Innovation

Collaboration

Investment

MAINE'S BLUE ECONOMY TASK FORCE

A REPORT TO THE MAINE LEGISLATURE

VOLUME 2

DECEMBER 3, 2025

AUGUSTA, MAINE

DEPARTMENT OF ECONOMIC AND COMMUNITY DEVELOPMENT

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Executive Summary

Maine's future is tied to the sea. According to data from the National Oceanic and Atmospheric Administration (NOAA), ocean-related businesses contributed nearly $6.8 billion to Maine's gross domestic product and employed over 90,000 people. Beyond the economic numbers, the ocean is central to Maine's identity. Our more than 5,000 miles of coastline, including inlets and islands, is longer than that of any other state except Alaska.

From the boats we build to the fish and shellfish we catch to the new ideas emerging from our laboratories and working waterfronts, the ocean shapes how Mainers live and work. Many components of our marine-related economy such as our seafood industry, aquaculture, offshore wind, and others have already been the subjects of carefully considered roadmaps and strategy documents.[1] Yet other sectors that provide jobs, spark innovation, and keep Maine's coastal communities thriving have not yet received this kind of careful consideration. Meanwhile, other states and countries have invested significant resources in understanding and growing these marine economic sectors within their borders. Each jurisdiction defines the bounds of this collective differently, yet they typically share the same name. They are referred to as the "blue economy."

In order to allow Maine to join other states and regions in taking advantage of these opportunities, the Legislature established the first Blue Economy Task Force in 2024. Its first priority was to produce a definition of Maine's blue economy. It also identified five economic sectors or industries with high economic growth potential: aquaculture and marine vegetation, marine biotechnology, ocean data and research, resilient coastal infrastructure, and sustainable boatbuilding and marine propulsion. It did not identify these sectors as replacements or even direct competition for other ocean industries that already have clear strategies and investments in place. Rather the Task Force sought to focus attention on new opportunities that could deliver broad benefits for Maine's people and communities, in many cases while supporting our legacy industries. The first report concluded with a series of recommendations to strengthen coordination and investment across the spectrum of Maine's marine sectors. These

Definition of Maine's blue economy

Maine's blue economy means a sustainable and equitable ocean economy that optimizes innovation to expand economic opportunities in our coastal communities and to solve pressing societal needs. It is grounded in Maine's unique maritime heritage, research expertise, and location.

For purposes of this definition, the Task Force further defines "sustainable and equitable" to mean practices that support economic growth while maintaining or improving the health of marine ecosystems and without negatively impacting social, environmental, and cultural aspects of the community.

[1] For a full list see Appendix B of "Maine's Blue Economy Task Force: A Report to the Maine Legislature," Michael Conathan Consulting, et al., January 31, 2025. Available at: https://www.maine.gov/decd/business-development/sites/maine.gov.de.

recommendations are referenced in full in the January 2025 report submitted to the Legislature.[2]

In June 2025, the Legislature reestablished the Blue Economy Task Force and codified the definition of Maine's blue economy. This new Task Force, made up of 23 members and more than a dozen additional participants (see Appendix A), was charged with two priorities: **1) develop recommendations for a Maine Center for the Blue Economy**; and **2) recommend improvements to blue economy workforce and training programs**.

The recommendations addressing each of those directives are summarized here and described in greater detail in the subsequent sections of this report. It is important to note that this work—and the foundation established by the first Task Force—moved forward with the understanding that other major ocean sectors were already progressing under pre-existing strategies and institutional processes. As these sectors evolve, the Blue Economy Center could eventually provide a natural venue for added coordination or strategic support. Any future expansion would be guided by the Center's board, executive director, and stakeholders, and would remain consistent with the goals and priorities in this report.

Recommendations for a Maine Blue Economy Center

The Task Force recommends establishing a Blue Economy Center focused on the three key functions Maine needs most to unlock the full potential of its blue economy – synthesizing data, strengthening coordination, and attracting investment. It also developed recommendations for the Center's structure, governance, and budget. These recommendations are summarized here and explained in greater detail in the Center Design Considerations section, which includes a table of recommended activities and deliverables, a set of guiding principles, and a suggested implementation framework.

The Center's Key Functions

1. *Synthesize data and highlight emerging trends*

   The Center should gather, analyze, and share data, including creating an Ocean Economy Database to measure and track key sectors; provide these data through accessible tools such as an online portal; and communicate emerging trends and insights.

2. *Coordinate Maine's blue economy ecosystem*

   The Center should serve as a navigator for Maine's blue economy by connecting partners and aligning initiatives in the public, private, and nonprofit sectors; support workforce development efforts; and ensure marine industries outside the five identified sectors remain central to economic decisions.

[2] Maine's Blue Economy Task Force: A Report to the Maine Legislature, Michael Conathan Consulting, et al., January 31, 2025. Available at: https://www.maine.gov/decd/business-development/sites/maine.gov.de

3. *Support innovation and attract investment*

   The Center should position Maine to compete for federal, private, and philanthropic funding; promote the state's blue economy to investors and funders; champion policies and programs that support growth of the blue economy; and represent Maine's leadership nationally and internationally.

The Center's Governance, Structure, and Budget

The Blue Economy Center should be overseen by the Department of Economic and Community Development and launched at the Maine Technology Institute or a comparable quasi-state partner organization. It should receive guidance and support from an Advisory Board consisting of 10-15 members. Members should represent the breadth of Maine's coast and include a diversity of marine industries, with a majority of members working directly for businesses and trade groups in the blue economy.

Given the tight budget landscape for FY2026, the Task Force has offered a conservative funding recommendation. It proposes two years of startup support to cover1-2 full-time staff members and initial activities ($500,000 to $1,000,000 per year). For year three and beyond, the Center should pursue bond funding and external investment, potentially in partnership with other emerging economic development initiatives such as the Life Sciences and Innovation Center.

Recommendations for Improvements to Blue Economy Workforce and Training Programs

The Task Force also produced a set of workforce recommendations that outline the Center's role and identify broader training needs Maine must address to realize its full growth potential.

The Role of the Center

The Center should use its role as a statewide coordinating body to:

- Compile and analyze data on blue economy workforce program participation, outcomes, and funding;
- Identify geographic and sectoral gaps in these programs;
- Facilitate collaboration among education, industry, and government partners;
- Serve as a clearinghouse and promoter for internships, apprenticeships, and cross-disciplinary training;
- Track and align diverse funding sources, including state, federal, and private sector.

Additional Workforce and Training Recommendations

While beyond the scope originally envisioned for the Task Force, the following recommendations would strengthen efforts to build Maine's blue economy workforce.

Conduct Targeted Workforce Analyses

Assess workforce barriers and future needs in two specific sectors that are currently underrepresented in such programs: coastal resilience & infrastructure and shipbuilding & sustainable propulsion.

Expand and Coordinate Existing Efforts

Strengthen outreach and marketing for blue economy programs and career opportunities, particularly among K-12 students, and develop a blue economy education map of existing statewide efforts and a communications strategy.

Develop New Models to Expand the Workforce Pipeline

Collaborate with experienced partner organizations to expand workforce pipelines, including exploring service-based or Corps models.

Improve Funding Sustainability

Support resource development and advocacy to sustain and expand workforce initiatives as industry needs evolve.

Conclusion

Throughout its work, both iterations of the Blue Economy Task Force emphasized that as Maine pursues opportunities to grow its blue economy, it must continue to support the industries that shaped our relationship with the sea. The working waterfronts, businesses, and trades built on hard work, ingenuity, and stewardship of natural resources form the foundation on which a new generation of ocean-based innovation will grow.

The Five Blue Economy Sectors Identified by the First Task Force

These sectors build on the skills, knowledge, and problem-solving that have long defined work along Maine's coast. Short descriptions are provided below; a more detailed economic analysis appears in Appendix D.

Aquaculture & Marine Vegetation

Aquaculture is expected to drive most of the world's future growth in seafood production. Maine has more than 300 licensed sites covering nearly 2,000 acres, and seaweed farming has expanded rapidly—making Maine the nation's leading producer of farmed seaweed. Marine vegetation supports food, pharmaceuticals, fertilizers, biobased materials, and potential carbon-removal solutions. Growth will require progress in product and market development, permitting efficiency, community engagement, processing capacity, and global competitiveness.

Marine Biotechnology

Marine biotechnology develops new health, agricultural, consumer, and industrial products from marine organisms. While some products have longstanding roots in Maine, most activity remains early-stage. Advancing toward Maine-made commercial products will require close coordination across research institutions, startups, aquaculture producers, and the proposed Maine Life Sciences Innovation Center.

Ocean Data & Marine Research

Nearly every ocean industry depends on real-time environmental data. This fast-growing sector—NOAA's "Ocean Enterprise"—includes sensors, buoys, autonomous vehicles, mapping tools, forecasting systems, and data analytics/AI. Maine is already a leader in ocean science and modeling. Expanding this sector requires strengthening research–industry collaboration, identifying components Maine can scale commercially, and building a skilled workforce.

Resilient Coastal Infrastructure

Rising seas and stronger storms are challenging Maine's coastal roads, utilities, buildings, and working waterfronts. Preparing infrastructure for future conditions also presents economic opportunity. Maine firms are advancing modern construction and modular fabrication, while universities develop new composite materials. Municipalities and conservation organizations are pursuing nature-based solutions such as wetlands, dunes, and oyster reefs to reduce erosion and protect communities.

Sustainable Boatbuilding & Marine Propulsion

Boatbuilding is one of Maine's most iconic industries, grounded in more than 400 years of craftsmanship. The sector is rapidly evolving with composites, digital design tools, and electric or hybrid propulsion. Maine companies are developing electric outboards, high-capacity batteries, and efficient workboats. As global demand shifts toward low-emission vessels, Maine is well positioned to combine its heritage with advanced manufacturing and cutting-edge propulsion technologies.

Design Considerations for the Maine Blue Economy Center

When considering how best to establish a Maine Blue Economy Center, the Task Force began with a simple premise: form should follow function. Members first discussed what the Center should do – how it could help Maine capitalize on growing economic opportunity. These discussions focused on providing measurable value: connecting people and programs, securing investment, supporting innovation, and tracking progress over time.

The Task Force recommends that any future organizational model emphasize accountability, efficiency, and visible results. The structure the state chooses should build on existing strengths, avoid unnecessary duplication of effort, and use public resources wisely. Members therefore recommend that the Department of Economic and Community Development (DECD) shepherd the next stage of work according to these recommendations, including the formation of the Center and ensuring it has the funding and institutional support for development. The Task Force noted that the Maine Technology Institute (MTI) may be a logical starting point for consideration, given its experience with innovation-focused partnerships.

The following pages describe the Task Force's vision for the Center, including its purpose, core functions, and a framework for implementation designed to ensure the Center delivers measurable benefits for Maine's coastal economy.

A Vision for the Maine Blue Economy Center

The Maine Blue Economy Center will strengthen a thriving, resilient, and inclusive ocean-based economy built on Maine's maritime heritage, world-class research, and spirit of innovation. It will support the needs of coastal communities with differing priorities and opportunities, from Kittery to Calais. It will serve as a hub that connects entrepreneurs, researchers, communities, and investors, by fostering collaboration, attracting new investment, and helping Maine lead in creating solutions that protect ocean health and grow opportunities for generations to come.

Key Functions

The first priorities for the Center's staff should be to form an Advisory Board (described below) and jointly create an initial 2-year strategic plan, including a review of analogous efforts that have already been established in other states and countries, to establish operational priorities and anchor the work and success metrics for the Center going forward. To accelerate development of this plan, the Task Force identified the following three key functions for the Center to focus on at its outset. It also specified a list of objectives and activities to illustrate how these functions could be carried out during the initial term of Center's establishment.

1. Synthesize Data and Highlight Emerging Trends

- Gather, analyze, and share data that inform decisions, measure progress, and identify new opportunities, including by creating an Ocean Economy Database to measure and track the economic contributions of blue economy sectors.

- Provide accessible tools, such as a blue economy asset map hosted on a regularly updated online portal, to help policymakers and partners track outcomes.
- Communicate emerging trends and insights that can guide investment and policy decisions, including through an annual State of Maine's Blue Economy report.

2. Coordinate Maine's Blue Economy Ecosystem

- Serve as a navigator to connect partners and align initiatives, build strong networks, simplify communication, increase collaboration, learn from past activities, and avoid unnecessary duplication of effort. This should include coordination among state and federal agencies, academic institutions, industry groups, and community organizations.
- Provide advice to support workforce development efforts at partner institutions to attract, train, and retain talent in ocean and coastal industries.
- Ensure Maine's traditional industries remain central to the state's evolving blue economy.

3. Support Innovation and Attract Investment

- Identify funding opportunities and position Maine to compete for government, private, and philanthropic investment in blue economy sectors where the state has competitive strengths.
- Promote Maine's blue economy, shining a light on the state's strengths and opportunities targeted at investors and funders.
- Champion policies and programs that support sustainable growth across blue economy sectors.
- Represent Maine's leadership in ocean innovation at regional, national, and international levels.

Activities & Deliverables

Key Function	Activities	Deliverables
KEY FUNCTION 1: **Synthesize Data & Highlight Emerging Trends**	• Create an Ocean Economy Database to track economic performance, jobs, and investment. • Compile an asset map highlighting facilities, workforce, and funding resources and host it via an online portal.[3] • Publish an annual State of Maine's Blue Economy report with performance metrics and emerging trends. • Publish a regular newsletter.	• Database • Asset Map • Annual Report • Newsletter

[3] The Task Force notes that versions or components of this asset map already exist and can serve as a starting point for this activity. These include efforts by the Gulf of Maine Research Institute and the Roux Institute.

