packing, but not at volumes or certifications needed for many scale-ready brands.

Building second-stage infrastructure helps keep the pipeline of startup companies—and their jobs—inside the state's economy. "Second-stage" facilities provide the bridge between incubator-scale and large co-packers, with automated/semi-automated lines capable of hundreds to thousands of units/day, HACCP/PCQI compliance, and category-specific needs (e.g., allergen-free zones, pasteurization/retort, IQF, bottling, and shelf-life/stability testing)—precisely what the Rhode Island Food Strategy identifies as the necessary additional processing and manufacturing infrastructure to reach institutional markets and expand product offerings. For seafood and aquaculture, the Strategy calls out processing capacity and wastewater infrastructure as prerequisites to keep more Rhode Island-landed fish in state (filleting/spec'd portions, prepared formats). Notably, Rhode Island is already moving in this direction: Hope & Main's West End Kitchens expansion and a Providence manufacturing campus financed via New Markets Tax Credits will add multiple shared-use kitchens, co-packing, cold storage, and graduate spaces—a strong proof of concept that merits scaling into a fully-fledged second-stage manufacturing network.

Supporting targeted investments in second-stage manufacturing and intermediate processing will help stem company flight, enable institutional market access, and compound impact from prior incubation investments—turning today's "missing middle" into a durable growth engine for the state.

5 https://assets.simpleviewinc.com/simpleview/image/upload/v1/clients/rhodeisland/rifood17_8575615a-fa9d-4fce-9f5f-867bd8c54fa4.pdf

## Case Study/Best Practice:

**The State of Minnesota's "Right-Sized" Food Manufacturing Agenda.** In 2022, the Minnesota Department of Agriculture and the Agricultural Utilization Research Institute (AURI) published a statewide assessment showing that food and beverage manufacturing delivers the highest economic returns of any industry in Minnesota. The study estimated that a 5 percent output gain could generate ~$11 billion in GDP impact and nearly 168,000 jobs. However, what was impeding this growth was a critical shortage of affordable, accessible "right-sized" co-manufacturing for ready-to-scale brands. The study framed a policy agenda to build the "missing middle" of processing.

AURI—a state-funded nonprofit—operationalizes this agenda through applied research, technical assistance, and industry development, catalyzing plant/equipment investments and firm growth. Reported client outcomes from 2019–2023 include 451 jobs created/retained, $147 million in capital investment in new plants or equipment, and $262 million in annual revenue increases. These efforts have helped companies move beyond shared kitchens into pilot and mid-scale production thereby retaining companies and expanding intermediate manufacturing in state. The model illustrates a pathway to convert food entrepreneurship into durable manufacturing growth.

## **Action 13:** Increase the Amount of Innovative Research Conducted in Rhode Island Around "Smart" Agriculture and the Agri-Food Nexus

Rhode Island's food innovation cluster has historically been market-driven and entrepreneurship-focused rather than intensely research-anchored, with prior assessments explicitly noting the absence of significant university R&D or large-scale innovation hubs backing the sector. This research deficit constrains the state's ability to capture high-value segments of the agri-food economy despite possessing natural competitive advantages: severe land and coastal geography necessitating technology-intensive production systems, a specialized aquaculture sector, demonstrated culinary entrepreneurship, and underutilized convergence opportunities between life sciences research strengths and functional food development markets.

Boosting the scale of Rhode Island's food sector into a research-enabled innovation cluster will require a portfolio approach investing simultaneously across multiple interdependent dimensions: physical infrastructure providing shared-use facilities and testing capabilities, applied research programs addressing precision agriculture technologies and food-as-medicine applications, talent development mechanisms creating interdisciplinary research teams, industry partnership models engaging anchor companies in sponsored research, and targeted funding instruments de-risking early-stage translational projects. The state must build complementary capacity across infrastructure, research programming, workforce integration, and commercialization pathways to establish the critical mass necessary for generating intellectual property, attracting R&D-intensive food technology companies, and positioning Rhode Island as a differentiated hub for science-backed innovation in sustainable aquaculture, functional foods, and climate-adapted agricultural systems.

The state should consider a combination of approaches to scaling the ag and food research ecosystem that could include:

- **Establishing Precision Aquaculture and Smart Agriculture Research Infrastructure:** Create a Rhode Island Center for Precision Aquaculture and Controlled Environment Agriculture consolidating relevant capabilities across URI's College of Environment and Life Sciences and Graduate School of Oceanography, and Rhode Island Food Center with RWU CEED's Aquatic Diagnostic Laboratory and the Matunuck Oyster Farm hatchery research facility. Priority research domains might include IoT-enabled sensor networks for real-time water quality monitoring in shellfish farms, computer vision-based automated feeding systems for finfish aquaculture, predictive modeling for harmful algal bloom risk assessment, selective breeding programs for climate-resilient oyster and kelp strains with enhanced nutritional profiles, and energy-efficient environmental control systems for vertical farming addressing New England's cost constraints. These efforts could integrate with Rhode Island's other testing facilities and Narragansett Bay as living laboratories for testing autonomous monitoring platforms, underwater sensor networks, and marine-based controlled environment agriculture systems generating dual-use technologies applicable to Ocean Tech Hub commercial maritime and defense markets.

