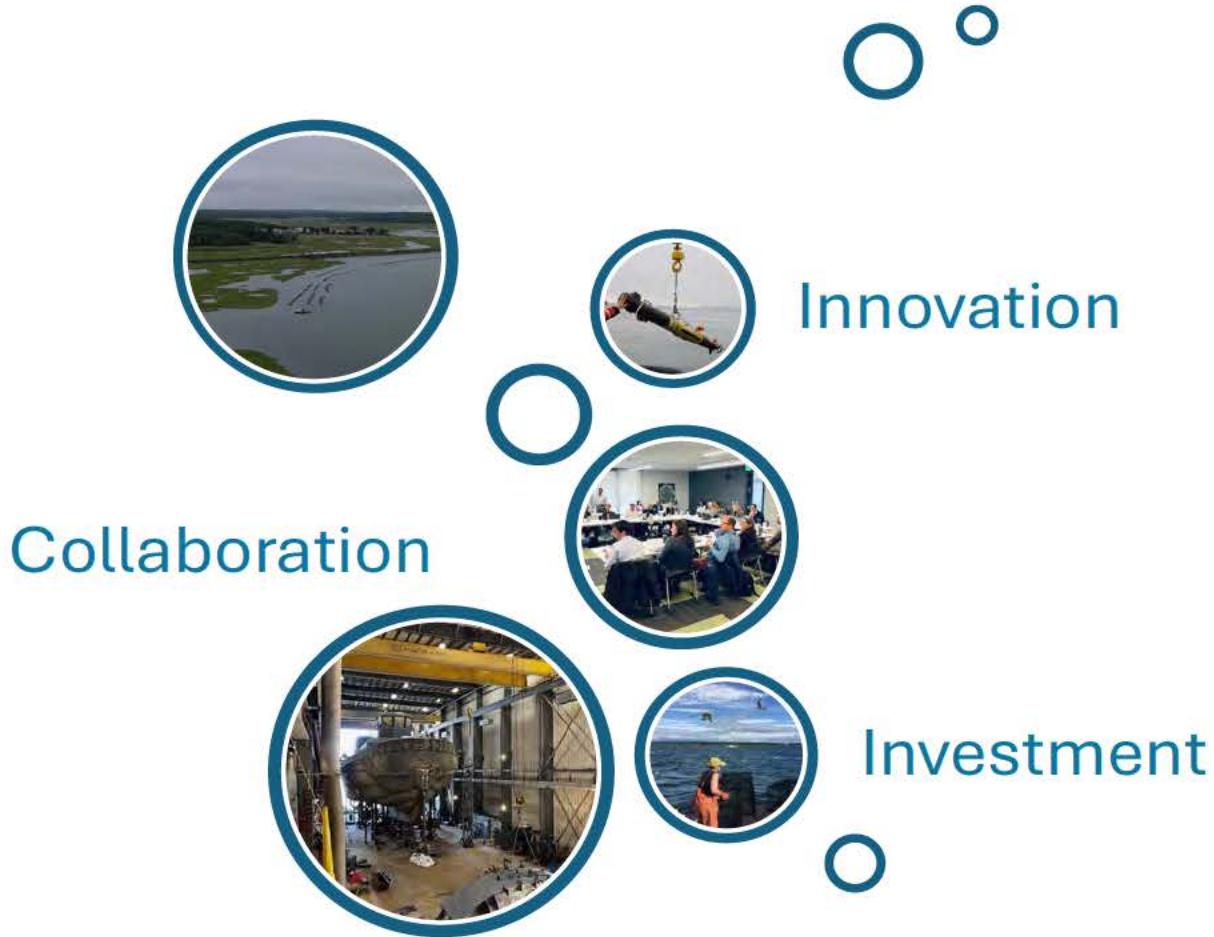


MAINE STATE LEGISLATURE

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MAINE'S BLUE ECONOMY TASK FORCE A REPORT TO THE MAINE LEGISLATURE

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Preface

Maine's Blue Economy Task Force (Task Force) was established when the legislature passed S.P. 523 - LD 1286, "to support Maine's emergence as a center for blue economy innovation and opportunity in the 21st century." The legislation defined the blue economy as "business sectors that rely on the sustainable use of ocean resources for economic health, improved livelihoods, jobs or ecosystem health."