KEY FUNCTION 2: **Coordinate Maine's Blue Economy Ecosystem**	• Strengthen and maintain a statewide Blue Economy Network. • Hold quarterly stakeholder meetings to share updates and align efforts. • Coordinate with entities convening annual blue economy meetings[4] and explore the possibility of combining forces to support an annual multi-day conference. • Proactively include ocean industries beyond the five sectors (e.g. fishing, recreation and tourism, renewable energy, etc.) to identify partnerships and shared opportunities through formal partnerships with other state programs and informal engagement with industry and trade groups.	• Network Directory • Quarterly Meetings • Annual Conference • Partnership MOUs with other industries and sectors
KEY FUNCTION 2: **Support Workforce Development Pathways**	• Compile data on blue economy workforce program participation and outcomes and identify gaps. • Facilitate collaboration among providers, industries, and policymakers. • Serve as a clearinghouse and promoter of internships and opportunities.	• Skills Gap Report; • Blue economy workforce clearinghouse or database
KEY FUNCTION 3: **Support Innovation & Attract Investment**	• Identify funding opportunities to support growth of the blue economy sectors. • Create promotional materials for Maine's blue economy. • Identify policy changes that could facilitate growth • Collaborate with DECD, MTI, other state programs, and investors to align goals and messaging. • Represent Maine in national and international blue economy forums and events.	• Funding Prospectus • Promotional materials • Policy briefing materials • Conference attendance and speaking engagements

[4] Examples include the Blue Economy Innovation Summit most recently convened by the Gulf of Maine Research Institute and the Roux Institute, possible annual events under the Marine Biotechnology Initiative of Bigelow Laboratory and Hatch Blue, and events put on by the University of Maine.

Governance & Structure

- Government Sponsor: Department of Economic and Community Development (DECD)
- Host Organization: Maine Technology Institute (MTI) or comparable quasi-state partner
- Strategic Support: Advisory Board consisting of 10-15 members from all along Maine's coast, including significant representation from individuals working in the blue economy (industry members and leaders of trade organizations), supplemented with representatives from research organizations and academia, Tribal leaders, nonprofit leaders, and representatives of municipal governments. Board members should be asked to provide advice to the Center staff but not have fiduciary or direct oversight authority. They should also be considered ambassadors for the Center and regularly engaged in outreach to stakeholders in their communities.

Budget

In its deliberations about budget for the Center, the Task Force was mindful that the state is operating under particularly tight budget constraints for fiscal year 2026, and it took that situation into account in making these recommendations. The amounts recommended here should be considered a bare minimum for what is actually needed for the Center to have a chance at achieving success. The Center should also have authority to raise and manage outside funds, using state contributions as a match for federal and philanthropic support when possible.

- **Years 1-2:** Provide startup funding for two years of operations, covering core personnel and initial activities ($500,000 to $1,000,000 per year)
- **Years 3 and beyond:** Seek bond and external investment, potentially in partnership with other emerging economic development projects in the state such as the Life Sciences and Innovation Center.

Guiding Principles

The Task Force agreed that the Center's work should be grounded in the following guiding principles.

- **Stability & Nonpartisanship:** Operate consistently across administrations.
- **Objectivity:** Serve as a neutral convener rather than an advocate for any single sector.
- **Inclusion:** Engage communities throughout Maine.
- **Efficiency & Agility:** Keep a lean, results-oriented structure.
- **Transparency & Accountability:** Report progress annually and invite public input.
- **Integration:** Align with existing state strategies.

A Suggested Implementation Framework

The Task Force recognizes that its list of deliverables is quite ambitious for a Center with a small staff to complete during the first two years of operation. To provide a potential pathway to future development and full realization of the Center's potential the Task Force offers the following suggestions for consideration as part of a five to ten year strategic plan.

Deliverables and Metrics

Short Term (Years 1-2)

- Establish an organizational home and hire 1 FTE Executive Director and 1 FTE Program Manager.
- Establish the Advisory Board and subcommittees (Workforce, Investment, Communications).
- Adopt an annual work plan and transparent reporting system.
- Publish an initial 2-year strategic plan followed by an updated 5-year strategy.
- Create an Ocean Economy Database and Asset Map.
- Publish annual State of Maine's Blue Economy report.
- Grow and deepen the Maine blue economy network

Metrics: Staff in place by Q3 2026; Advisory Board meets quarterly; first "State of Maine's Blue Economy" report delivered to the Legislature.

Medium Term (Years 3-5)

- Secure at least $5 million in external funding from philanthropic, federal, or other sources.
- Pilot one cross-sector innovation project each year.
- Align training programs with existing programs.
- Continue to expand Maine's blue economy network
- Host an international blue economy summit in Maine.

Metrics: Year-over-year growth in investment; new R&D projects; increase in workforce enrollment; growth from baseline of active blue economy businesses and organizations.

Long Term (Years 5+)

- Evaluate structure and recommend transition to an independent nonprofit or public-private institute.
- Establish a sustainable funding stream or endowment.
- Further strengthen Maine's blue economy network (how many active participants and organizations?)

Metrics: Financial independence through a combination of federal, state, and private sector funding mechanisms; recognition as a leading U.S blue economy hub; measurable growth in GDP contribution of ocean sectors.

Blue Economy Workforce Considerations

The Legislature directed the Task Force to "recommend improvements and expansions of blue economy workforce education and training to encompass the elementary and secondary school system and public and private institutions of higher education." To fulfill this task, the Task Force focused first on what Maine most needs this system to accomplish: helping more people enter, remain, and advance in ocean-related careers.

A subcommittee of Task Force members representing education, industry, and government met four times over two months to assess the state's workforce development landscape and identify opportunities for progress. The group looked to connect existing efforts, reduce duplication, and recommend actions that could deliver measurable results. The findings and recommendations are summarized in this section. See Appendix C for the subcommittee's full report.

Maine's blue economy workforce faces demographic headwinds and emerging opportunities. The state has diverse educational institutions, a growing network of innovation hubs, established degree-granting programs, and short and long-term training programs. However, these efforts lack coordination, ease of access, and ability to transition within and across disciplines. Better coordination across recruitment, training, and education would help Maine build a more resilient and adaptable blue economy workforce.

Workforce Challenges

Maine's demographics and geography present major constraints across the blue economy. The state's median age has risen from 42.8 in 2012 to 44.8 in 2024, well above the national average. An aging population, youth outmigration, and rising housing costs, particularly along the coast, create significant barriers to recruitment and retention. While wages have grown by 75% since 2012, home prices have surged by over 220%. Costs for childcare and healthcare add further pressure for workers and employers.

Recruitment and Retention Issues

Awareness of blue economy careers is limited, career pathways are often unclear, and fewer young people are entering traditional maritime trades. Opportunities for hands-on learning, internships, and apprenticeships exist but are not well coordinated or promoted. Expanding programs such as Jobs for Maine Graduates and the Aquaculture Apprenticeship Program could strengthen recruitment, as could introducing younger students to ocean-related topics in their grade school curricula. Addressing quality-of-life barriers—including housing, childcare, and access to coastal infrastructure—is essential for workforce retention.

Education and Training Gaps

The subcommittee reviewed 25 degree and non-degree institutions offering blue economy programs and found strong foundational capacity but uneven coverage across sectors. Aquaculture programs are well developed, but the other four sectors show significant gaps. Education pathways can be viewed in four phases – **basics**, **specialization**, **connections**, and

innovation – but progression across these stages is inconsistent. Many programs remain siloed by discipline or geography.

Connections Across Educational Institutions

Maine's colleges and training programs offer a strong base for specialized learning, but smaller institutions and non-degree programs can lack visibility and coordination. Cross-institutional collaboration, particularly among science, engineering, and business disciplines, is limited but will be increasingly necessary to prepare a flexible, future-ready workforce.

Small Business and Regional Considerations

Many blue economy businesses in Maine are small or start-ups with limited capacity to train or upskill workers. Education and training programs should therefore be flexible, modular, and available across regions. While the eastern and southern coasts have relatively good access to training resources, mid-coast and other more rural areas continue to face significant gaps in access.

Sector-Specific Observations

The five sectors the Task Force identified are at varying stages of maturity and development. In general, here's where each sector stands.

- **Aquaculture and Marine Vegetation:** Mature sector with comprehensive education and training pathways.
- **Marine Biotechnology:** Emerging field with graduate-level capacity but limited non-degree training and industry linkages.
- **Ocean Data & Research:** Strong in data science and analytics but lacks marine-specific applications and hardware training.
- **Coastal Resilience & Infrastructure:** Under-specified workforce needs; overlaps with construction and engineering sectors.
- **Sustainable Boatbuilding & Propulsion:** Lacks coordinated programs; new initiatives at Maine Maritime Academy show promise.

Workforce Recommendations

Role of the Maine Blue Economy Center

The Center should use its role as a statewide coordinating body to:

- Compile and analyze data on blue economy program participation, outcomes, and funding.
- Identify geographic and sectoral gaps.
- Facilitate collaboration among education, industry, and government partners.
- Serve as a clearinghouse and promoter for internships, apprenticeships, and cross-disciplinary training.

- Track and align diverse funding sources, including state, federal, philanthropic, and private

Additional Workforce Recommendations

The following recommendations are beyond the scope envisioned for the Task Force but would be valuable to building a blue economy workforce in Maine. An entity such as the Maine Development Foundation could be well-positioned to coordinate this work.

Expand and Coordinate Existing Efforts

- Strengthen outreach and marketing for blue economy programs and career opportunities, particularly among K-12 students.
- Develop a statewide blue economy education map and communications strategy to connect programs and raise awareness of available training pathways.

Conduct Targeted Workforce Analyses

- Assess workforce barriers and future needs in the coastal resilience & infrastructure sector, building on the state's infrastructure and rebuilding report.
- Evaluate shipbuilding & sustainable propulsion opportunities, with focus on advanced composites, electrification, and emerging technologies.

Develop New Models to Expand the Workforce Pipeline

- Collaborate with partners such as the Maine National Guard, Volunteer Maine, Educate Maine, the Maine Aquaculture Association, and SeaGrant, to expand workforce pipelines.
- Explore service-based or Corps models that connect students and transitioning workers to blue economy careers.

Improve Funding Sustainability

- Support resource development and advocacy to sustain and expand workforce initiatives as industry needs evolve

Conclusion

The five blue economy sectors identified by the Task Force show how Maine can grow its blue economy in ways that remain true to its maritime roots. Whether this is represented by lobstermen expanding their collaborations with researchers, kelp farmers producing seaweed for bioproducts, or boatbuilders designing electric workboats with forest bioproducts, Maine's future maps directly onto the skills and traditions that have long shaped our coast.

Establishing the Maine Blue Economy Center will better inform and coordinate stakeholders in Maine's marine industries to diversify and strengthen our entire state's economy. Growing and evolving our workforce development programs will ensure that all Mainers better understand the opportunities these emerging businesses will bring to their hometowns, and train future leaders to fill roles from the engine room to the board room.

Thoughtful investment in the growth of Maine's blue economy through these carefully considered recommendations will put our state on a pathway to leadership by leveraging what we have already done so well throughout the centuries: building thriving communities alongside a healthy and productive ocean.

Appendices

APPENDIX A: Blue Economy Task Force 2.0 Membership and Participant List

Blue Economy Task Force Membership - September 24 - December 3, 2025

The resolve stipulates that the Task Force consist of 23 members as follows:

- One member of the Senate, appointed by the President of the Senate
- Two members of the House, representing the two political parties holding the largest number of seats, appointed by the Speaker of the House
- The President of the Maine Technology Institute or their designee
- 19 members appointed by the DECD Commissioner, a majority of whom must represent "a blue economy business or an entity directly involved in the commercialization of blue economy research and innovation."

The resolve further stipulates that the DECD Commissioner "shall ensure to the greatest extent practicable that members who served on the… 'prior task force' are provided an opportunity to serve" on the new Task Force. Since the previous Task Force had more than 23 members, the commissioner opted to appoint the mandated 23 members as "voting" members and invite other members of the previous Task Force and additional key stakeholders to join the meetings in an unofficial capacity.

At no point during its work did the Task Force hold any votes. All its work, including the approval of this report, was carried out by consensus.

Voting Members of the Blue Economy Task Force

Elected officials

1. Senator Jill Duson (D, Portland)
2. Representative Morgan Rielly (D, Westbrook)
3. Representative Tiffany Strout (R, Harrington)

President of Maine Technology Institute

4. Brian Whitney

Co-Chair, Appointed by Commissioner of the Department of Economic and Community Development

5. Director of the Office of Business Development - Charlotte Mace (9/24/2025 - 10/24/2025)

Representatives of public and private research institutions:

6. Nick Battista, The Island Institute (Co-Chair)
7. Brian Beal, Downeast Institute
8. Rhiannon Hampson, Gulf of Maine Research Institute
9. Ann Langston Noll, Maine Aquaculture Innovation Center
10. Beth Orcutt, Bigelow Laboratory for Ocean Sciences
11. Cameron Wake, University of New England
12. Jake Ward, University of Maine

Representatives of businesses that are innovating in various blue economy sectors:

13. Cem Giray, Salmonics
14. Bill Keleher, Kennebec River Biosciences
15. Mitchell Lench, Oceans Balance
16. Nick Planson, Shred Electric

Representatives of fisheries and aquaculture businesses

17. Jeff Auger, Atlantic Aqua Farms, Ltd.
18. Ben Conniff, Luke's Lobster
19. Steven Hedlund, Cooke Aquaculture
20. Jonny Sonnenfeld, Greenhead Lobster

Equity investors in blue economy businesses:

21. Tim Agnew, Bold Ocean Ventures
22. Keith Bisson, Coastal Enterprises, Inc.
23. Jason Mitchell, Norfolk Green

Additional "Non-Voting" Task Force Members invited to participate

This list includes all members of the original Task Force who were not appointed as voting members.