- **Launch Food-as-Medicine Research Initiative Leveraging Life Sciences Strengths:** The state could establish a cross-institutional Food for Health Research Program linking elements such as Brown's Carney Institute for Brain Science, George and Anne Ryan Institute for Neuroscience, URI College of Pharmacy, URI Department of Nutrition, and JWU's College of Food Innovation & Technology to investigate bioactive compounds in Rhode Island-sourced seafood, shellfish, and seaweeds with applications in neuroprotection, healthy aging, and metabolic health. Research could prioritize characterization of marine-derived compounds in kelp and sea vegetables as well as therapeutic target peptides from local seafood species. Initial clinical validation studies could be scaled through Brown University Health integrated networks and Butler Hospital Memory & Aging Program collaborations. Any promising findings could then be translated into functional food product pipelines via JWU's Food Innovation Design Lab prototyping capabilities and Hope & Main's commercialization infrastructure.

- **Develop Applied Research Capacity in Food Systems Modeling and Supply Chain Optimization:** The state could explore the potential for Brown's applied mathematics and URI's complex systems modeling capabilities to address Rhode Island-specific agricultural challenges including land-use optimization under severe spatial constraints, climate adaptation strategies for shifting Northeast growing seasons, distributed cold chain logistics for networks of small-scale aquaculture and specialty food producers, and food security intervention modeling.

- **Explore Options for Creation of Shared-Use Food Innovations Research Facility:** There is potential to convert underutilized infrastructure into a multi-use Food Systems Research and Testing Facility providing pilot-scale processing equipment for novel preservation techniques and formulation optimization, analytical chemistry instrumentation for nutritional profiling and bioactive compound characterization, sensory evaluation and consumer testing laboratories, and space for industry-academic research partnerships. Co-locating assets near the URI Agricultural Experiment Station and link facility operations to Hope & Main's commercialization services, JWU's culinary development expertise, and proposed other potential strategic investments has the potential to provide a more robust innovation ecosystem supporting concept stages through commercial validation.

- **Expand Targeted Research Funding Mechanisms:** Targeting Innovation Voucher programs specifically for food-agriculture research partnerships and establishing competitive Food Innovation Research Challenge providing grants for university-industry collaborative projects addressing research priority areas (e.g. precision agriculture technologies, functional food development, sustainable packaging solutions, and food waste reduction innovations) have the potential to incentivize further industry-facing applications. There is also the potential for the state to support targeting of additional federal funding through USDA NIFA AFRI programs, NOAA Sea Grant aquaculture research, and NIH nutrition/aging mechanisms while also leveraging RI Life Science Hub's ongoing investments to target support for food-health convergence research through non-dilutive grants for technology validation.

- **Establish Joint Faculty Appointments and Industry Partnerships:** Additional collaborative and cross disciplinary research teams in this area could be promoted through joint appointments linking JWU's culinary innovation faculty with URI nutrition researchers, Brown's biomedical/public health investigators, and RISD's sustainable materials designers to catalyze interdisciplinary collaboration on agri-food innovation challenges. The state could also expand sponsored research partnerships with anchor companies and position clinical research and healthcare system organizations as untapped innovation partner for population health nutrition interventions. Similarly, there is the opportunity to formalize research collaborations between URI Fisheries Extension, commercial fishing operations at Point Judith and Newport ports, and the numerous small- to mid-scale aquaculture operations to ensure technology development addresses practitioner-identified production constraints and market opportunities.

In addition to these potential interventions that could be used to begin to scale research (or others identified by research stakeholders that could advance the potential for a consolidated research identity), Rhode Island university research stakeholders can seek to create a coordinated investment and partnership strategy that clearly articulates and promotes the state's interdisciplinary agri-food innovation aspirations and elevates this "brand" alongside other growth areas highlighted in this report.

## Case Study/Best Practice:

**The North Carolina Research Campus (NCRC), Kannapolis.** Launched as a multi-university research community devoted to human health, nutrition, and agriculture, the North Carolina Research Campus (NCRC) today spans 350 acres and convenes eight universities alongside the David H. Murdock Research Institute (DHMRI) to pursue collaborative science on safer, more nutritious crops, healthier foods, precision nutrition, and clinical research. The campus's model—co-locating academic programs, shared core facilities, and industry partners—was designed to catalyze cross-disciplinary work on plant phytochemicals, post-harvest physiology, and population-based studies that connect agriculture directly to human health outcomes. This approach has been steadily reinforced by state and local partners through ongoing investment and downtown revitalization that positions NCRC as the anchor of a growing life-science zone in the Charlotte region.

NCRC's research portfolio spans bench science to applied validation, with programs investigating how nutrients and plant phytochemicals interact with lifestyle and environment to affect conditions such as cardiovascular disease, diabetes, obesity, and neurodevelopment. The campus highlights collaborative, multi-disciplinary work. Recent funding announcements underscore the breadth of research activity: the Duke Kannapolis Community Registry advancing health-equity research access, a NASA-funded project quantifying viral loads in extreme environments, and the emergence of startups like Atlantic Fish Co. in cell-cultured seafood—all part of a pipeline that translates fundamental discoveries into ag-food innovations and health applications.