As required in statute, the Task Force was composed of members representing an array of businesses, trade organizations, public and private research institutions, investors, government officials, and non-profit organizations. A list of the 38 Task Force members can be found in Appendix A. The Task Force held six meetings between August 2024 and January 2025. Meetings were noticed online and included opportunities for public engagement either in person or online via Zoom. In addition, the legislation required a series of consultations to be conducted allowing an even broader degree of input from those interested in Maine's blue economy.

A team of consultants managed the work of the Task Force and organized the information gathered from the Task Force meetings, consultations and additional research and subject matter expertise to produce this report. As required by the legislation, this report includes:

- A description of the blue economy;
- A review of how other states and countries are approaching planning of and investment in their blue economies;
- An identification of sectors within Maine's blue economy, including which of them already have an existing economic plan, strategy, or roadmap;
- For sectors that do not have a plan, strategy, or roadmap, identification of opportunities, competitive advantage, and assets to help the state take advantage of these opportunities;
- Identification of opportunities to enhance or facilitate growth of sectors that do have a plan, strategy, or roadmap; and
- Recommendations about how to better position the state to take advantage of specific or unique opportunities to grow its blue economy.

"Oceans generate an estimated US\$1.5 trillion in yearly global economic activity, directly supporting at least 300 million jobs and providing some 2 billion people with their primary source of proteins and micronutrients. Cultural relationships with oceans extend beyond these commercial benefits, ranging from the diverse traditions of coastal communities (including over 30 million coastal Indigenous peoples), to myriad tourism and leisure activities, to the occupational identity of fishworkers and seafarers for whom oceans represent a way of life beyond a livelihood. Oceans are also essential for sustaining life on Earth by maintaining global ecological and climate systems. They comprise 99% of the Earth's habitable space for wild species and have absorbed an estimated 90% of excess heat from global anthropogenic warming."¹

- *One Earth, 2022*

Executive Summary

The term "blue economy" has emerged over the past few decades as a paradigm for sustainable economic development that emphasizes the productive use of ocean resources while preserving the health of marine ecosystems. It has come to be understood to represent a subset of the broader ocean economy, which includes all industries related to the ocean. Maine has a long history of sustainable use of its ocean and coastal resources, and numerous assets that position our state exceptionally well to take advantage of growing national and international interest in developing the blue economy, but the state has yet to clearly identify and prioritize this development that can lead to realizing its vast potential.

Maine is missing an opportunity on which other states are already capitalizing. In the most recent example, in 2024, the U.S. Department of Commerce announced over \$54 million in federal funding for four consortia of organizations to develop the blue economy.¹ The Gulf of Maine Research Institute led a consortium of organizations in applying for this grant, but their group was not selected as a finalist. In addition, other states such as Washington, Rhode Island, California, Alaska, and several others have dedicated funding and other resources to develop ocean-related industries and sustainable ocean uses. Maine shares many of the traits that have allowed those states to establish and grow economic opportunities, and arguably has advantages over some of them in certain areas. However, Maine's efforts to support ocean-related industries to date have been energetic but disorganized.

Through its efforts, including consultations with over 100 individuals engaged in businesses and activities linked to the blue economy, the Blue Economy Task Force (see Appendix A) - established by the Legislature in 2024 - has identified areas where Maine can begin to close this gap by capitalizing on its storied maritime legacy and accelerating the pace of innovation that has begun to take hold along our shores.

In this report, the Blue Economy Task Force (Task Force) describes and defines Maine's blue economy, identifies our state's opportunities and challenges in this field, and makes recommendations for ways Maine can take advantage of its strengths. It also includes a review of the several roadmaps and reports that have been completed in recent years in support of some components of Maine's blue economy (see Appendix B). This review identifies recommendations that have yet to be implemented, notes areas of overlap, and points out gaps in those reports where additional research and development could pay dividends to the state.

Defining The Blue Economy in Maine

Maine has unique attributes that make it an important location for the development of blue economy businesses and economic activity and is uniquely positioned in this space as a state with abundant ocean and coastal resources.