- Patrick Arnold, New England Ocean Cluster & University of Southern Maine
- Sebastian Belle, Maine Aquaculture Association
- Dan Berger, Maine International Trade Center
- Philip Bogden, Roux Institute, Northeastern University
- Deborah Bouchard, Aquaculture Research Institute
- John Caron, The Landing School
- Kristen Danaher, Washburn-Doughty
- Audrey Hodgdon, Hodgdon Yachts
- Sean Ireland, Windward Development Group

- Nathan Johnson, Ocean Renewable Power Company
- Scott Kleimann, Governor's Office of Policy Innovation & the Future
- Ben Martens, Maine Coast Fishermen's Association
- Jack Parker, Reed & Reed
- Brendyn Sarnacki, Maine Maritime Academy
- Chip Terry, BlueTrace

Blue Economy Task Force - Workforce Subcommittee Membership

- Jeff Auger, Atlantic Aquafarms
- Patrick Arnold, University of Southern Maine / New England Ocean Cluster
- Jake Daniele and Eric Weidman, Maine DECD
- Kristin Danaher, Washburn and Doughty
- Ben Conniff, Luke's Lobster
- John Caron, The Landing School
- Senator Jill Duson
- Samantha Dina, Maine Department of Labor
- Rhiannon Hampson, Gulf of Maine Research Institute
- Stacey Keefer, Maine Maritime Trades Association
- Anne Langston Noll, Maine Aquaculture Innovation Center
- Phil Bogden, Roux Institute
- Brendyn Sarnacki and Jennifer Waters, Maine Maritime Academy
- Representative Tiffany Strout
- Cameron Wake, University of New England
- Jake Ward and Katrina Armstrong, University of Maine
- Erica Watson, Maine Development Foundation (for SEAMaine)

Blue Economy Task Force Consulting Team

- Michael Conathan, Michael Conathan Consulting, LLC
- Charles Colgan, Ocean Economics, LLC
- Blaine Grimes, Ocean House Consulting, LLC
- Dana O'Brien, BioHarbor Strategies, LLC
- Laura Taylor Singer, SAMBAS Consulting, LLC

APPENDIX B: Meeting Schedule and Topics

All meetings were held on-line and open for the public to observe.

Blue Economy Task Force Meetings

Wednesday, September 10
10:00AM – 12:00PM
Key Question: What is the unique purpose of the Maine Blue Economy Center?

1. Better understand Maine's strengths and challenges in the blue economy
2. Discuss ideas to describe the unique purpose of Center for the Blue Economy (The What)
3. Generate a list of specific activities that a Center could do to add value to work already underway (The How)

Wednesday, October 1
10:00AM – 12:00PM
Key Question: How should a potential Center operate?

1. Review outcomes from discussion to define the Center's Purpose and Activities
2. Review and discuss options for a Center's organizational structure

Friday, November 7
11:00AM – 1:00PM
Key Question: What are the critical Workforce issues to advance Maine's Blue Economy?

1. Learn from the Workforce Subcommittee and seek agreement on recommendations for a Center's role in supporting Maine's blue economy workforce.
2. Reflect on elements of near final draft recommendations to the legislature on the purpose, structure and tasks of a Blue Economy Center.
3. Discuss initial thinking on host for a Blue Economy Center
4. Provide feedback on outline for the draft report to the legislature.

Tuesday, November 18
9:00AM – 11:00AM
Key Question: Does the Draft Report include the key elements required of the Task Force?

1. Reflect on the draft report to the legislature and suggest edits, additions and critiques.
2. Reach agreement on moving forward the report to DECD for submission to the Legislature.

Blue Economy Workforce Subcommittee Meetings

Tuesday, September 23rd
3:00PM-4:00 PM

Friday, October 10th
9:00AM-10:00 AM

Thursday, October 14th
11:00AM-12:00PM

Monday, October 27th
9:00AM-10:00AM

APPENDIX C: Workforce Subcommittee Report

Report of the Workforce Subcommittee

To The Blue Economy Task Force

Background

One of the two legislatively directed goals of LD1023 was to: "recommend improvements and expansions of the blue economy workforce education and training to encompass the elementary and secondary school system and public and private institutions of higher education." To address this deliverable, a volunteer subcommittee of the Blue Economy Task Force (BETF) met as a group four times over the course of two months to both identify existing workforce development programs and capacities throughout the state of Maine and to consider potential improvements and expansions of blue economy workforce education and training. The work of the subcommittee was supported by Nick Battista, co-chair of the BETF, and consultants Blaine Grimes and Charles Colgan.

There is no doubt that the future of the blue economy depends on the availability of an adequate and appropriately educated workforce. But establishing that pool of workers is not going to be easy. Like Maine's broader economy, the blue economy is affected by demographic challenges including an aging workforce, outmigration, and soaring housing costs. But there are particular challenges for the blue economy, both for existing industries and the emerging ones that will form a major part of the future blue economy. Some of these were highlighted by the initial Blue Economy Task Force.

Maine's Workforce Conditions

The demographic and economic constraints on workforce supply in Maine are well known. One is an aging workforce. In 2012 the median age in Maine was 42.8 years. In 2024 it was 44.8 years, compared with a U.S. median age of 39 years. (Bureau of the Census 2025) Maine's age imbalance does not occur because of a disproportionately large number of people over 65 but because of a disproportionately smaller number of people under 20. This has been

the case since 2000. It is an issue in all of Maine, though somewhat less in urban counties like Cumberland, and much higher in rural counties like Hancock and Washington.

The major implication of this demographic structure is not that there are too few workers for the blue economy but that the blue economy must be very competitive to attract workers from within the pool of young people entering the workforce or recruiting from current employees in other fields. They must be provided with sustainable and well-paying positions to promote workforce retention. These issues underpin the strategies for worker recruitment and skills development discussed below.

Housing affordability is also a common challenge throughout Maine, but particularly in coastal areas. From 2012-2023, wages in Maine grew by 75% unadjusted for inflation (Bureau of Labor Statistics) while the median home price rose by 221% (Maine Association of Realtors). In coastal Maine, the continued investment in seasonal properties has been a major cause of the interlinked problems with price and supply. In Stonington, for example, over half of the housing stock is held for seasonal use. Of note, Maine has the nation's largest vacancy rate (21%) due to seasonal housing use (Colgan et al. 2025), which directly impacts every coastal community in terms of workforce recruitment and retention. This issue extends well beyond the blue economy, of course. It is a national and statewide issue that is highly complex and not within the remit of the subcommittee or the time frame of the Task Force.

Additionally, it should be noted that the blue economy does not necessarily have to take place solely in coastal communities. Some of the most important work in marine applications of composite materials is done in Orono at the University of Maine. Sabre Yachts builds significant custom yachts in Raymond. Marine data need not be held in shoreline communities. Distributing blue economy activity across both inland and coastal Maine is one potential solution. Housing costs are high by historic standards throughout Maine, but there are obviously locations which are more and less affordable. The spatial distribution of Maine's blue economy growth will be shaped in part by variations in housing affordability and availability.

Broadly speaking, blue economy employers face two major workforce issues: 1) recruitment and retention of employees, and 2) availability of adequate education and training opportunities for a changing and growing set of blue economy industries. This analysis points to these two areas as likely challenges across all sectors of the blue economy but given the time constraints of this process we were not able to verify that these are the most important

challenges. We recommend further discussions with businesses in each sector to more specifically identify and understand their workforce needs.

The first challenge is recruitment of employees into the jobs that are available. Many current jobs are in specialized fields that receive relatively little attention from job seekers without specific educational or family connections. This problem is exacerbated by Maine's overall demographic condition with fewer young people. While there are some steps that are being taken to offset some of the disadvantages in recruitment, more can be done, which will be discussed in the recommendations section below.

A second major hurdle is making sure there are adequate and appropriate education and training resources to ensure that the workforce has the requisite knowledge and skills to support a competitive and growing set of blue economy industries. The subcommittee reviewed the programs offered by twenty-five degree and non-degree granting institutions and found that Maine has strong capacity for preparing the current workforce, but the training needs for the future blue economy will require additions and modifications to that capacity.

The array of blue economy education and training programs in Maine is complex, so the subcommittee's review of these programs was at a relatively high level. However, we were able to identify some major strengths and weaknesses. The assessment below examines currently available programs through two perspectives. The first considers workforce development as a means of worker attraction followed by education and training. The second considers the current resources as they may relate to the five sectors identified as the key innovation and development opportunities for economic growth in Maine's blue economy.

Workforce Recruitment and Retention

Recruitment is the point at which an individual decides that they are going to pursue a career in an ocean-related occupation. This could occur early on because of family connections, during formal education years, perhaps as early as primary or secondary school, as a part of post-secondary education or even in mid-late career as an alternate career path.

The breadth of blue economy jobs today is not well understood among students in primary and secondary school. These years are thus an important opportunity to raise awareness and possibly recruit young people to foster an interest in pursuing relevant training and education. In many parts of the blue economy, such as commercial fishing, ship and

boatbuilding, and increasingly aquaculture, there is a strong tradition of intergenerational participation and training that can be expected to continue, provided that these industries remain profitable. Early exposure in middle school and high school to training opportunities and increased availability of two-year programs and certifications can be a pathway to recruit younger people to careers involving work on the water. At the same time, there are fewer and fewer young people available to be brought into family businesses, in part because there are fewer young people overall in Maine and in part because many young people quite deliberately choose another path, oftentimes outside of Maine.

So where can a workforce be recruited? Four major pools of potential supply exist:

1. Young people exposed to the blue economy as part of their primary and secondary education or their basic undergraduate education through specific classes, field trips, apprenticeships, or short courses. There are many organizations offering these types of opportunities, but the level of participation (numbers of students and outcomes) is unclear. Organizations such as the Downeast Institute, GMRI, Bigelow Labs, the Maine Aquaculture Association and the Island Institute all offer such programs, as do many of Maine's colleges and universities. Connecting the dots between programs and coordinating opportunities for young people remains a challenge.
2. People employed in other occupations or industries who might be interested in changing either what they do or where they do it, regardless of educational background or degree.
3. People from outside of Maine. The most important path for these potential recruits is the higher education institutions which attract many students from outside Maine and whose graduates often choose to stay in Maine. One notable example of successful out of state recruitment is the Maine Aquaculture Association Apprenticeship program.
4. Under-represented populations who have historically played only minor roles in the blue economy. For example, women are often strongly represented in the sciences, particularly the life sciences, but are under-represented in engineering and other technical fields. There are also individuals who have an appropriate education but lack access or agency to participate due to gaps in language skills or other cultural barriers.

Various groups have been making concerted efforts to address recruitment particularly through the education system. There are numerous examples of short courses, week-long or

month-long coastal experiences, introductory marine science courses, apprenticeships, and internships made available throughout the state. One obvious place to partner to increase awareness and exposure to blue economy work opportunities would be with Jobs for Maine Graduates which has a broad network of secondary schools, two-year associate's degree programs, and colleges to support career path exploration. Subcommittee members noted opportunities to expand efforts of this type, making knowledge of them more widely available, and finding external support for creation of work experiences such as internships in businesses and other organizations.

There are also efforts to establish focused marine-related education programs at the secondary school level. The Maine Ocean School, launched in Searsport in 2018, but a lack of sustained funding, likely exacerbated by the Covid pandemic, forced the closure of the school whose last class was in 2022. A new effort is underway led by Maine Maritime Academy. Its New Brunswick facility could be the home of expanded programs aimed at the secondary school population.

Supporting workforce recruitment and retention by addressing quality of life issues (e.g., access to reliable childcare, affordable housing, access to the water), particularly in coastal communities, is increasingly urgent. This may, in fact, be the single most important barrier to filling available blue economy jobs.

Building the Skilled Blue Economy Workforce

The process to prepare the blue economy workforce with the appropriate knowledge and skills is highly variable in both time and type. Some key skills can be covered in short day-long or multi-day long courses or programs lasting several years before completion. The process can be broken down into four phases:

1. Basics
2. Specialization
3. Connections
4. Innovation

TABLE 1. Institutions Working in the Four Blue Economy Workforce Phases

Basics	Specialization	Connections	Innnovation
Univ. of Maine	Univ. of Maine	Univ. of Maine	Univ. of Maine
USM	USM	USM	USM
Univ. of New England	Univ. of New England	Univ. of New England	Univ. of New England
Colby College		Colby College	
Bowdoin College		Bowdoin College	
	Maine Maritime Acad	Maine Maritime Acad	Maine Maritime Acad
Northeastern Univ Roux Inst.	Northeastern Univ Roux Inst.	Northeastern Univ Roux Inst.	Northeastern Univ Roux Inst.
SMCC	SMCC		
WCCC	WCCC		
Ctr for Cooperative Aquaculture Research			
	Downeast Institute (U. Maine Machias)		
Cianboro	Cianboro		
The Landing School	The Landing School	The Landing School	The Landing School
	The Island Institute		
Lift All Boats			
Bigelow Lab		Bigelow Lab	
Eastern Maine Skippers			
Maine Aquaculture Association	Maine Aquaculture Association		
Washington Coastal County			
Portland			
Waldo			
Mid-Coast			

There can be a temptation to think of these four phases as a pipeline of education and training starting with basics and continuing to high levels of knowledge where innovation is the focus. But a single pipeline from basics to innovation is a misleading metaphor. Some individuals will find meaningful careers with only the basics while others will build on their specialization or connections. There is, in other words, a network of careers that emerges from the various stages of the central pipeline. This makes the concept of a coordinated statewide approach of continuous skill-building and cross-institution coordination and progression of certification so important.

Table 1 provides an overview of the institutions included in the subcommittee's analysis and these phases. The table obviously hides a great deal of detail but does demonstrate the breadth of places where blue economy education opportunities currently exist. The levels and types of education and training can be roughly described as follows:

Basics

The exact form of basic preparation depends on the specific parts of the blue economy that someone will enter. The basics might include introductory biology, fundamental engine repair, vessel operation, data science, or welding. Other courses in business, the social sciences, or geology may also be foundations for some careers. Basics are offered in the largest number of different institutions. The outputs of these programs can include certificates or some other credential, including micro-credentials that take less time to earn than degrees. Colleges and universities provide basic courses in various academic disciplines. In addition to primarily education institutions, there are also training programs offered by private organizations, such as Cianbro, which offers many courses on the basics of construction methods and practices. Secondary school vocational programs offer basic courses in technical skills, and at least one institution, the Washington County Coastal Vocational-Tech offers a basic course in aquaculture-related skills. The connections between basic courses and future career education and blue economy careers are a key transition point to target as part of recruitment strategies.

Specialization

Specialized programs build on basics and offer advanced education that can become the foundation for specific careers. These programs often include undergraduate majors that lead to

bachelor's degrees, but for some fields, specialized training is completed with associates degrees or advanced certificates. Community college majors are also an important part of these programs. Co-operative programs such as those offered by Northeastern University's Roux Institute provide an additional direct path to experiential learning in industry. Advanced training in construction fields is offered at community colleges and by Cianbro. One of the major challenges in specialized education is that as knowledge and technology keep expanding, the amount of material that must be covered to be considered adequate to current conditions also grows.