Over time, the campus has been scaled and strengthened through targeted public–private investment and place-based development. In 2022, Insite Properties announced a $500 million plan to accelerate build-out in and around NCRC, including ~800,000 sq ft of new office, research, and medical space, 47,000 sq ft of commercial/retail, and 1,200 residential units—explicitly intended to support higher education, research, medical, and industry uses. Parallel city-led downtown revitalization efforts (streetscapes, ballpark, mixed-use housing) have further knit the campus into an active urban fabric, reinforcing NCRC's role as a regional hub for nutrition, crop science, and food innovation that attracts companies, talent, and federal projects.

# **STRATEGY 5:** CATALYZE A ROBUST INNOVATION ECOSYSTEM TO HELP ENSURE ECONOMIC VITALITY



## *Rationale*

Growth in Rhode Island's identified opportunity areas will not happen in a vacuum. To translate research into jobs, firms, and durable prosperity, the state must simultaneously invest in the foundational conditions that make innovation and commercialization possible. Today, Rhode Island's ability to commercialize its research base to its own economic development advantage has not yet been realized. Many academic institutions show uneven technology transfer and commercialization performance because they lack the resources, infrastructure, and coordinated mechanisms needed to transition intellectual property (IP) to market and sustain value-added industrial partnerships. Building a more adaptive and resilient innovation ecosystem requires targeted investments in infrastructure, services, and coordination that enable scalable commercialization, entrepreneurial growth, and sustained engagement with private and federal partners.

National trends underscore why Rhode Island must catalyze a coordinated, adaptive innovation ecosystem rather than relying on legacy, ad hoc approaches to technology transfer and commercialization. National evidence illustrates that it takes proactive leadership to turn campus discoveries into regional economic gains. In addition, in an environment in which it is critical to diversify academic revenue streams, creating stronger inter institutional collaborations to build synergies and eliminate duplication, catalyzing support for startup formation, and developing an intentional focus on value-added industrial relations will help create new and expanded funding models.

Catalyzing Rhode Island's innovation ecosystem therefore means targeted investments in three complementary pillars. First, creating a robust, proactive commercialization system that validates market need, develops prototypes, navigates regulatory pathways, and brings new products to market will build a pipeline of deal flow in the growth opportunity areas. Second, a more holistic industrial relationship building and contracting process so that collaborations move faster and at lower cost. Third, a statewide I Corps style training and mentor network that pairs principal investigators and student teams with serial entrepreneurs and industry experts to accelerate investor readiness and success. Furthermore, these pillars are mutually reinforcing and foster a more robust innovation ecosystem.

The economic rationale is straightforward: these investments convert research capacity into durable prosperity by scaling startups, expanding industry partnerships, and attracting risk capital. By adopting these practices, Rhode Island can systematically translate research into jobs and firms, and build a resilient, connected ecosystem that sustains growth through industry cycles. In short, catalyzing a robust innovation ecosystem is not optional—it is the enabling platform for Rhode Island's long term economic vitality.

## **Action 14:** Create a Robust, Proactive Commercialization System to Build a Pipeline of Deal Flow in the Growth Opportunity Areas

University efforts to translate research to the marketplace were a limited and often ad hoc process until the passage of the Bayh-Dole Act in 1980.[6] Bayh-Dole required universities to take responsibility for intellectual property developed with federal funds, initiating a broadened university role in patent activities and licensing, given that federal funding comprised more than half of university research funding.

By the close of the 20th Century, technology transfer offices were a common organizational feature found at research universities across the nation. However, activities typically involved the ***passive management of intellectual property***. In other words, activities were focused on seeking disclosures of discoveries from research faculty before they were made public, determining whether to file for patent protection based on the novelty and potential market for the technology, and then seeking to license the intellectual property (to either an existing company or to create a new business, often led by the faculty or their graduate students) to pursue the development of a product, process, service or other intervention based on the discovery and its associated license.

In the past decade, it has become apparent to leading research universities that moving research discoveries into the marketplace cannot be fostered effectively through a passive "pipeline" approach. Instead, the process of translation of research discoveries to the marketplace is a highly complex, interactive, and market-driven process that calls for a ***proactive commercialization approach*** to enhancing research discoveries into technology solutions to meet the need(s) of customers in the marketplace. It involves a number of activities, such as assessing technology and its potential markets against current products in the marketplace (e.g., technology and market assessments). It also involves proof-of-concept of the viability of technology and optimizing its engineering and design to meet price points of the marketplace in order to enhance the potential for sales and growth. As a result, the value proposition of university-industry collaborations is significant—universities can offer their cutting-edge solutions based on research discoveries and expertise, while industry partners can bring their understanding of market needs and expertise and capabilities in product development. Finally, for successful startups, it involves addressing product-market fit, identifying and recruiting seasoned management teams as well as securing risk capital that will carry the product and/or firm through the various stages of growth and development.