¹ Press release: "Biden-Harris Administration Identifies 4 business 'accelerators' to boost the Blue Economy," Dec. 9, 2024. Available at: <https://www.noaa.gov/news-release/biden-harris-administration-identifies-4-business-accelerators-to-boost-blue-economy>

Maine's strengths include:

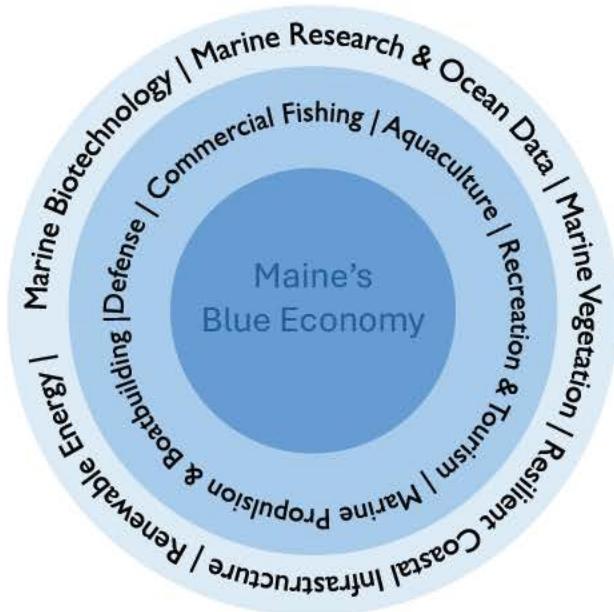
- a geographic location between the northern European hubs of the blue economy and the markets of the U.S. east coast, making it home to the first ports vessels encounter heading west from Europe;
- deepwater ports that serve a wide variety of maritime transportation needs;
- some of the only deepwater offshore areas under state control along the Atlantic seaboard, allowing state regulators to permit, test, and potentially develop deepwater activities without going through a full federal permitting process;
- a workforce of experienced ocean users populating a coastline dominated by small towns home to independent thinkers and operators;
- access to abundant living marine resources for wild capture and cultivated harvest;
- a culture of marine and maritime heritage and an ingrained ethic of sustainability;
- a network of research organizations and academic institutions with a history of innovation in construction, materials development, and creative use of natural resources; and
- a thriving and historic industry of ship and boatbuilding.

The legislation establishing the Task Force defines the blue economy as: "business sectors that rely on the sustainable use of ocean resources for economic health, improved livelihoods, jobs or ecosystem health."² Building on the starting point provided by the Legislature, the Task Force has opted to describe Maine's blue economy as follows:

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 marine heritage, research expertise, and location.

For purposes of this description, 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.

² SB. 523 - L.D. 1286, Sec. 1.



Inner circle = Traditional/evolving blue economy industries for Maine

Outer circle = Emerging/developing blue economy industries for Maine

Blue Economy Themes

Although Maine is well-positioned to take advantage of its many opportunities and attributes, the growth of Maine's blue economy also faces challenges and obstacles. The Task Force identified several overarching themes as a result of its review of existing roadmaps and plans and input from consultations.

These themes include:

- *Access to the Ocean* - Maine has over 5,000 miles of coastline that hosts a broad array of communities, but as the value of waterfront property increases, maintaining access to the water and working waterfront infrastructure for both legacy industries and emerging uses is leading to conflicts and complexity.
- *Community Involvement, Workforce, and Infrastructure* - Like businesses and industries throughout the state, those in Maine's blue economy are subject to pressures including affordability of housing and services and finding a well-trained workforce.
- *Regulatory and Social License* - Many participants highlighted slow and difficult permitting processes as barriers to industry growth. There will always be tension between parties that desire a more streamlined, facile process and those who desire a more precautionary, methodical approach. There are also inherent conflicts between existing and emerging industries.
- *Market Development and Finance* - As a state with a small population, Maine is particularly burdened by having relatively few investors, making access to capital a significant barrier to growth. Yet the Maine brand has value in market development, and

in recent years, more investment has begun to flow into the state. Growing this pool of funding will be critical to future prosperity.

- *Sustainability and Climate Change* - The Gulf of Maine is among the fastest warming bodies of water on the planet, and extreme weather events are on the rise, as evidenced by the devastating winter storms of 2023-24. This presents obstacles in the form of damage to coastal infrastructure and shifts in availability of commercially important species. It also creates opportunities in emerging industries such as maritime electrification and decarbonization, marine carbon dioxide removal, and coastal reconstruction and stabilization.
- *Research Institutions* - Maine is fortunate to have numerous institutions with research missions related to the ocean including institutions of higher education, governmental and non-governmental laboratories, and independent nonprofit organizations. This density of research capacity will be critical to the sustainability challenges noted above. The research institutions are also growing to collectively comprise a significant source of high-quality employment.

Opportunities to Grow Maine's Blue Economy

In light of these advantages and obstacles, the Task Force identified several key sectors poised for growth in addition to industries that were already captured in existing economic development plan, strategy, or roadmap.