Connections

A key requirement and challenge of the blue economy is the ability to make connections across multiple disciplines. The increased scope and rigor of specialized courses require some balance with exposure to other fields if specialized sciences and engineering are to be the foundation for economic opportunities. These transdisciplinary connections can be made with curricula that include minors in addition to majors. Connections can also be made with the dual majors or simply taking courses in multiple fields. Connections can also be made across multiple sciences (biology, geology, physics, chemistry), or between sciences and business, entrepreneurship, engineering, and community decision making, or multiple aspects of climate change. There are also connections made within courses, though these are difficult to detect.

Connections include transdisciplinary training but also links between education and job experiences. Once again, the example of Northeastern University's Roux Institute is an example here with its co-op learning style. Such programs allow graduates of various disciplines to step across academic and industry specific silos and giving them hands-on work opportunities, skills training and validation in careers that they have never imagined. This concept could serve as a model for increased cross-industry and institution coordination to attract and retain a diverse blue economy workforce by providing not just "degree indifferent" internships, but lifelong learning experiences. An effective multi-institution workforce training network can be relevant not only for recent graduates seeking apprenticeship or internship opportunities but for adults interested in pursuing new or alternate careers. This model is likely to be an increasingly common feature of blue economy-related education.

Innovation

Innovation in the form of new products or services or improvements to the production of goods and services can originate from people with almost any educational background. But certain types of programs place more emphasis on advancing knowledge in their fields. These are for the most part graduate programs, particularly at the doctoral level, which is primarily focused on developing new knowledge. Innovation is also a key part of shaping the evolution of blue economy workforce preparation as the development of instructors is a key function of graduate programs. The University of Maine is the principal institution with graduate programs, though the University of New England, The Roux Institute and Maine Maritime Academy also offer masters' degrees. Some masters' degrees at the University of Southern Maine cover fields related to the blue economy, but without a specific blue economy focus.

Tables 2A and 2B display the data from Table 1 in a more traditional format using subjects and credential types. There are many organizations providing non-degree education and offering a variety of credentials and subjects. Degree programs are offered by University of Maine and community college campuses, though no institutions offer as many blue economy related programs as the University of Maine.

Table 2A: Types of Blue Economy Related Course Offerings by Institution

	Marine-related short courses	Vocational / Technical General	Marine-related Vocational / Technical	Marine Science		
				BA/BS	MA/MS	PhD
College / University	Univ. of Maine			Univ. of Maine	Univ. of Maine	Univ. of Maine
			Univ. of New England	Univ. of New England	Univ. of New England	
	Colby College			Colby College		
	Bowdoin College			Bowdoin College		
	Maine Maritime Acad		Maine Maritime Acad	Maine Maritime Acad		
Community College			SMCC			
			WCCC			
Nondegree Institutions			Ctr for Cooperative Aquaculture Research			
			Downeast Institute (U. Maine Machias)			
			Cianboro			
	The Landing School		The Landing School	The Landing School		
			The Island Institute			
			Lift All Boats			
	Bigelow Lab					
			Eastern Maine Skippers			
Trade Assns			Maine Aquaculture Association			
Secondary Vocational Programs			Washington Coastal County	Washington Coastal County		
			Portland			
			Waldo			
			Mid-Coast			

Table 2B: Institutions Offering Degrees in Blue Economy Related Subjects

	Natural Sciences			Aquaculture			Sustainable Boatbuilding
	BS	**MS**	**PhD**	**AA/AS**	**BA/BS**	**MA/MS**	**BA/BS**
Colleges / Universities	Univ. of Maine	Univ. of Maine	Univ. of Maine	Univ. of Maine	Univ. of Maine	Univ. of Maine	
	USM	USM					
							The Landing School
	Univ. of New England	Univ. of New England			Univ. of New England		
	Colby College						
	Bowdoin College						
	Maine Maritime Acad				Maine Maritime Acad		
		Northeastern Univ Roux Inst.	Northeastern Univ Roux Inst.				
Community College				WCCC			
Non-Degree Institutions				Ctr for Cooperative Aquaculture Research			

	Engineering			Marine Affairs / Policy	Computer and Data Sciences		
	BA/BS	**MA/MS**	**PhD**	**BA/BS**	**BA/BS**	**MA/MS**	**PhD**
Colleges / Universities	Univ. of Maine	Univ. of Maine	Univ. of Maine		Univ. of Maine	Univ. of Maine	Univ. of Maine
	USM	USM			USM	USM	
				Univ. of New England	Univ. of New England		
					Colby College		
	Bowdoin College				Bowdoin College		
	Maine Maritime Acad	Maine Maritime Acad		Maine Maritime Acad			
		Northeastern Univ Roux Inst.				Northeastern Univ Roux Inst.	

The Workforce for the Blue Economy Future

Of the five blue economy sectors identified by the Task Force, aquaculture is the most well understood and supported by a number of different institutions. We have a moderate understanding of the workforce needs in marine biotech and ocean data and the least well understood areas are boatbuilding and coastal marine infrastructure. Table 3 rearranges the data again, this time by the availability of programs by the five sectors identified as being key to the future blue economy.

In general, the programs listed here are those that are provided by organizations with specific education and training missions. Missing are workforce development programs that may be run by employers, particularly large employers such as Bath Iron Works. The organizations providing specific skills development provide important support for larger employees but are particularly critical for the many small firms in the blue economy that can provide little or no workforce development services.

Table 3: Availability of Programs in the Five Blue Economy Sectors

		Aquaculture & Marine Vegetation	Marine Biotech	Ocean Data and Marine Research	Resilient Coastal Infrastructure	Sustainable boatbuilding and propulsion
Non-degree	Vocational & On-the-Job Training	X			X	X
	Apprentice & Internships	X		X	X	X
	Certificates	X			X	X
Degree	Associates	X			X	X
	Bachelors	X	X	X	X	
	Masters	X	X	X	X	
	Doctorate	X	X	X	X	

Aquaculture and Marine Vegetation

Aquaculture is the one sector for which Maine currently offers a full range of programs. This is not surprising given the relatively rapid growth of aquaculture at a time of overall labor shortages. There are many "recruitment" type experiences offered by many different institutions to give people a short introduction to the field in the hopes of spurring expanded interest in a career. The one remaining area of weakness is in K-12 offerings.

Resilient Coastal Infrastructure

We don't fully understand the scope and scale of the workforce needs for coastal marine infrastructure. There are programs at all levels that could be applicable or may address aspects of the needs of the sector, for example engineering or environmental permitting. Because many of the jobs in this area involve the building trades, which are taught in multiple types of institutions, the subcommittee is not clear about whether any programs have been developed with a specific focus on coastal resilience and infrastructure support. The sector also includes the composites program at the University of Maine, which is already assisting in the design of more stable infrastructure. The Governor's Commission on Infrastructure Rebuilding and Resilience (Maine Commission on Infrastructure and Resilience 2025) identified several types of jobs in which Maine is deficient, including emergency and resilience planners and emergency managers. These positions are often filled as part of other jobs and full-time people are rare. There exist many opportunities for training and for developing specialists in coastal resilience and infrastructure.

Marine Biotechnology

Of the other sectors which have been designated for growth, marine biotechnology has core capacity that is being developed at the degree and advanced degree levels across the state. The need for non-degree programs in the sector should be further assessed. This represents the relative newness of this field and the fact that there are very few educational assets that explicitly name "marine biotechnology". Education in this field is often made up primarily of connecting courses involving for example, biology and engineering. Some workers with more basic skills, such as lab technicians or assistants, may be involved but they are difficult to identify as distinctly suited for this sector.

Sustainable Boatbuilding and Marine Propulsion

Sustainable boatbuilding and marine propulsion also lacks a clear articulation or plan around the major workforce needs and challenges. This is a clear gap. In this case, it shows up as the mirror image of marine biotech, with some programs available to support basic skills, particularly with the addition of the new Maine Maritime Academy programs at Brunswick Landing. More advanced courses in this field could be included if the composites engineering program at the University of Maine is considered part of this sector.

Ocean Data and Marine Research

Ocean data and marine research is similar to marine biotech in that the relevant education and training programs are difficult to identify as clearly marine related. If this sector is defined as the collection of ocean measurements and the technologies created for that purpose, Maine is well equipped with institutions doing training in data sciences and management, particularly with the addition of Northeastern University's Roux Institute. However, the creation and testing of measurement technologies is a much smaller part. The workforce needs here also remain less clear.

Recommendations

Maine already has a wide diversity of programs filling blue economy workforce needs of all types. Many are long-standing with significant and growing traction; others are relatively new and just beginning to gain momentum. There is, in other words, a firm foundation on which to build further capacity and improve and expand programmatic efforts. That said, the workforce subcommittee identified several actionable steps which could be taken to improve and increase blue economy workforce recruitment, training and retention.

Marketing and Coordinating Existing Program Offerings

The first obvious step to take would be a continuation of existing programs, expanding the number of offerings and topics covered, reaching out to new populations, and building new credentials, both degree and non-degree. More effective marketing of current blue economy career opportunities and availability of education and training programs for students from K-12 should be a priority. Many organizations cited difficulty "getting the word out" given their

respective institutions' small size and budgets and therefore some programs are under-utilized. As mentioned earlier, an early and quick win could be achieved through building a direct connection with Jobs for Maine Graduates to assure that the 13,000 students who are currently part of this program are made aware of blue economy career training and job opportunities.

All the organizations already involved with blue economy workforce issues will seek their own paths to improvements and expansions as the blue economy itself grows and changes. The Task Force is not able to make specific recommendations across all the organizations other than to encourage increased coordination and allocating of resources for the blue economy workforce whenever possible.

Analysis of Workforce Strategy and Programmatic Gaps in Key Sectors

There are a few obvious gaps in our understanding of workforce needs where further work would be helpful. For both the resilient coastal infrastructure and boatbuilding and sustainable propulsion sectors, an in-depth analysis of the workforce barriers, challenges and needs (similar to the work SEAMaine has done for the living marine resource sector) is needed.

- *Coastal Resilience and Infrastructure*
    - The subcommittee suggests using the Infrastructure, Resilience and Rebuilding report as the starting point for identifying the right skills and workforce needs to define the sector.
- *Shipbuilding and Sustainable Marine Propulsion*
    - The workforce analysis for this sector should include a look at both the current needs for existing boatbuilding and related businesses as well as a forward-looking assessment of the future needs of the sector including advanced composites and electrifying marine propulsion.

Data Collection on Existing Programs Across all Five Sectors

Small businesses play a significant role in Maine's Blue Economy. This means workforce development programs and analysis should include a focus on supporting their needs, which has implications on the development and delivery of programs like certificates and apprentice programs. The aquaculture sector could be used as a model for how an apprenticeship program could support smaller businesses in other sectors.

At the same time, the strengths and weaknesses of the existing array of programs and services could be enhanced with planning and program development support from the proposed Maine Blue Economy Center. In particular, the Center could take a closer look at the programs discussed here to get a picture of the relative size of the programs in terms of number of people served and completion recognition (certificates, degrees, etc.) obtained. This would include both the current status of use but also trend data. This would result in a more complete picture of Maine's existing workforce development capacity.

The Center could also work with industry and workforce development organizations to identify ways to fill gaps in the current system, some of which may be geographic, with a concentration of programs in certain areas. A quick overview suggests eastern and southern Maine are relatively better served than the midcoast. This is more the case with programs for recruitment and basic training and education.

Emphasis on Making Connections and Cross Discipline Specialization Opportunities

Cross-specialization programs connecting the different disciplinary perspectives is another area that could be greatly increased with supporting research and planning services from the Center. There are many opportunities for such offerings to be formed by contributions from different organizations so that no one organization must bear the costs of becoming expert in all fields. But such cooperative approaches between institutions are difficult to establish and continue because of inevitable questions about funding and the tendency of all organizations to protect their own capacity. The Center could provide an organizational counterweight to keep cooperative programs operating and encouraging their expansion. It could further assist by leaning into existing cross disciplinary structures, which have been proven to be highly effective.

Internships and apprenticeships were found to be an important link in the workforce development process, in part because of their role teaching basics but also as a key resource in the recruitment of workers into blue economy jobs. Many organizations sponsor these experiences, and it is possible to have more. But these arrangements are sometimes difficult to execute and hard to make visible to potential applicants. The Center could serve as a clearinghouse for available opportunities and help recruit participants to openings. The management of interns and apprentices can be time consuming, and the Center could serve a

facilitation role that could expand these key kinds of opportunities.

Potential Partners/Existing Platforms and Models to Embrace

Among the groups that the Center could partner with that could be a source of additional workforce would be our Maine National Guard and Volunteer Maine, our state service commission. There are many current National Guard members working at Bath Iron Works, and most have educational backgrounds or experience in STEM fields. Additionally, underemployment is an issue with many Guard units, and many blue economy jobs could be appealing to this population. Another path to follow could be the establishment of a Corps, analogous to the Working Waterfront Infrastructure Engineering Corps, which is currently administered by SeaGrant and recruits current undergraduate and graduate students to work with coastal and island communities on making their working waterfront infrastructure more resilient. There is the potential to use the Corps construct to introduce Maine students to aquaculture and commercial fishing as well as other sectors in need of additional workforce capacity. A specialized Corps, while promoting service, can also serve as a workforce development tool, offering students and young Mainers a glimpse into future opportunities in Maine's Blue Economy.

Another role for the Center could be to connect and coordinate workforce development efforts in support of other emerging areas of economic development focus. These include the Defense Industry Alliance, the Blue Biotechnology Initiative at Bigelow Laboratories and the newly designated Maine Life Sciences Innovation Center. Each of these organizations will touch on workforce issues as they are so pervasive in the Maine economy and there is overlap in specializations that can strengthen each of the separate efforts.