As a report by the Association of Public and Land Grant Universities on Technology Transfer Evolution explains:

> *University leaders are increasingly responding to the needs of the innovation economy—and in particular their local economies—by including innovation, entrepreneurship, and "economic engagement" programming in their strategic planning processes … In evolving toward broader participation in university economic engagement, technology transfer offices will develop deeper relationships with industry and other community partners; broaden their reach to areas such as education, technology development, and entrepreneurship; and integrate more closely with other supportive administrative functions such as industry contracting.*[7]

6 David C. Mowery and Bhaven N. Sampat, "University Patent and Policy Debates" in the USA, 1925–1980," Industrial and Corporate Change, Volume 10, Issue 3, 1 August 2001, Pages 781–814.

7 Association of Public and Land Grant Universities, Technology Transfer Evolution, November 2017, pages 3-4.

In order for Rhode Island to have a high-functioning innovation ecosystem that focuses on advancing translational research and commercialization capacity, its academic research institutions must combine IP stewardship with market validation, translational development, entrepreneurial support, and strong industrial relations. Elements of the ecosystem must include:

- **Innovation capacity:** To address significant gaps in Rhode Island's capacity and expertise in technology commercialization, establish an integrated innovation function that develops additional capacity and programming to proactively identify and pursue translational/ commercialization pathways for high-potential research.

- **Commercialization pathways:** For high potential commercialization opportunities that are identified, bring together expertise, support, and funding to launch new opportunities. With few exceptions, most discoveries require further development and de-risking prior to making the license or spinoff decisions. Sources of funding for this effort are limited since federal research funding is seldom available for such support, and the technology is too unproven to attract private investment. It is critical for Rhode Island's effort to advance the commercialization of promising technologies to have a sustained program that combines proof-of-concept funding to de-risk technologies with wrap-around commercialization advisory services.

- **Market & competitive assessments:** Evaluating potential market(s) against existing products and emerging competitors to identify compelling customer needs and product–market fit.

- **Proof-of-concept (PoC)/proof-of-commercial-readiness:** Executing milestone-driven translational projects that address critical technical, regulatory, manufacturing, and reimbursement questions to de-risk the technology.

In short, Rhode Island needs a commercialization function that augments traditional tech transfer by focusing on customer need, commercial feasibility, and venture readiness, while building long-term industry partnerships.

Consideration should be given to centralizing the technology transfer and commercialization functionality of the state's public research universities with strong coordination/collaboration with and among its private research universities in order to expand the staffing and operational capacity, provide commercialization support and resources for promising opportunities, develop startup-friendly licensing terms and support services (e.g., standardized agreements with low upfront costs and royalty deferrals), and work to embed commercialization metrics into faculty evaluation criteria. This centralized/ coordinated approach would also allow for the consistent application of best practices, more efficient IP management, and a stronger, unified interface for external partners seeking to engage with Rhode Island's innovation ecosystem.

## Case Studies/Best Practices:

**The Deshpande Center for Technological Innovation at MIT**. The Deshpande Center is pioneering effort to advance commercialization of high potential university research discoveries and technology innovations. The Deshpande Center stands out in its emphasis on ensuring wrap-around entrepreneurial services along with its proof-of-concept funding. An immersive experience exposes grantees to a rich net¬work of experts — including other MIT researchers, venture investors, and executives with experience in early-stage companies —as well as events sponsored by the center and MIT's startup-friendly culture. This includes funding a seasoned entrepreneur "catalyst" mentor for each project by the Deshpande Center to provide the research team with ongoing guidance as they assess market opportunities, commercialize their inventions, and launch startup companies.

Since 2002, the Deshpande Center has averaged roughly $1 million a year in first year and renewal grants. Altogether, 190+ projects involving 500+ faculty, post-docs, and graduate students have been funded, which has generated the following results:

- 51 spinout companies, and
- More than $1.5 billion in investment capital raised by these startups.

**Stanford University High Impact Fund (HIT)** builds upon best practices to help advance technologies to the point where additional external funding or technology transfer, to an existing organization or to an inventor-led start-up, is achieved. Project teams involved with the HIT Fund are provided with hands-on mentoring and coaching resources, including:

- Industry-specific executives and domain experts as advisor(s) through the award term.
- Connections to industry experts who can share actionable insights on key requirements, prototype building, industry standards, and manufacturing at scale.
- Introductions to potential partners, customers, suppliers, collaborators, investors, and advisory board members.
- MBA Interns to help with customer discovery, identifying go-to-market approaches, and analyzing the market opportunity and competitive landscape.
- Patent attorneys and technology licensing experts to help with patent strategy and white space mapping.
- Friendly VCs to offer feedback on go-to-market strategy and investment pitches.
- Business ideation sessions with Industry and domain experts to help identify promising market opportunities and go-to-market approaches.

To build a future pipeline of high-quality commercialization projects, HIT also offers an initial track of Advisory Support Only that can lay the foundation for seeking funding in future years.

In its initial pilot year of 2022, the HIT Fund was already demonstrating results. Thirteen project teams were funded, and by 2023 three had already created companies and were engaged in license negotiations. Collectively, the HIT Fund has facilitated discussions for project leaders with more than 150 industry experts and stakeholders, including potential partners, possible customers, and VC investors.