Industries and sectors **with** strong momentum and an existing development plan, strategy, or roadmap focused on its ocean and coastal components include:

- Commercial fishing and seafood
- Aquaculture
- Offshore wind
- Some components of other industries and sectors listed below

Industries and sectors **without** an existing development plan, strategy, or roadmap focused on its ocean and coastal components include:

- Marine research and ocean data
- Marine biotechnology and life sciences
- Marine vegetation (seaweeds, algae, and seagrasses)
- Resilient coastal infrastructure
- Marine propulsion systems and boatbuilding
- Defense and national security
- Recreation and tourism

In addition, the Task Force identified three key themes to categorize and articulate these opportunities into a vision for the future of Maine's blue economy:

- *Innovation:* The blue economy comprises inherently forward-looking opportunities in the form of innovative emerging industries and encouraging and incentivizing legacy industries to modernize and incorporate new practices as appropriate.
- *Collaboration:* As a state with a small population but a long coastline, Maine lacks a single location clearly positioned to serve as a blue economy hub. Instead we have numerous smaller entities that each play individualized, specific roles in developing our blue economy and rely on collaboration to fill gaps and compete on a national or international scale.
- *Investment:* Public, philanthropic, and private investors have all begun to take notice that blue economy innovators will be responsible for launching new industries. Maine is currently behind other states in leveraging these funds, but we have all the components necessary to seek the funding that would close the gap.

Blue Economy Task Force Recommendations

Maine can capitalize on the development of its blue economy to strengthen our coastal communities, make our state competitive, and build additional respect and recognition for the Maine brand in national and international markets. To do so, the Task Force makes the following initial recommendations:

1. Establish a Maine Center for the Blue Economy.³

The presence of a unifying cluster-style organization, often created as a public-private partnership with underlying support from the public sector, creates an enabling environment that fosters blue economy growth. Establishment of such an organization would position Maine for greater success in acquiring funding and attracting innovators and start-ups to take advantage of the state's strengths.

2. Create a blue economy focus among existing state development and finance programs and prioritize investments in blue economy research, development, and commercialization.

The blue economy cuts across multiple state agencies and departments. It will require a concerted effort on behalf of leaders within the state government to act collaboratively on these opportunities. This also extends to ensuring funding allocations are crafted in a manner that makes blue economy entities eligible to receive them.

³ N.B.: The Bioscience Association of Maine has submitted legislation to establish and provide \$4 million to stand-up a Maine Life Science Innovation Center which defines life sciences to include elements of the blue economy identified in this report (e.g., marine biotechnology, marine vegetation, and data) and which has a similar proposed function to the Maine Center for the Blue Economy.

3. Form a blue economy education and training council to coordinate curriculum and research opportunities. The council should also consider actions to promote commercialization of research.

Blue economy workforce supply is a major theme suggested throughout the Task Force's consultations as well as from the existing development plans, strategies, and roadmaps. The relevant workforce development currently takes place in a large number of public and private educational institutions, primarily in higher education. Adding education and training programs of direct relevance to blue economy industries will lead to more availability of workers and keep more young Mainers in state to take good paying jobs in their communities.

4. Continue the work of the Task Force.

The work of the Task Force was effective, but highly constrained by the tight deadlines established in the enabling legislation. There is much more work left to do to reach additional contributors and stakeholders, provide more evidence of opportunities, develop more granular and targeted recommendations, and spread greater understanding of blue economy opportunities, particularly in more rural and remote communities. The design and formation of the blue economy center recommended above would be an important role for the next iteration of the Task Force, if funded.

5. Act on key recommendations from existing policy plans.

The Task Force includes by reference the many excellent ideas that have emerged from other development plans, strategies, and roadmaps. Many of their recommendations that have not yet been implemented would contribute to growing Maine's blue economy. Specific examples are listed in the recommendations section below.

The Blue Economy: Emerging Trends

The term "blue economy" has emerged over the past few decades to provide a paradigm for sustainable economic development that emphasizes the productive use of ocean resources while preserving the health of marine ecosystems. The term has come to be understood in most cases to represent a subset of the broader ocean economy, which represents all industries related to the ocean.

As awareness of the environmental impact of ocean and coastal economic activity has increased, the definition of the blue economy has narrowed to include only marine-based activities that promote environmental sustainability, social equity, and economic growth. This includes, but is not limited to, sectors such as sustainable fisheries and aquaculture, marine biotechnology, renewable ocean energy, eco-tourism, and marine research and data acquisition and analysis. The concept aims to balance economic benefit with the need to protect marine biodiversity and mitigate the impacts of climate change. This shift reflects a growing recognition that the ocean's resources must be managed holistically, ensuring that both current and future generations can thrive while maintaining the health of the planet's oceans.