Assessment of Funding for Current and Future Needs

Finally, it would greatly help the blue economy workforce development efforts if a more detailed understanding of current funding and possible future funding for workforce development programming could be developed and maintained by the Center. The Legislature is surely the largest funder of programs, but tuition is another key resource, as are contributions from private philanthropy, industry, and the federal government. The funding landscape is likely

to change quickly, and perhaps dramatically, over the next several years so a system-wide assessment and support to delivering organizations is critical.

List of Blue Economy Related Workforce Programs

Part 1: Programs outside the University of Maine

Aquaculture								
Organization/ Program Owner	**Program Name**	**K-8**	**High School**	**Vocational/ Cert.**	**2-year undergrad**	**4-year undergrad**	**Internship**	**Graduate**
Univ. of New England (UNE)	School of Marine and Enviro. Programs (BS & BA)					X	X	
UNE	Business (Marine Entrepreneurship)					X		
UNE	Professional Studies							X
Maine Aquaculture Assn (MAA) & Gulf of Maine Research Institute (GMRI)	Apprenticeship Program			X			X	
MAA, GMRI, Southern Maine CC (SMCC)	Aquaculture Pioneers			X			X	
MAA	Certificate			X				
CEI, Maine Aquaculture Innovation Center (MAIC), SeaGrant	Aquaculture in Shared Waters			X				
Washington County CC (WCCC)	Aqua 101			X			X	
MAA, Maine Maritime Academy (MMA)	Mariculture Certificate			X			X	

Marine Biotech								
Organization/ Program Owner	**Program Name**	**K-8**	**High School**	**Vocational/ Cert.**	**2-year undergrad**	**4-year undergrad**	**Internship**	**Graduate**
Bigelow Laboratory	Keller Bloom (HS), Sea Change Semester (undergrad)		X			X	X	
Aquaculture Research Institute	Applied aquatic animal health R&D			X				

Ocean Data & Marine Research								
Organization/ Program Owner	**Program Name**	**K-8**	**High School**	**Vocational/ Cert.**	**2-year undergrad**	**4-year undergrad**	**Internship**	**Graduate**
GMRI		X				X	X	
MMA	Ocean studies programs					X		
Northeastern Univ. Roux Institute	Masters Programs							X

Ship and Boatbuilding								
Organization/ Program Owner	**Program Name**	**K-8**	**High School**	**Vocational/ Cert.**	**2-year undergrad**	**4-year undergrad**	**Internship**	**Graduate**
The Landing School & UNE	sustainable boat building			X	X		X	
The Island Institute & SMCC	Electric Boat course			X				
MMA	small craft construction labs			X				
MMA	ABYC Certicications (marine systems, elec, diesel, and gas)			X				
MMA	Dual fuel (diesel/NG)					X		
MMA, Brunswick	welding, shipfitting, pipefitting, electronics			X				
MMA, Bath Iron Works				X	X			
MMA, Portsmouth Naval Shipyard	PNS training program (welders, machinists, electricians)			X				

Maritime Operations (General)								
Organization/ Program Owner	**Program Name**	**K-8**	**High School**	**Vocational/ Cert.**	**2-year undergrad**	**4-year undergrad**	**Internship**	**Graduate**
Eastern Maine Skippers			X	X				
Lift All Boats			X	X				
New England Young Fishermen's' Alliance				X				
MMA	ship handling, systems training					X		
MMA, Northern Maine CC	offshore safety and crew transfer				X			

Part 2: University of Maine Blue Economy Programs

Aquaculture								
Organization / Program Owner	**Program Name**	**K-8**	**High School**	**Vocational/ Cert**	**2-year undergrad**	**4-year undergrad**	**Internship**	**Graduate**
UMaine Cooperative Extension (4-H)	K–12 Aquaculture Micro-credentials/Aquaculture Ambassadors	X	X					
UMaine Cooperative Extension (4-H)	4-H Aquaponics Project/Aquarium Club	X						
UMaine CCAR	"Innovations in Aquaculture" 4-H Toolkit/Virtual Field Trips/Portable Touch Tank/Aquaculture Teaching Lab	X	X					
UMaine CCAR	RAS Training (Recirculating Aquaculture Systems)			X				
UMaine ARI	AquEOUS Undergraduate Research Fellowships/Aquaculture Externship						X	
UMaine Sea Grant / MAIC / CCAR	Aquaculture in Shared Waters			X				
UMaine DMC	Semester by the Sea					X		
UMaine DMC	DMC Summer Internships (10–12 weeks)						X	
UMaine Lobster Institute	LI Summer Internships (10–12 weeks)						X	
UMaine SMS	Scientific Diving			X		X		X
UMaine SMS	B.S. Marine Science (Aquaculture Track)					X		
UMaine Graduate School (SMS-led)	M.S. & Ph.D. in Aquaculture & Aquatic Resources/ Dual M.S. in Marine Policy & Aquaculture							X

Marine Biotechnology								
Organization / Program Owner	**Program Name**	**K–8**	**High School**	**Vocational/ Cert**	**2-year undergrad**	**4-year undergrad**	**Internship**	**Graduate**
UMaine Cooperative Extension	UMS Seafood HACCP Micro-credential			X				
UMaine ARI & AAHL	Applied Aquatic Animal Health R&D Training			X				
UMaine SOMA / Engineering	Biomedical Engineering – B.S.					X		
UMaine SOMA / Engineering	Biomedical Engineering – M.S.							X
UMaine Graduate School	One Health & the Environment Graduate Certificate							X

Ocean Data & Marine Research								
Organization / Program Owner	**Program Name**	**K–8**	**High School**	**Vocational/ Cert**	**2-year undergrad**	**4-year undergrad**	**Internship**	**Graduate**
UMaine SMS	B.S. Marine Science / Semester by the Sea					X		
UMaine SMS	Scientific Diving			X		X		X
UMaine SMS	Professional Science Master (PSM) in Marine Sciences							X
UMaine SMS	M.S. & Ph.D. Oceanography and M.S. & Ph.D. Marine Biology							X
UMaine DMC & LI	Summer Internships						X	
UMaine Graduate School	Data Science & Engineering Graduate Certificate							X
UMaine DMC	TORCH Workshops (Coastal Habitats Training)			X				

Resilient Coastal Infrastructure								
Organization / Program Owner	**Program Name**	**K–8**	**High School**	**Vocational/ Cert**	**2-year undergrad**	**4-year undergrad**	**Internship**	**Graduate**
UMaine CIE	B.S. Civil Engineering					X		
UMaine CIE	M.S. & Ph.D. Civil Engineering							X
UMaine Grad School	Graduate Certificate in Climate Science & Adaptation (Online)							X
UMaine ASCC	Offshore Wind Micro-credentials			X				
UMaine ASCC	Student Training – Alfond W² Ocean Engineering Lab						X	X

Ship and Boat Building								
Organization / Program Owner	**Program Name**	**K–8**	**High School**	**Vocational/ Cert**	**2-year undergrad**	**4-year undergrad**	**Internship**	**Graduate**
UMaine ASCC	3D-Printed Vessel R&D (e.g., 3Dirigo)						X	X
UMaine ASCC	Hydrodynamic Testing Training (Alfond W² Lab)						X	X
UMaine ASCC	Factory of the Future – Boatbuilding Bay						X	X
UMaine ASCC	Bio-based Composites & Additive Manufacturing Training						X	X

APPENDIX D: The Economic Outlook for Maine's Blue Economy

This appendix provides additional background on the current state of Maine's blue economy and the broader trends shaping its future. The analysis, prepared for the Task Force, examines long-term employment patterns, global market dynamics, and the five emerging sectors identified earlier in this report. Examples of Maine companies making contributions to the key sectors of the blue economy are provided as well.

Several points from the analysis help clarify why Maine's blue economy presents both challenges and opportunities:

1. Maine's established ocean industries continue to contribute meaningfully, but many show signs of slower future growth.
2. Global blue economy trends indicate growth potential in the sectors proposed for focus in Maine, but also point to significant risks to the blue economy if climate change is not effectively managed soon.
3. The five emerging opportunity areas identified by the Task Force align with where the strongest potential may exist.
4. Better economic data are needed to fully understand performance and competitiveness, and growth potential.
5. Maine already has examples of innovation across the five sectors, but future scale remains an open question.

The Outlook for the Blue Economy in Maine

Maine's entire history is connected with the blue economy since the first European ship, the pinnace *Virginia,* was built at the Popham Colony in 1608. Today, Maine is one of the top five states in the proportion of employment in the six principal blue economy sectors. (Colgan, 2025)

A drive along the coast would show little has changed over the past half century. Bath Iron Works is still building ships for the Navy. Lobster boats still dot the near shore waters. Traffic in the summer along Route 1 remains congested on Fridays and Sundays in the summer. But a closer look shows important changes. There are more cars, but fewer lobster boats. The sardine industry, once the mainstay of Washington County's ocean economy has disappeared in

its entirety. The Portland Pipeline, which made the Port of Portland the largest oil handling port on the east coast, gets only a few tankers a year, replaced in the harbor by cruise ships.

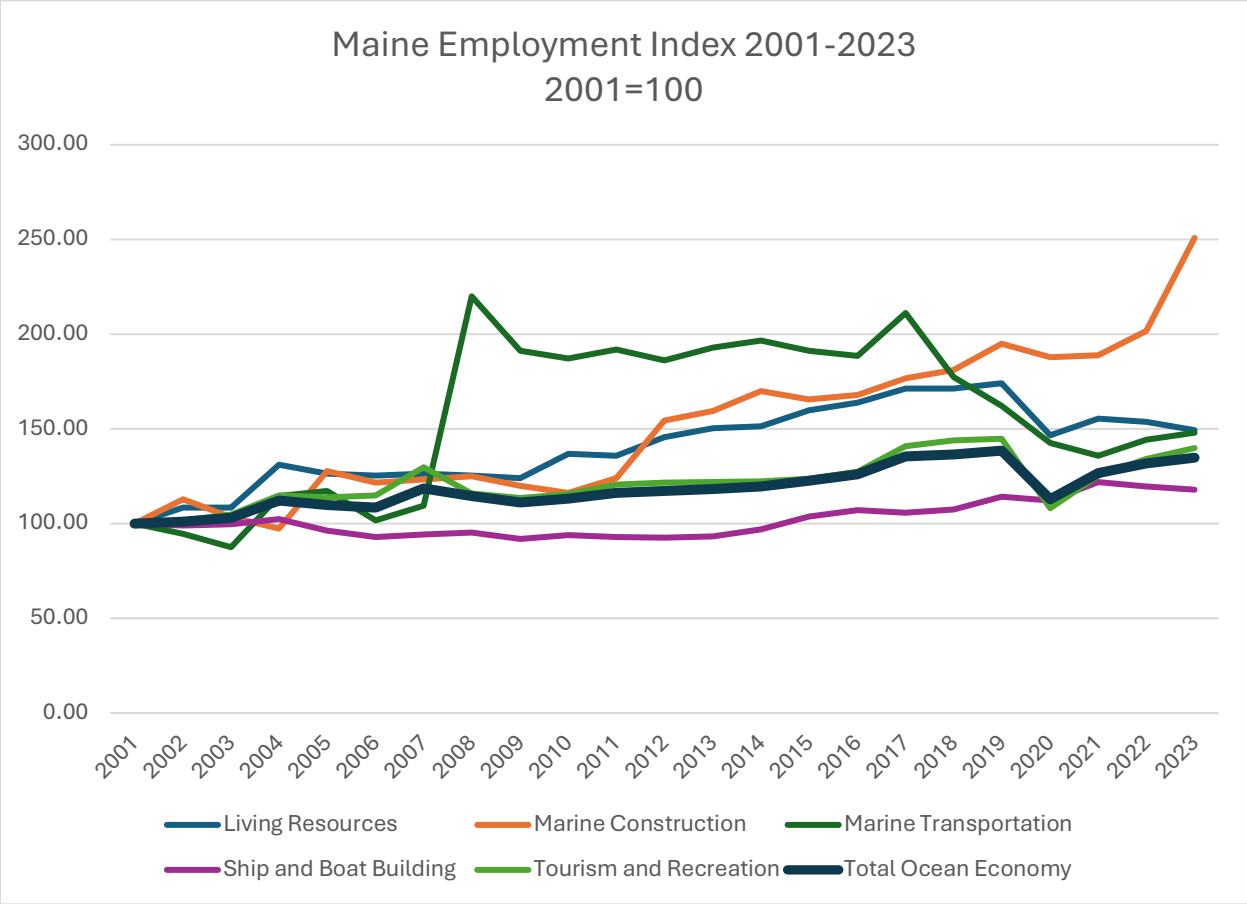

Figure 1. (Source: NOAA: Special Tabulation of Ocean Economy Data)

A portion of the dynamism in Maine's blue economy can be seen in Figure 1, which shows employment in the six principal sectors from 2001-2023 with the levels adjusted to a common index basis of 2001=100. This permits employment levels of greatly different sizes to be shown in a single graph. The total of the five sectors is shown in the heavy black line. The overall trend is driven by employment in the ocean-based tourism and recreation sector, which accounts for almost two thirds (64%) of blue economy employment. The dramatic effects of the Covid-19 pandemic in 2020 are apparent.

Marine transportation showed significant growth thanks to the Eimskip container terminal in Portland and the arrival of cruise ships in Portland, Bar Harbor, and other ports. Some decline in cruise ships from 2018 through the early post-pandemic years is also shown.

Marine construction shows the most significant growth, though this is something of a statistical illusion since this is a small sector in which rates of change can be exaggerated.

The living resources sector is comprised of commercial fishing, fish processing, fish markets and aquaculture. However, it does not include most the employment in the fisheries harvesting because of laws governing the measurement of employment in commercial fishing. The reported growth in this sector is comprised of aquaculture and fish processing, particularly lobster processing.

Figure 2 compares employment change with change in the gross domestic product for each sector, adjusted for inflation. Tourism and recreation and ship and boat building showed growth in output faster than employment. This is a sign of competitiveness, though there are short term factors influencing the last few years. For tourism and recreation there is some of the Covid rebound effect in the post 2020 figures. For ship and boat building, the annual level of GDP is dependent in part on phases of the federal procurement cycle at Bath Iron Works and Portsmouth-Kittery Naval Shipyard in any one year. Marine construction has some of the same annual variation.