## **Action 15:** Ensure Industrial Engagements are Advanced between Academic Institutions and Corporate Partners in each of the Growth Opportunity Areas

At a time when innovation, talent, and technology capabilities are the key driving forces for economic prosperity, industry engagement with universities is of critical importance. The close ties and frequent collaborations between universities and companies are not one dimensional but span across a wide range of engagements and collaborative activities. These wide-ranging activities include pre-competitive basic research projects or consortia, applied sponsored research to address a specific company need, licensing of university technologies, corporate education and training, and connections to student talent through capstone/design projects, internships, and job recruitment.

From industry's perspective, the importance of industry engagement with research universities has become increasingly imperative since the evolution from closed models of corporate research to open corporate innovation models coupled with the rise of disruptive platform technologies driving industry innovation. As noted in the Harvard Business Journal:

> *Today, few firms monopolize the technologies on which they rely, and they can no longer absorb the total costs of radical innovation alone. First, technology imitation occurs far more quickly today than in the past, due in part to the global base of technology competitors and the speed of reverse engineering … Second, technology "platforms" undergird new products more than in the past. Basic science in genomics is the platform on which new biological drugs rely; advances in machine learning support the Internet of Things in everything from home appliances to automobiles; and new computational methods manage both power plants and grocery store supply chains. No corporate research center "owns" any of these platforms, but they all must understand and apply advances within them to new products and services … Together, these trends are forcing firms to buck the age-old binary of "making" technology (often in isolation) or "buying" it (often from afar) in favor of "leveraging and learning." Ideally, companies leverage the research capacity in platform technologies of universities and learn from clusters of firms, researchers, and others…*

At the same time, leading research universities are finding significant value from increasing industry engagement. Industry funding of university research is rising in importance in sustaining a university's research enterprise. Since 2010, industry-funded research to universities across the U.S. grew by 78 percent, well outpacing the 44 percent growth of federal funding and helping to drive the 59 percent growth in total university research funding.

Beyond the value of industry research funding, research universities are recognizing a significant value in industry collaborations for the translation of research discoveries into the marketplace. The fast pace of innovation is making it hard for universities to keep up with the commercial demands for applications and solutions, particularly disruptive platform technologies, which meet customer needs. University-industry collaborations offer a mutually beneficial value in which universities can offer their cutting-edge solutions based on research discoveries and expertise, while industry partners can bring their understanding of market/customer needs as well as their expertise and capabilities in product development.

Plus, both industry and universities share a common need for attracting the best and brightest talent. For industry, talent has become a critical competitive factor in their success. Universities are also competing for top students and the capability of universities to have their students engage with leading companies for internships and capstone/senior design projects as well as to be recruited to top companies is a key advantage.

Industry engagement by universities is also a key driver of economic development. An examination of numerous studies published in leading economic journals of the relationship between industry innovation and university research expenditures at the regional level concluded that "almost without exception, the research has found a relationship between the measure of innovation and university research performed in close proximity."[8] According to a study prepared for the U.S. Small Business Administration, "Research universities and investment in research universities are major factors contributing to economic growth in the labor market areas in which the universities are situated."[9]

To help ensure holistic industrial engagements are advanced between Rhode Island's academic institutions and corporate partners in each of the growth opportunity areas, consideration should be given to:

- **Creating dedicated industry contracting functions to oversee all industry contracting at each research university.** Industry contract negotiation is fundamentally different from federal pre-award functions due to industry expectations regarding timelines, IP terms, indemnification, customized work plans, and other matters. By creating a specialized unit to negotiate all industry-sponsored research contracts, capstone/senior design projects, and consortia with industry, Rhode Island's institutions can develop the expertise to serve the specialized needs of industry contracting.

- **Developing business-tested, nimble, industry contract principles/frameworks to be available as a starting point for industry negotiations to improve processing times and change industry perceptions.** There is growing recognition that a barrier to industry partnerships for universities is the time needed to negotiate terms and conditions for industry partnerships and misperceptions of what each party requires. In particular, there are many terms and conditions sought or required by universities that their industry collaborators may not understand, such as right-to-publish clauses, governing law clauses, intellectual property ownership and management clauses, indemnity clauses, and others. The development and sharing of standard agreements and/or term sheets as the starting point for negotiations can remove misunderstandings surrounding a university's interests and ensure more consistency from one negotiation to the next.

- **Catalyzing strategic corporate partnerships within the opportunity areas.** Holistic industry engagement requires being able to effectively and efficiently tap all of the capabilities of a university in collaborating with industry partners across the breadth of faculty expertise, high-quality students, and specialized labs and infrastructure found across Colleges, School, and other Units within a targeted opportunity area. Even at universities with a strong legacy of strong corporate relations, this is not a simple undertaking where multi-disciplinary faculty expertise is needed to serve the needs of corporate partners. By focusing on developing holistic corporate partnerships within the opportunity areas, Rhode Island will seek to cement its economic position.

8 Paula Stephan, How Economics Shapes Science, Harvard University Press, 2012, page 214, citing studies from Adam Jaffe et al "Geographic Localization of Knowledge Sources as Evidenced by Patent Citations," Quarterly Journal of Economics, 108:576–98; Zoltan Acs, et al, "Real Effects of Academic Research," American Economic Review 83:363–67; Grant Black, The Geography of Small Firm Innovation, New York, Kluwer, and Corinne Autant-Bernard, "Science and Knowledge Flows," Research Policy 30:1069–78.

9 Bruce Kirchhoff, "The Influence of R&D Expenditures on New Firm Formation and Economic Growth," Maplewood, N.J.: BJK Associates, 2002.

## Case Study/Best Practice:

**Georgia Tech's Advancement of Corporate Innovation Centers.** Georgia Institute of Technology (Georgia Tech) is well-known for advancing corporate innovation centers. Nearly two dozen Fortune 500 companies have established corporate innovation centers associated with Georgia Tech, typically housed at the university-affiliated Technology Square Innovation District. These include Accenture, Anthem, AT&T, Boeing, GE, Microsoft, and Siemen's. These corporate innovation centers advance strategic "enterprise to institute" collaboration by tailoring a spectrum of engagement options to achieve corporate and university objectives for sustained and productive relationships involving contract research, student and faculty engagement, joint initiatives in science and technology exploration, translation of discoveries into innovations, and signature interdisciplinary research initiatives. Key success factors in advancing corporate innovation centers include proximity to campus and the ability to step outside of normal operations to conduct more "whitespace" development with company-own dedicated space.

Georgia Tech established an Office of Industry Collaboration in 2012, reporting to the Executive Vice President for Research, with the purpose of advancing strategic "enterprise to institute" collaborations. This new office sought to enhance Georgia Tech's industry partnerships beyond traditional corporate sponsored research and student recruitment handled by the existing Office of Corporate Relations that reported to the Office of Development.

Georgia Tech's success in advancing corporate innovation centers is driven by dedicated "account managers" that work to develop a tailored value proposition for each company seeking to collaborate with Georgia Tech. These account managers are charged with undertaking industry outreach, defining a tailored set of activities for each corporate partner, and streamlining administrative hurdles in establishing "enterprise to institute" collaborations.

Additionally, Georgia Tech established new contracting approaches to support the development of corporate innovation centers. To speed up the process for contracting, a range of standardized industry contracting agreements were developed, including for basic research, applied research, demonstration, and specialized testing. These standardized industry contracting agreements are supported by a dedicated industry contracting team, known as the Corporate & International Contracting Directorate, within the Office of Sponsored Programs.

Recently, Georgia Tech announced a new Office of Corporate Engagement that merges the role of the Office of Industry Collaboration in advancing strategic "enterprise to institute" collaborations and the longstanding Office of Corporate Relations for traditional project specific sponsored research and student recruitment into a more cohesive, coordinated approach that can serve as a central clearinghouse and hub for all partner relationships and transactional activities, such as recruitment, research, intellectual property, philanthropy, economic development, and education and training.

## **Action 16:** Invest in Entrepreneurial Support within Rhode Island's Academic Research Institutions Focused on Growth Opportunity Areas

Entrepreneurship education and programming are playing an increasingly important role in how research universities can translate their innovations and the talent of their students to impact society. At the same time, the changing demands of the innovation economy are requiring greater levels of entrepreneurial skills as well as a holistic entrepreneurial mindset no matter what the industry or the position. The importance of entrepreneurship for higher education is captured by the Association of Public and Land Grant Universities in its 2017 report Technology Transfer Evolution:

> *If universities are to be full partners in the innovation economy, we must prepare our students and faculty to participate … More and more, people are creating their own job and career paths, rather than having that path dictated for them by companies and other employers. Acknowledging this, our universities support student and faculty entrepreneurship, and work to create an environment that provides access to resources needed for entrepreneurial success. To create this environment, universities must develop ways to create cultures that not only incubate companies, but also incubate influencers, leaders, entrepreneurs, and other agents of change. Collectively, these are the forces that will drive innovation and economic and societal progress in the future.*[10]

One approach to encouraging entrepreneurship is the National Science Foundation Innovation Corps (I-Corps) program, which began in 2011. At universities across the nation, I-Corps Regional Hubs help nurture and support teams of researchers to participate in the National I-Corps Program and transition their technology concepts into the marketplace. Each Hub provides a range of services, such as infrastructure, advice, resources, networking opportunities, regional I-Corps training, and modest funding to enable these teams to transition their scientific work into the marketplace. Participants learn new entrepreneurial skills by speaking to potential users, conducting customer discovery, and identifying valuable product insights or potential pivots. The Hub also helps guide teams into the National I-Corps Program.

Brown University is a partner institution of the New England Region I-Corps Hub, which was launched in January 2025. This partnership is led by MIT and is composed of seven other New England universities. Through this regional Hub, teams can participate in regional I-Corps programs (I-Corps Spark & Fusion), as part of the pathway for eligibility for the National I-Corps program. At Brown, the I-Corps team works in collaboration with Brown Technology Innovations to ensure I-Corps participants are connected to the entrepreneurship ecosystem at Brown University. The I-Corps program at Brown also collaborates with other universities in Rhode Island to engage faculty, graduate students, and postdocs in regional I-Corps programming available through the New England Region I-Corps Hub.