Living resources grew at about the same pace in both employment and output. This is most likely related to the large portion of the lobster catch and the shellfish aquaculture that goes to the fresh market with minimal processing. Adding value to this sector has long been a strategic goal for the sector and Maine has made important gains with the growth of lobster processing which has offset some of the declines in groundfish catch.

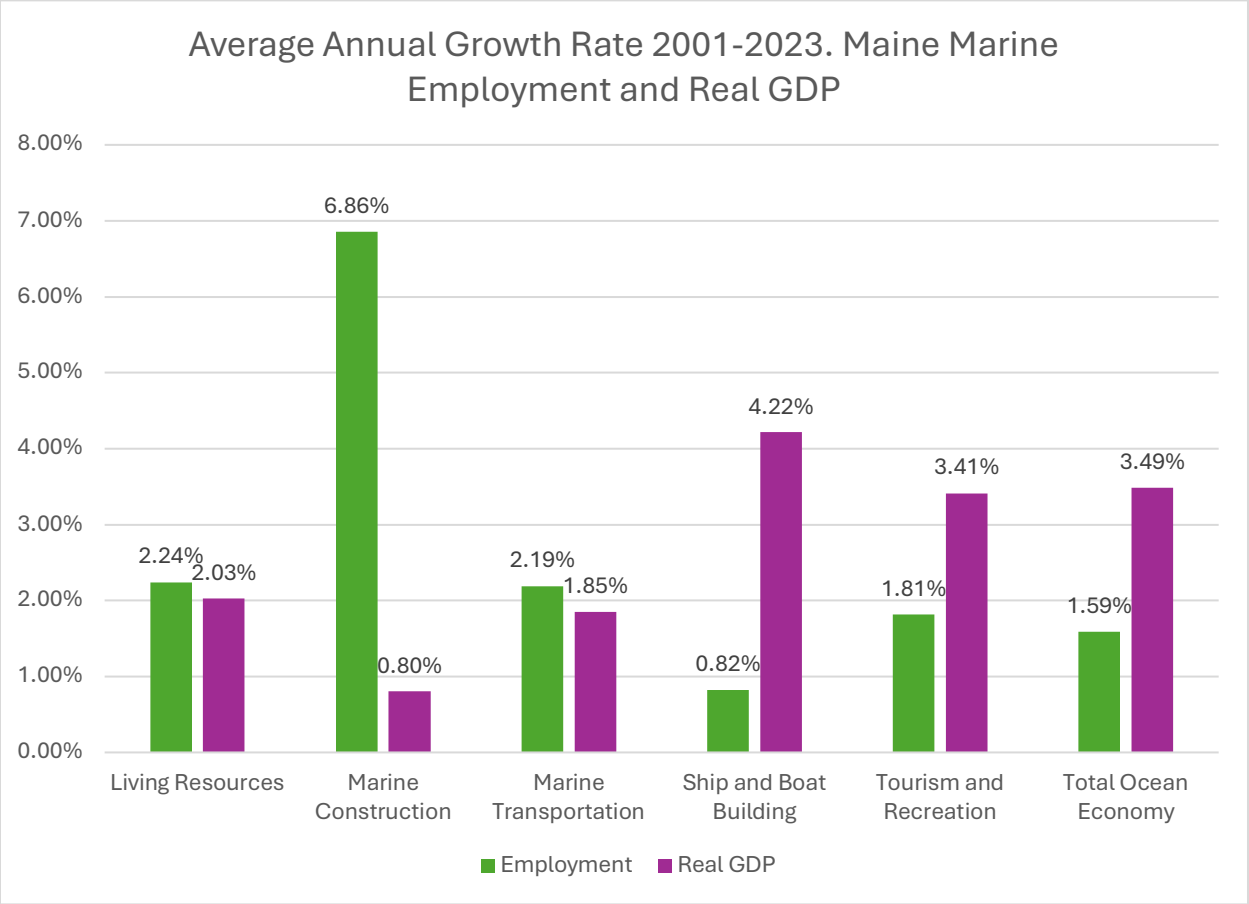

Figure 2. (Source: NOAA: Special Tabulation of Ocean Economy Data)

Figure 3 compares the annual growth rates in employment between the Maine blue economy and the sectors in the U.S. and plus the total ocean economy. One major difference between Maine and the U.S. is found in the offshore mineral resources sector. This is dominated by the oil and gas industry which has no presence in Maine. Of the other sectors, Maine is roughly comparable in growth rates to the U.S. for the sectors except for marine construction, which is subject to the small numbers in Maine, and marine transportation, which is driven in part by growth in the cruise industry throughout the coast and expansions at cargo terminals outside of Maine. Overall, employment in Maine averaged slightly faster growth rates than the U.S. over 2001-2023.

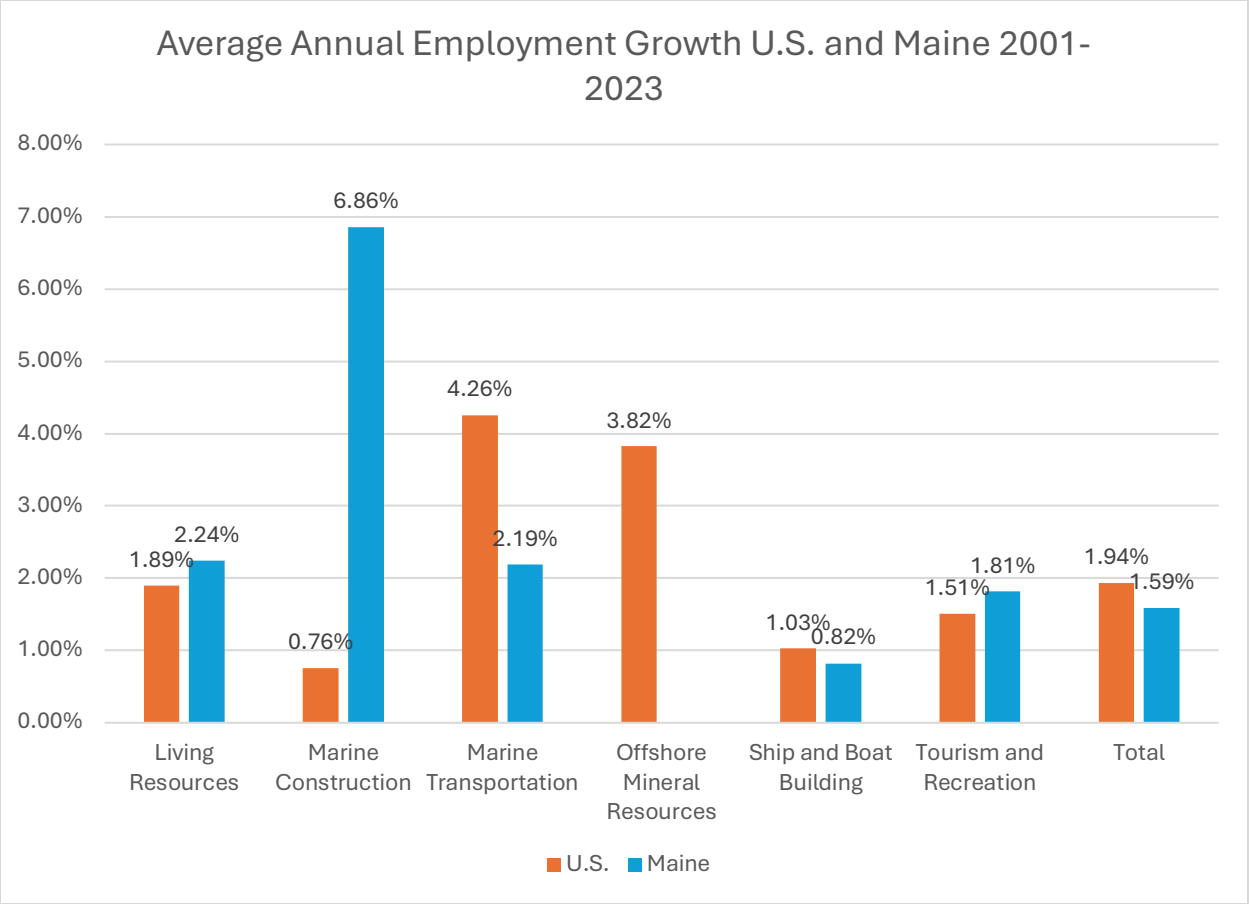

Figure 3. (Source: NOAA: Special Tabulation of Ocean Economy Data)(Organization for Economic Cooperation & Development, 2025)

The past two decades have seen positive annual average growth rates in employment and output in Maine's traditional blue economy sectors, though there have been some temporary and other long-term shifts within and among the sectors. If it is deemed sufficient to let the future be little more than an extension of the past two decades, the blue economy will continue to make solid contributions to Maine, sometimes showing above long-term average, sometimes below long-term average growth rates. But for the most part Maine's current blue economy is comprised of mature industries with relatively slow growth to offset potential declines.

It is unlikely, however, that the growth rates of the past two decades will continue. A starting point for discussion of future prospects is the outlook for the global blue economy. The Organization for Economic Cooperation and Development (OECD) has published two long term outlooks for the global ocean economy. The first, in 2015, covered the period out to 2030. The

most recent version published in 2025 covers the period from 2025 to 2050. (Organization for Economic Cooperation & Development, 2025)

The OECD outlook foresees large changes in the global blue economy primarily due to climate change, which will create significant risks to existing industries and require substantial innovation to maintain even current levels of economic contribution. The definition of the blue economy that OECD uses is substantially similar to that used in the U.S., consisting of the following sectors:

Marine & Coastal Tourism	Offshore Oil and Gas
Transportation & Ports	Fishing & Aquaculture
Ship building & Marine Equipment	Trade, Transport and R&D Services
Offshore Wind/ Renewables	

The major difference between the data sets is the inclusion of offshore wind and renewable electricity generation from the ocean, which is a large sector in Europe, growing in Asia, but still very small in North America. The foundation of the OECD projections is the pace at which the global economy can shift away from fossil fuels as the primary energy source and towards energy conservation and renewables-based electric generation. The OECD projections use three scenarios. The first is a continuation of growth on ocean economy output at or near recent growth rates. This is the baseline scenario which is compared against “fast transition” and “slow transition scenarios. The parameters for these scenarios are shown in Figure 4.

The first thing to note is that whichever transition scenario is discussed, the results are very different from the baseline. The baseline scenario envisions a nearly 200% increase in real gross value added – the same measure as real gross domestic product in the U.S./Maine estimates. But under the “fast transition” scenario the estimated level of GVA in 2050 is less than half that of the baseline (about a 90% increase). Under the “slow transition” global ocean related falls by nearly 50% compared with the 2025 baseline level.

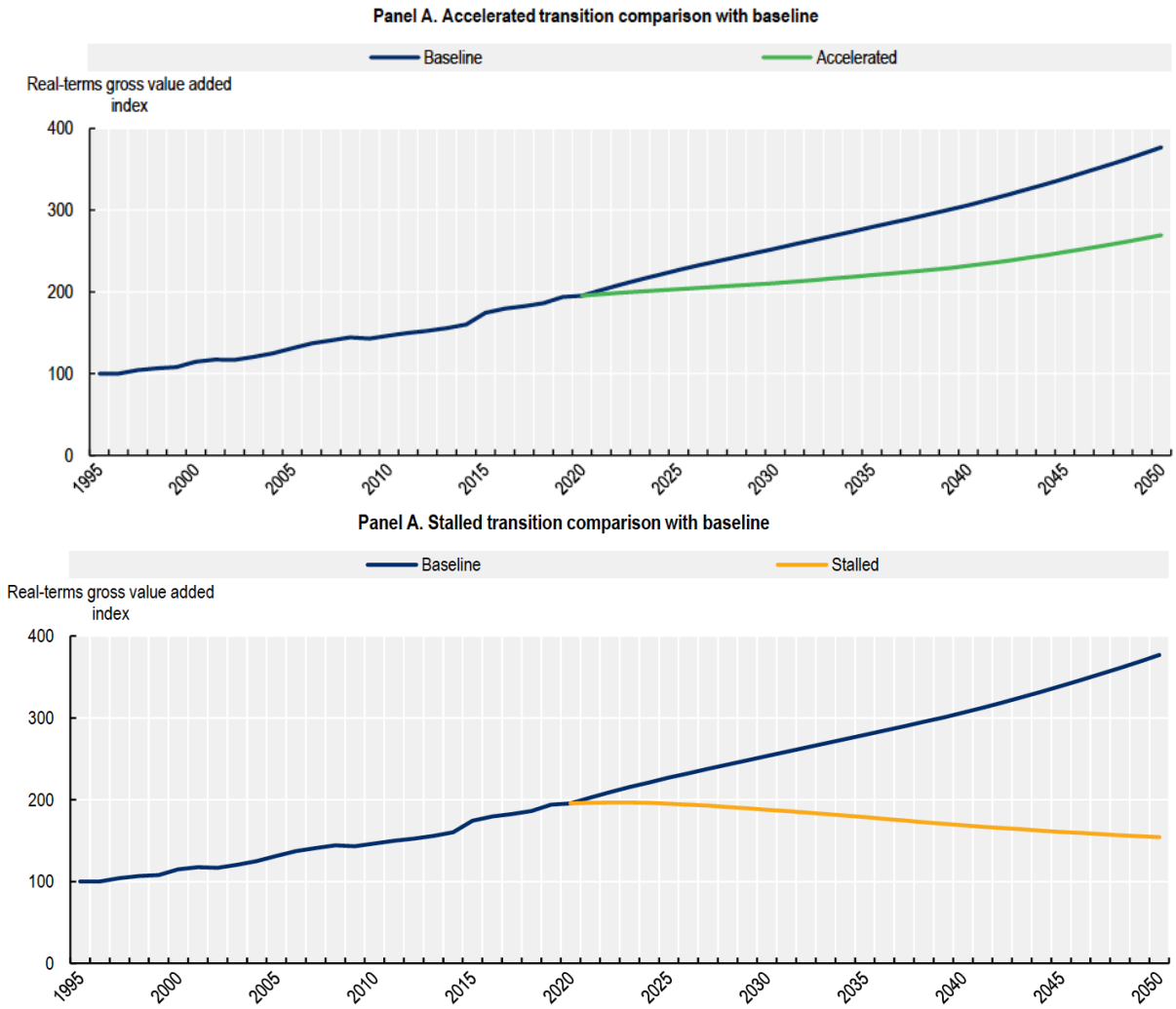

Figure 4. Source: OECD, 2025

Figure 5 breaks the two scenarios into their sectoral-level effects. The largest differences are to be found, not surprisingly, in the energy sectors, with substantially more offshore oil and gas and substantially less renewable energy in the slow transition scenario. But in fact, the choice of transition scenario affects the output of all sectors, with the slow transition showing substantially less growth in output from 2025-2050. There is a couple of reasons why a slow transition away from fossil fuels will significantly harm the prospects for the ocean economy. First, fossil fuels will become more and more expensive as fewer additions to supply are made and these will tend to be in the higher cost regions. This will be offset in part by conservation, but slow transition inevitably higher costs affecting sectors like tourism and recreation. And second, sea levels will continue to rise even under the most optimistic transition scenarios because more than a

century's heat is already trapped in the ocean. This will alter shorelines such as ports and beaches, increasing the demand for resilient coasts but not fast enough to offset lost shoreline.

Obviously, it is not possible to know which scenario will be closer to what actually transpires, but the OECD assumption was based on the speed with which the globe was able to keep greenhouse gas emissions to a level consistent with no more than an average of 1.5 degrees C above 2000 by 2100. Information presented at the most recent United Nations climate conference suggests the global mean temperature will rise by 2.5 to 2.9 degrees C by 2100. (Somini Sengupta et al., 2025) Based on current information it appears more likely that the future of the blue economy will be closer to the slow transition than the faster.

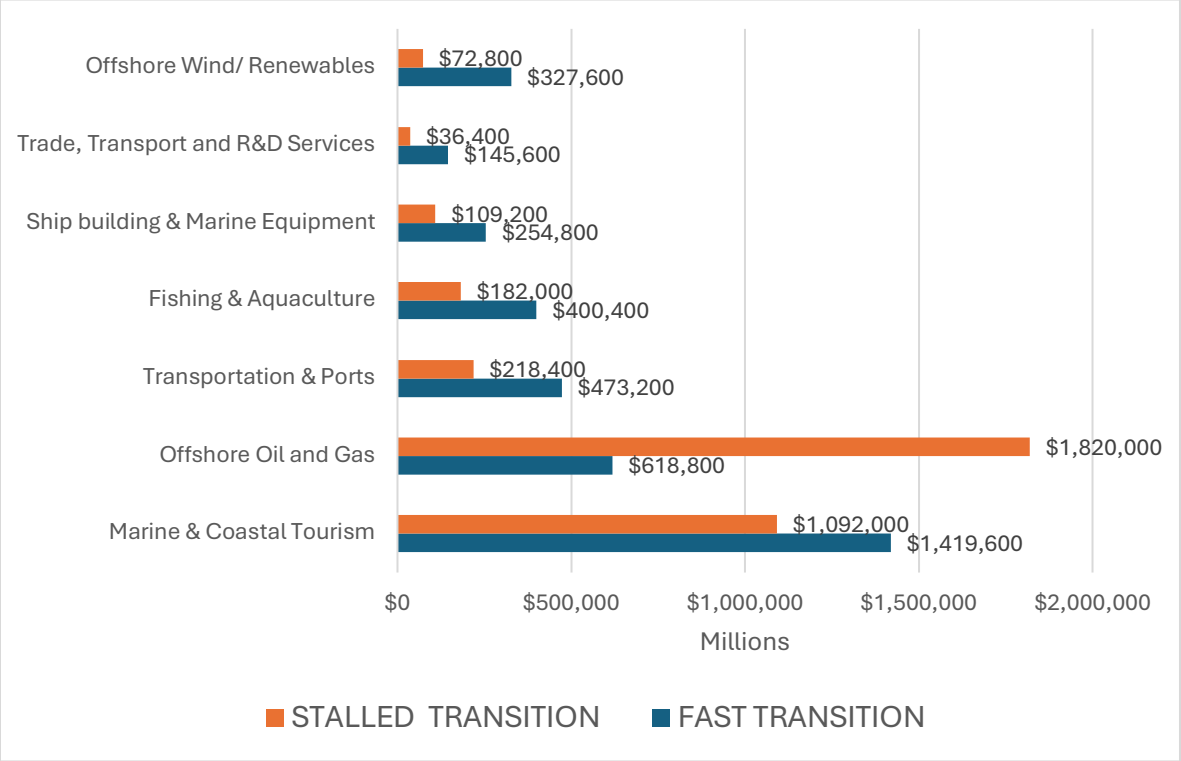

Figure 5. Source: OECD, 2025

Exploration of Maine's Blue Economy Sectors

A key question then is the extent to which the industries identified in the first report of the Blue Economy Task Force can establish sufficient scale and competitive position to keep Maine's blue economy at or above its current level of contribution. It is not possible at this stage to forecast performance of these opportunities, in no small measure because the data are not available to measure even their current performance, much less make predictions with any

degree of accuracy. Collecting the data will be an important function of the proposed Center as discussed in the recommendations section of the December 2025 Task Force report.

It is, however, possible to note several key factors that will be highly influential in the prospects for these emerging industries. The Task Force also felt it would be useful to highlight examples of Maine businesses, new and old, large and small, that are already part of our robust blue economy.

Aquaculture

One of the areas of greatest agreement in outlooks for the global blue economy is that aquaculture is expected to experience significant growth over the next twenty-five years. Aquaculture is expected to comprise virtually all of the growth in food from the sea by offsetting declines in capture fisheries due to climate change and other factors. (Figure 6)

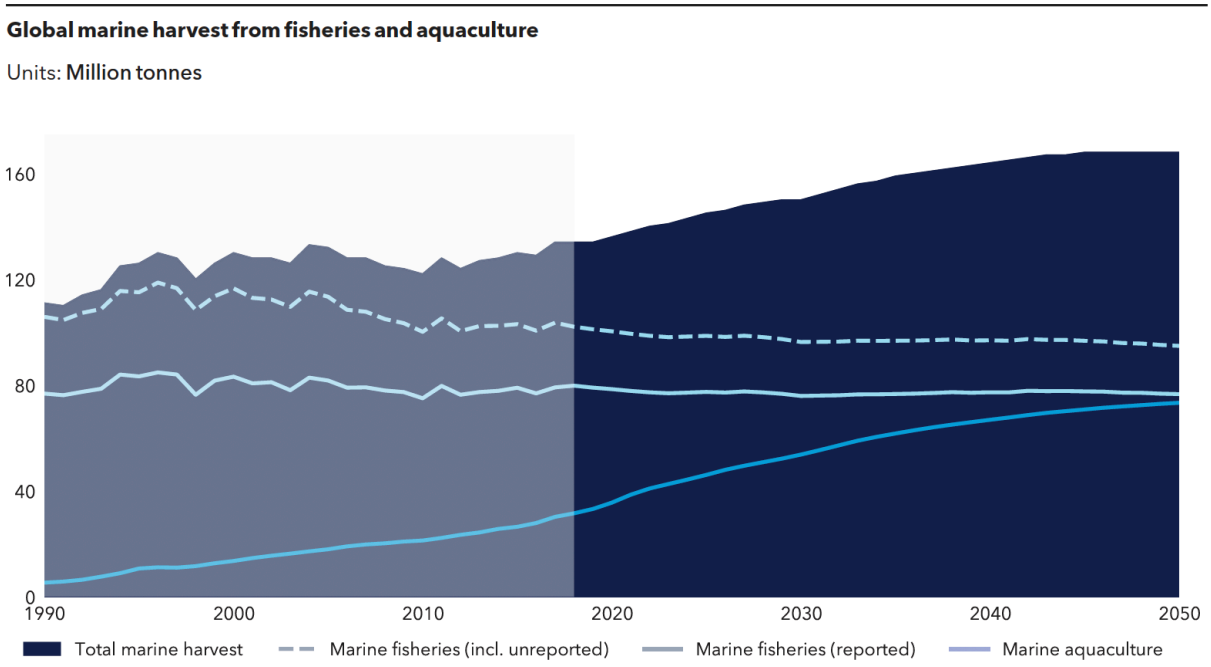

Figure 6. Source: DNV 2025)

Most of the growth in aquaculture will take place in Asia, particularly China, which is already the largest producer of cultured fish. Mollusks such as oysters, mussels, and clams are primarily cultured rather than wild caught and are expected to nearly double in global output. Finfish and crustaceans are also farmed but the majority of each are still wild caught. The exception to this is Atlantic salmon, which is farmed in many countries around the world, and in the U.S. in Maine and Washington.

While Indigenous populations have been cultivating seafood for millennia, the modern Maine aquaculture industry launched about 50 years ago with the construction of a mussel farm in Walpole. Over that time aquaculture has grown to 1,951 acres currently leased by DMR across more than 300 licensed sites averaging 7.7 acres each. Table 1 shows the distribution of the number of sites and total acreage of the major types of aquaculture taking place in Maine. Note that these are the species authorized by DMR permits. The actual production levels are not shown and likely shift from year to year among different products on the same site.

	Sites	Acres	% of Sites	% of Acreage
Scallop	43	442	7.7%	10.2%
Oysters	226	1167	40.3%	27.0%
Mussels	79	1103	14.1%	25.5%
Clams	48	307	8.6%	7.1%
Algae	84	448	15.0%	10.4%
Salmon	48	307	8.6%	7.1%
Other Finfish	23	473	4.1%	10.9%
Sea Urchins	10	79	1.8%	1.8%

Table 1. (Source: Maine Department of Marine Resources)

Oysters and mussels occupy the parts of sites totaling more than 1,100 acres, but oyster culture has by far the largest number of sites. Also notable is the large number of sites where various forms of algae (seaweed) is grown. In general, algae aquaculture is the fastest growing form of aquaculture. The algae can produce many different types of products including food, pharmaceutical ingredients, and other raw materials. Algae can also serve an important role in carbon dioxide removal ("blue carbon"), though the monetization of this benefit is still uncertain. The market potential for algae is very large, but Maine is still at early stages of growth.

Founded in 1996 as Micro Technologies, Kennebec River Biosciences (KRB) provides aquatic animal health testing, diagnostics, and customized health solutions for finfish, shellfish, and crustaceans worldwide. It has significantly expanded its services and facilities since its founding and has recently announced an expansion from its base in Richmond to Brunswick Landing. The company offers pathogen and disease testing, import/export inspections, and custom vaccines to help clients manage and improve the health of aquatic animals.

The global expectations for growth in aquaculture, particularly compared to traditional capture fisheries, suggest a much larger role for aquaculture in the blue economy. Such a role is not assured, however. With the exception of Atlantic salmon aquaculture, most of what Maine is producing is shellfish that are high value, but low value added. Maine aquaculture is also comprised of many small firms making it difficult to achieve sufficient scale to be competitive against a global aquaculture industry that is rapidly growing also. Developing new products from the existing harvest is a key to expanding the contribution of aquaculture to the economy unless revised permitting procedures result in a significant increase in production. In that case growth in both raw materials and value-added products would put Maine aquaculture on a trend closer to global forecasts.

Blue Hill Bay Mussels is an innovative shellfish aquaculture company founded by Evan Young 24 years ago in Hancock County. The company farms eastern blue mussels on ropes in the ocean, producing large harvests and a secure supply. The company partnered with the Downeast Institute in 2012 to address a decline in wild mussel seed. The Institute provides seed to Blue Hill Bay Mussels ensuring a consistent source of product for both the company and other Maine mussel farmers. The company also has a selective breeding program, such as the "Maine Gold" mussel, to differentiate its product in the marketplace with a unique appearance and high meat yield.

Marine Biotechnology

Marine biotechnology in Maine had its roots in extraction of chemicals from seaweed nearly 40 years ago. It has grown in size and diversity until it is now a very difficult industry to measure, in large part because it is difficult to define precisely, and also because standard economic data contains no industry called “marine biotechnology." A useful starting point is the recently completed assessment of marine biotechnology conducted by the Bigelow Laboratory for Ocean Sciences. (Bigelow Laboratory for Ocean Sciences 2025) This assessment found that aquaculture, particularly seaweed aquaculture, together with some wild capture fisheries provides a steady supply of raw materials that can be transformed into a variety of products with large global markets. These include:

Segment	Total Segment Market Size (2022)	CAGR (2022–2030)	Seaweed- or Blue Biotech-Specific Market (2030)
Marine Pharmaceuticals	$2.6B	8–10%	**$5.0B**
Nutraceuticals	$450.0B	7.5%	**$3.9B**
Biostimulants	$2.6B	~10%	**$1.8B**
Livestock Feed Supplements	$38.9B	~3.9%	**$1.1B**
Pet Food	$115.5B	~5.11%	**$1.1B**
Bioplastics & Biopolymers	$11.5B	~20%	**$0.8B**

Table 2: Source: Bigelow Laboratories

Cold Current Kelp is a women-owned, vertically integrated kelp farm and skincare company in Southern Maine. The company was founded in 2021 with the goal of creating clean skincare products using kelp as a primary ingredient. Cold Current Kelp exemplifies a "sea-to-skin" business model, managing every step of the process from growing kelp in local Maine waters to harvesting, drying, and developing the final product. The company's flagship product is the KelpGlow Facial Oil, which combines regeneratively grown sugar kelp extract with nourishing organic oils. Cold Current Kelp has received several grants, including from the Maine Technology Institute and a research and development grant through the USDA's Small Business Innovation Research (SBIR) program.