While URI is not a partner institution of an I-Corps Hub, URI has previously participated in I Corps programming (e.g., NE I Corps@MIT short courses and information sessions delivered with URI Ventures and the RIHub Venture Mentoring Service). Currently, URI partners closely with the I-Corps Program at Brown to increase awareness and knowledge about I-Corps as a resource for URI faculty and students.  The teams from URI and Brown work

10 Association of Public and Land Grant Universities, Technology Transfer Evolution, November 2017, page 17.

closely to recruit teams to regional Spark cohorts through co-hosted info sessions on the URI campus, and are planning to co-host a Blue-Tech focused Spark cohort at a later date.

It is recommended that Rhode Island enhance its participation by developing a statewide I-Corps pipeline. In particular, the state should:

- Further leverage all of Rhode Island's institutions of higher education to expand Rhode Island's I-Corps pipeline of deal flow into the regional I-Corps programming. Catalyzing this pipeline could include requiring participation in I-Corps for certain types of funding applications or other entrepreneurship and innovation programming (i.e., incubators, accelerators, disclosures to tech transfer offices, etc.). Enhancing this effort statewide would help assist a greater number of researchers, faculty, and graduate students from across Rhode Island in launching new startups and in validating market potential.

- Partner with Rhode Island's entrepreneurial support efforts to increase knowledge and awareness about I-Corps opportunities available through the New England Region I-Corps Hub.

- Connect promising graduates of the I-Corps program within the opportunity areas to the identified programs in the earlier strategies when appropriate and/or to the RIHub. Providing post-I-Corps support will be critical to help ensure that I-Corps teams are incorporated into Rhode Island's ecosystem to sustain forward momentum.

## Case Studies/Best Practices:

**The Ohio I-Corps program (I-Corps@Ohio)** helps university faculty, staff, and students from across Ohio turn their research and technology into startups by teaching customer discovery, lean launch, and business model innovation, similar to the national NSF I-Corps program, driving economic growth by validating market potential and connecting innovators with resources for company formation. It's a state-funded initiative focused on developing market-driven value propositions and scalable business models to attract funding and create jobs in Ohio.

**The University of Central Florida (UCF) I-Corps program** helps university researchers and students commercialize technology by providing customer discovery, business modeling, and entrepreneurial training, essentially turning research into startups. While UCF is the primary site, it also acts as a hub working to connect and provide these resources to other Florida academic institutions, aiming to build a statewide innovation ecosystem for moving science from labs to the marketplace faster, often involving other academic institutions in the state and leveraging regional networks.

# IMPLEMENTATION ROADMAP

**Based on TEConomy's assessment of the Rhode Island S&T ecosystem, and its experience implementing S&T Roadmaps around the nation, Table 2 identifies for each strategy and subsequent actions:**

- The classification of **Priority:** critical for those actions that are essential for the success of the strategy, significant for those actions that can make a major impact in advancing the strategy, and important for those actions that can contribute to the success of the strategy.

- The classification of **Timing** goes from immediate to mid-term. Immediate actions are those that should be undertaken in the first year; short-term actions are those to be undertaken in years two and three; and mid-term actions are those to be implemented beginning in years four and five. However, a number of actions implemented during the first five years will take a full 10 years or more to begin to see measurable impacts.

- **Key Performance Indicators (KPIs),** quantifiable measures used to track progress toward specific strategic objectives. In this context, KPIs turn Rhode Island's S&T investments into clear, measurable outcomes (e.g., milestone attainment, startup formation, industry partnerships), enabling leaders to monitor performance, make timely go/no-go decisions, and course-correct to maximize economic impact.

**Table 2.**
Recommended Implementation Plan

| Action | Priority | Timing | KPIs |
|---|---|---|---|
| **Strategy 1: Strengthen and Support the Maritime and Naval Systems Growth Opportunity** | | | |
| **Action 1.** Establish a Maritime and Naval Innovation Advisory Council. | Important | Immediate | Year over year change in the value-added generated by cluster firms.<br>Net New and Retained Jobs + Median Wage Growth in Priority Occupations.<br>Annual $ and # of federal awards (e.g., grants, contracts, OTAs, SBIR/STTRs) secured by Rhode Island entities.<br>Share of tank/lab/in-water trials conducted that convert to contracts, licenses, or recurring revenue.<br>Follow-on risk capital invested per $1 invested and number of firms that reach ≥$10M annual sales and ≥10 FTEs.<br>Value of private capex invested by primes, suppliers, and ocean tech firms |
| **Action 2.** Develop an Integrated Maritime Testing and Prototyping Infrastructure Network. | Critical | Short-term | |
| **Action 3.** Expand and Diversify Collaborative Technology Development Programs Focused on Dual Use Maritime Technologies. | Important | Mid-term | |
| **Action 4.** Establish Sector-Specific Financial Resources to Support Capital-Intensive Early-Stage Ocean and Maritime Technology Companies | Critical | Short-term | |
| **Action 5.** Expand Maritime-Focused Advanced Manufacturing Supply Chain and Workforce Development Programming | Critical | Short-term | |
| **Strategy 2: Foster the Continued Development of the Emerging Life Sciences Growth Opportunity** | | | |
| **Action 6.** Coordinate Neurosciences and Aging-Related Research Clusters Into Focused Tech Transfer "Brand" for the State's Life Sciences Innovation Ecosystem. | Important | Mid-term | Year over year change in the value-added generated by cluster firms.<br>Net New and Retained Jobs + Median Wage Growth in Priority Occupations.<br>Annual $ and # of external awards/funding secured by Rhode Island entities.<br>Value of private capex invested by bio-related companies |
| **Action 7.** Expand Support for Translation Activity in Life Science Research. | Critical | Short-term | |
| **Action 8.** Expand Economic Development Support for Life Sciences Industry. | Critical | Immediate | |

| Action | Priority | Timing | KPIs |
|---|---|---|---|
| **Strategy 3: Pursue Resilience and Risk Management Technologies as an Innovation-led Growth Opportunity** | | | |
| **Action 9.** Establish a Signature Loss Prevention and Resilience Technology Commercialization Initiative. | Important | Short-term | Annual revenues secured, including commercial sales and service contracts, insurer/utility/ infrastructure procurements, and multi site deployment agreements.<br>Share of tested/certified pilots that convert to paid contracts, licenses, or recurring revenue.<br>Value of private capex invested by resilience and risk management related companies. |
| **Action 10.** Develop Environment for Rhode Island to Serve as Regional Hub for Resilience Technology Companies. | Significant | Mid-term | |
| **Strategy 4: Support Ag and Food Innovations as an Innovation-led Growth Opportunity** | | | |
| **Action 11.** Create a Specialized Ag and Food Innovations Translational Research Initiative. | Significant | Mid-term | Year over year change in the value-added generated by cluster firms.<br>Annual $ and # of external awards/funding secured by Rhode Island entities.<br>Share of seafood/aquaculture output processed and packaged in state.<br>Volume of runs conducted by second-stage manufacturing capacity. |
| **Action 12.** Establish Second-Stage Manufacturing Infrastructure and Additional Intermediate Processing Capacity. | Important | Short-term | |
| **Action 13.** Increase the Amount of Innovative Research Conducted in Rhode Island Around "Smart" Agriculture and the Agri-Food Nexus. | Significant | Mid-term | |
| **Strategy 5: Catalyze a Robust Innovation Ecosystem to Help Ensure Economic Vitality** | | | |
| **Action 14.** Create a Robust, Proactive Commercialization System to Build a Pipeline of Deal Flow in the Growth Opportunity Areas. | Critical | Immediate | Share of translational projects that convert into industrial licenses/ options or new venture formation.<br>$ and # of industry-sponsored agreements executed by RI institutions and average # of days from first contact to signature.<br># of startups formed and the share that reach ≥$10M annual sales and ≥10 FTEs.<br>Follow-on risk capital invested per $1 invested. |
| **Action 15.** Ensure Industrial Engagements are Advanced between Academic Institutions and Corporate Partners in each of the Growth Opportunity Areas. | Important | Short-term | |
| **Action 16.** Invest in Entrepreneurial Support within Rhode Island's Academic Research Institutions Focused on Growth Opportunity Areas. | Important | Short-term | |

# A CALL TO ACTION

**Rhode Island is at a decisive moment. The state has the assets to compete in a knowledge-driven economy—deep research capability, strong institutional networks, a distinctive coastal and defense-linked identity, and momentum in key science and technology domains—but assets alone do not produce prosperity.**

Prosperity comes from execution: the ability to move innovations quickly from discovery to deployment, to help firms scale without leaving the state, and to ensure Rhode Islanders can access the skills and opportunities those innovations create. This is why "business-as-usual" is not enough. Rhode Island's advantage is its ability to coordinate and act fast; the risk is fragmentation and slow translation that allow others to capture the value of ideas developed here.

This strategy is a call for Rhode Island's leaders—across industry, higher education, government, and the broader innovation community—to align around a shared agenda that turns research strength into market impact. The Rhode Island Science & Technology Advisory Council (STAC) was established to make science and technology innovation central to the state's leadership agenda and to ensure that research activity is leveraged for commercialization, innovation, economic development, and jobs. And the expectations for statewide coordination are rising: Rhode Island's role in NSF EPSCoR is evolving toward deeper, more continuous responsibilities for ecosystem-wide analysis, alignment to a current statewide S&T plan, and coordinated action across networks and investments. In other words, the moment demands not only a plan—but a system for delivering outcomes.

To compete in today's innovation economy, Rhode Island must focus on the opportunity areas where it has a clear line of sight to significant markets. This line-of-sight approach is the practical filter that separates "interesting ideas" from "investable, scalable priorities." The strategies and actions outlined within this framework are designed to make Rhode Island's innovation ecosystem faster, more connected, and more competitive—so that commercialization becomes repeatable, not episodic; so that existing industries continuously upgrade productivity; and so that new ventures can launch and scale within the state.

Rhode Island has done this before—reinventing itself when old economic models no longer worked. The task now is to do it again, with science and technology as the engine and with a deliberate ecosystem strategy as the transmission. The recommendations in this report translate that urgency into action: what must be aligned, what must be built, and what must be measured to ensure Rhode Island's research strengths become scaled industries, higher-wage jobs, and long-term resilience.


TECONOMY
PARTNERS LLC