The Bigelow report identifies over 1100 organizations in biotechnology in Maine, a figure the report notes, that is larger than the number of organizations in Massachusetts, one of the global centers for biotechnology. This large number is somewhat misleading, however, in that over half the total number of companies is in raw materials supply from the aquaculture and capture fisheries industries. In other words, the sector is currently concentrated at the front end of the value chain. The potential of the sector in Maine depends on significant innovation to create Maine-specific value-added products. The Bigelow report suggests three principal avenues to accomplish this:

Increase utilization of waste from the capture and cultured products. This has long been a particular challenge for Maine's mollusk (oyster, mussel, and clam) and crustacean (lobster and crab) fisheries. Only around 20% of the live weight of these fisheries is edible, meaning there is a substantial amount of waste generated. Waste product utilization is one of the specific strategies discussed in the work of SEAMaine. (Gardner Penfold Inc., 2022)

- Harvesting novel marine genetic resources for pharmaceuticals, diagnostic materials, nutraceuticals, and supplements. The variety of products that could potentially be produced from Maine marine inputs will require a significant research and development infrastructure. Fortunately, such an infrastructure has grown up over the past twenty years with the University of Maine, the creation of the Gulf of Mane Research Institute, new programs at Colby, Bowdoin, and the University of New England combine research and education to form the core of the innovation workforce that will be required.
- In addition, the Governor has established a Maine Life Sciences Institute which will provide important services to supplement the Blue Economy Center in support of marine biotechnology.
- Expand seaweed aquaculture. A significant increase in the products derived from seaweed aquaculture will require a corresponding increase in raw material output. This will require expanding the area under cultivation for seaweed and perhaps a shift if species to focus on the most appropriate for a given use.

Salmonics

Salmonics is a biotechnology startup based in Brunswick that exemplifies the potential of circular economy business models within the blue economy. The company provides products such as salmon plasma, serum, fibrinogen, and thrombin, which are derived from blood harvested from farmed salmon that would otherwise be discarded as waste. The global market for these products is estimated to be between $35 billion and $40 billion. This process not only creates a valuable product but also supports environmental responsibility and sustainability by providing a value-added return for partner aquaculture companies.

The Bigelow report offers paths to biotechnology-based products in Maine based on current understandings of likely success. It should be noted that genetic material opens up many other as yet unknown possibilities which may be even more economically important for Maine.

Marine Data and Research

There are two senses in which marine data and research offer significant economic opportunity. The first is the collection, storage, distribution and analysis of data. The second is the production of the technologies used to collect and communicate data on the ocean. Together these comprise what NOAA calls the "Ocean Enterprise", which is defined as "the business component of the 'New Blue Economy.' The Ocean Enterprise is made up of the knowledge-based activities that support harnessing ocean resources for economic growth, while protecting ocean health…." (NOAA, 2021)

NOAA sponsored detailed surveys of businesses in the Ocean Enterprise in 2016 and 2021. An update is expected next year to cover the period 2020-2025. In 2020 Nationally 814 businesses were identified and surveyed in 2020. That year, California had the largest presence with 311 establishments. Massachusetts was fifth with 120. Together, Massachusetts, Rhode Island, and Connecticut had 158 establishments. Maine had 11. Together the number of business grew by more than 60% between 2015 and 2020, some of which were entirely new companies, some of which were existing companies which expanded into marine data and data technologies

between 2015 and 2020. Companies in this field are heavily export oriented, with about one quarter of sales outside the U.S.

New England Marine Monitoring (NEMM) is a Portland based company, spun out of the Gulf of Maine Research Institute in 2019, that uses a combination of video cameras, artificial intelligence (AI), and human technicians to provide electronic monitoring for commercial fishing fleets in New England. The technology helps collect more reliable and cost-effective data on fishing activities, including species caught and discarded, to aid fisheries management and environmental stewardship. This system replaces traditional human observers with technology, offering a more scalable and efficient way to meet regulatory requirements. Strategically placed cameras are mounted on fishing vessels to record all fishing activity from dock to dock. The cameras capture footage of fish being brought on board, sorted, and discarded. Artificial intelligence is used to analyze video footage, automatically identifying when fishing occurs and cutting out irrelevant parts. The AI is also trained to highlight fish being thrown overboard. Staff members review the footage to count, annotate, and verify the data, ensuring accuracy.

The companies in this sector tend to be small. In the 2020 sample 73% had under 50 employees. And over half the companies operate primarily in the Atlantic Ocean. The technology and data products include platforms (buoys, towed instruments, autonomous underwater vehicles, etc.); hydrographic surveys; navigation and positioning systems; data communications; biological, physical, and geologic measurements. Governments and universities are the largest purchasers of goods and services, along with environmental consulting, construction, shipping, fishing and other users.

The Ocean Enterprise study focuses on private sector, for-profit organizations providing technologies and data and information services. Public and nonprofit organizations also provide similar technologies and services, including universities like the University of Maine, research institutions like Bigelow and Gulf of Maine Research Institute. NERACOOS, the Northeast Regional Association of Coastal and Ocean Observing System, coordinates and provides data services as part of the U.S. Integrated Ocean Observing System. The organization links public, government, and private organizations from Maine to New Jersey. (www.neracoos.org)

Bluesonde is a Portland based startup company founded in 2024 that builds the water data and intelligence layer that helps adapt to climate challenges and meet growing demands. By making water data accessible and actionable, the company empowers communities, industries, and ecosystems to thrive in a changing world. Across multiple product generations and hundreds of deployed buoys, the Bluesonde team learned how to deliver reliable, accurate data in some of the harshest environments on Earth. Bluesonde is advancing scalable monitoring for oceans, freshwater systems, and industrial waterways. By equipping organizations with the data they need, Bluesonde enables responsible water management, sustainable operations, and climate resilience, providing the tools for smarter, more sustainable engagement with water.

The growth in data monitoring, analysis, and management related to the ocean has been significant over the past two decades, and there is good reason to expect as fast or faster growth in the future. The demand for data and analysis of ocean systems is growing because the uses of the ocean are growing more complex and reliant on data systems. There is hardly any use of the ocean that does not rely on or at least use data on past, current or future ocean conditions. And this reliance on data is only expected to increase with the availability of artificial intelligence systems to interpret and analyze the data. The growth in aquaculture, will require more information about ocean systems to optimize inputs and respond to threats such as harmful algal blooms. More detailed monitoring of shoreline process will be needed to respond to sea level rise.

Maine has the foundations upon which to build a more expansive and extensive ocean data enterprise, but there are important challenges. Maine has a number of institutions teaching and doing research in data science, but the marine applications are more commonly developed in the Massachusetts-Rhode Island-Connecticut blue economy clusters anchored by the Navy, MIT, and Woods Hole Oceanographic Institution.

This geographic divide is a key reason why the Ocean Enterprise study shows such a disparity in the number of Ocean Enterprise establishments between southern New England and Maine. On the other hand, NERACOOS and other ocean data systems are evidence that Maine can participate in the regional and global growth of marine data.

Resilient Coastal Infrastructure

Not long ago, construction on the coast of Maine primarily consisted of dredging harbors, building and rebuilding wharves and piers, and the occasional seawall. But the assumption of a stable coastline needing only a few modifications to accommodate economic uses has been refuted by both projections and actual experience. The 2020 climate report, *Maine Won't Wait*, notes that a 1.6 foot rise in sea levels would result in the loss of 67% of sand dunes and 47% of beach area by 2050, less than twenty-five years from now. *Maine Won't Wait* identified "Invest in Climate-Ready Infrastructure" as a key climate strategy, to consist of creating an infrastructure vulnerability study, selection of climate-ready design standards, and accumulating a state infrastructure adaptation fund.

CIANBRO

Founded in 1949, Cianbro is one of the United States' largest, most diverse, and 100% employee-owned construction and construction management companies. Headquartered in Pittsfield, Maine, the company operates across more than 40 states and employs over 3,000 "team members" who share in the company's value and profitability. Cianbro and its subsidiary brands offer a comprehensive range of services, including general contracting, construction management, design-build, and modular fabrication. The company is known for its strong commitment to safety, quality, and continuous improvement, applying Lean principles to execute complex projects safely, on schedule, and within budget.

Then came the historic flooding events of December 2023 and January 2024. Governor Janet Mills convened an Infrastructure Resilience and Rebuilding Commission to consider in more detail what might be done to address resilience issues on the coast and in the upper reaches of watersheds. The Governor and Legislature invested over $60 million to offset some of the losses and begin to rebuild. These storms received many of the headlines, but in fact since 2020 the State has invested over $110 million in infrastructure resilience projects, matched with $4.4 billion in federal funds. And these figures are merely a downpayment of what will be needed to respond to the combination of more intense weather hazards and rising water levels in both the ocean and rivers.

Maine faces what is now a common dilemma: find funds to rebuild infrastructure to reduce future hazards or wait until disasters strike and then rebuild to higher standards. Economically, the choice is simple. Funds spent to prevent damage save $13 for every one dollar

spent. (Maine Commission on Infrastructure Rebuilding and Resilience, 2025) The question of where the funds will come from to both reduce future damage and recover from some level of inevitable remains open, but the sums needed over the next several decades are difficult to estimate.

Enodia AI, an AI company based in Portland Maine and specializing in infrastructure resilience, was founded in 2024. It was founded as a spinout company from Northeastern University. The company uses AI and data analysis to enhance the resilience of critical infrastructure systems (e.g., power grids, transportation networks) against disruptions like extreme weather and cyber threats. Enodia provides a comprehensive, system-wide view of risk across interconnected systems. Their primary tool is the Infrastructure Resilience Analysis Decision Support Tool (InfRA-DST), a suite of analysis and visualization software. They offer risk assessment services, recovery planning, and design consultation to help stakeholders anticipate vulnerabilities and recover efficiently from disasters.

The need to invest as much money as soon as possible in resilient infrastructure creates substantial opportunity for Maine organizations. Obviously, construction is the industry most likely to benefit, but there are several connected industries which will play major roles. These include engineering, environment, and planning firms as well as specialized positions in state and local governments. The example of Enodia (see box) points to the connections between resilience and data systems and analysis.

Coastal adaptation will also offer several opportunities for technological innovation. The University of Maine's expertise in composite building materials will be employed to build some types of coastal structures, such as piers better able to withstand extreme weather events. The pier at the Downeast Institute, part of the University of Maine Machias and located in Beals in Washington County is an example.

An array of possible new resilience measures is being created by efforts to use natural infrastructure in place of or combined with engineered or "hard" flood management strategies. Engineered flood management, such as seawalls, can be effective in protecting properties on which they are installed but by deflecting energy they can accelerate erosion on neighboring

properties. Natural infrastructure, such as wetlands, sand dunes, and open space along the shoreline, is increasingly being used because it can provide substantial hazard reduction often at lower cost. Natural infrastructure is also increasingly being combined with engineered infrastructure to increase the effectiveness of the natural infrastructure and reduce the collateral damages of engineered infrastructure.

Boatbuilding and Sustainable Propulsion

The ship and boatbuilding sector in Maine comprises three principal industries: ships for the Navy which are built and repaired at BIW and the Portsmouth-Kittery Naval Shipyard, commercial boat building such fishing and work boats, and recreational vessels. The design and construction processes of the Navy ships are determined by the Navy and its contractors, so while there are a large number of jobs at the facilities, the future for ships and related technologies is primarily determined by forces outside Maine. Maine's principal contribution is preparing the workforce, which is discussed in Appendix C.

Two major technological changes that are already substantially transforming commercial and recreational boatbuilding. One is the choice of hull material, which has evolved from wood and fiberglass to more complex composite materials, incorporating Kevlar, carbon fiber, and other high strength-low weight materials. These are particularly the choice for the custom and semi-custom recreational boats in which Maine tends to specialize. The evolution of composite material boat building has been underway for some time and is expected to continue and expand.

Washburn & Doughty is a commercial shipbuilding company in East Boothbay, specializing in steel and aluminum vessels. Founded in 1977, the company is now considered the East Coast's premier builder of tugboats and also constructs ferries, barges, and other commercial vessels, often designing them in-house. The company builds boats to specific client needs or provides custom designs, adhering to strict regulatory standards such as ABS and USCG. Washburn and Doughty became the largest builder of tugboats on the East Coast by 2007 and has delivered over 50 tugboats since 1997. They have built sister-ship ferries for the Maine State Ferry Service, a vehicle and passenger ferry for the New York State Department of Transportation, and a variety of tugs for operators like Moran Towing.

The other major change is the decarbonization of vessel propulsion. While most attention in this area is focused on large cargo and cruise vessels, there are tens of thousands of work and recreational boats that will over time move away from gasoline or diesel engines. Alternatives include electric motors, hybrid electric-diesel or gas, alternative biobased fuels, or hybrid sail/power systems. For recreational boats, electric motors, including electric outboards are already in use. Work boats powered by electricity such as those used to support aquaculture operations and ferry boats are already being built in Maine.

The pace of the shift away from fossil fuels in the recreational and workboat fleets is uncertain but is at its earliest stages. Unlike automobiles, there are no government standards or requirements for alternative fuels, which would significantly affect the pace of the transition. Such standards are unlikely in the near term, but increasingly likely over time. Even without government requirements, increasing fossil fuel costs will encourage switching to alternative propulsion systems such as hybrid power trains.

Shred Electric develops marine electric propulsion systems. Their systems use swappable, shared batteries that can also power other equipment, such as processing machines and refrigeration units. The company is also involved in developing and testing a marine workboat with a high-capacity battery and an efficient electric outboard motor, supported by federal grants. Shred Electric focuses on electric propulsion, including surface drive motors that can operate in shallow water and bounce over obstacles. They also build larger electric boats, such as a workboat for the aquaculture industry. Their electric systems aim to be more reliable, quiet, and environmentally friendly than traditional gasoline engines, which can be noisy and cause pollution. The development of their workboat was supported by grants from sources like the U.S. Department of Agriculture and the U.S. Department of Energy.

This shift is likely to be particularly attractive to the lobster industry. Lobster and other trap fisheries are the most energy-intensive type of fishing per weight of edible product. (DNV, 2025) Already this year many lobster fishers lost a substantial portion of their net income to higher gasoline prices. The transition of the fishing fleet to alternate fuel may be affected by government rules but will still likely happen as the current fleet depreciates to the point where it must be replaced. Some boat owners may shift propulsion before full depreciation and some may stay with gas or diesel, but a shift towards alternative fuel or hybrid electric systems is likely to pick up speed over the next two decades.

APPENDIX E: Credits

Michael Conathan Consulting led the support team for the development and writing of this report. The full team consisted of:

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