Before proceeding to the specific issues explored by the Task Force, it is helpful to provide some additional background on two emerging trends. This section provides background on: 1) development of the blue economy in other states and countries with a focus on clusters as key organizational entities; and 2) the funding and public policy landscape.

The Blue Economy in Other States and Countries: Blue Economy Clusters

As part of the Task Force's investigation into blue economy operations in other states, the Task Force received presentations from leaders of ocean cluster organizations in Rhode Island and Washington. The blue economy in each of these states has benefitted from targeted state funding that helped establish infrastructure including cluster organizations with dedicated leadership and physical locations to serve as hubs of economic development.

In an economic development context, the concept of clusters describes a relationship among different organizations – public, private, and nonprofit – that allow a set of related industries located within a specific region to have some of the same economic advantages of very large organizations in selling to national or global markets.⁴ Clusters are designed to function in a way that makes the whole greater than the sum of its component parts, primarily through facilitation of both formal and informal relationships and interactions among businesses, knowledge institutions, nonprofit organizations, and governments (federal, Tribal, state, and municipal). Clusters are founded on a shared platform of knowledge and skills, not on industries per se. The same knowledge and skill set can produce many different types of projects. For example, in the Silicon Valley tech cluster, the same knowledge base yielded mainframe, mini-, and

⁴ Porter, Michael. 1997. *The Competitive Advantage of Nations*. New York: Free Press

microcomputers and smartphones, and provided the foundation for innumerable other hardware and software applications.

Clusters are often formed around or include keystone organizations. Two examples of maritime clusters in the U.S. include: 1) in southeastern Massachusetts, centered around the Woods Hole Oceanographic Institution and the National Oceanic and Atmospheric Administration (NOAA) Northeast Fisheries Center; and 2) in San Diego CA, centered around the Scripps Institution of Oceanography at the University of California San Diego. The latter example is supported by one of the first formally established U.S. blue economy clusters, TMA BlueTech (originally founded as The Maritime Alliance). The U.S. Navy also plays important roles in both of these clusters, with major suppliers and research laboratories in close proximity to each. Other states with established ocean or blue tech cluster organizations include Rhode Island, Connecticut, New York, North Carolina, Florida, Mississippi, California, Oregon, Alaska, and Michigan.



Maine does not have a single large research organization comparable to Woods Hole or Scripps or a major government research facility around which a cluster could form. It does, however, have an array of research and education organizations, a diversity of businesses engaged in blue economy enterprises, a long and proven history of partnership with the U.S. Navy in Bath, Kittery, and Brunswick, and a large number of nonprofit organizations with missions directly or indirectly related to the blue economy. In other words, Maine already has many of the components of what could be described as a densely populated but highly decentralized cluster.

Some organizations identifying themselves as clusters may or may not ultimately meet all the benchmarks of a fully realized cluster and more accurately function as incubators for start-up companies. The Portland-based New England Ocean Cluster is an example of an independent for-profit entity with a mission to “[discover] new opportunities for sustainable growth through connecting diverse, purpose-driven people and organizations.” While it has successful partnerships with regionally-based universities, it is not a fully developed cluster. It lacks coordination with government partners and direct engagement in and support for research, which are typically components of such clusters. Its work is focused on supporting, advising, and building networks for sustainable ocean-focused entrepreneurs.

The Task Force also investigated how the blue economy is developing in other countries. Maritime or blue economy clusters are found throughout Europe, with 12 identifiable clusters in Northern Europe and over 30 on both the European and African shores of the Mediterranean. A good example is Blue Cluster (or *Blauwe Cluster* in Dutch), headquartered in Ostend, Belgium. Blue Cluster is a membership organization founded in 2017. It is best classified as an entrepreneurship support organization with substantial scientific support. Blue Cluster provides assistance to around 180 members. Projects in fields such as blue tourism, coastal protection,

navigation, renewable energy, pollution, sustainable seafood, and marine biotechnology are supported with entrepreneurship guidance, and scientific assistance such as peer review of projects and laboratory testing. One interesting feature of Blue Cluster is that the organization facilitated the creation of development roadmaps for each of the areas in which the Cluster works.⁵

As part of a national competition to identify clusters across its industrial base, Canada has established and funded an industry-led “Ocean Supercluster.”⁶ In its 2023 annual report, the Ocean Supercluster announced it had “a portfolio of C\$400M in projects involving more than 300 partners who are delivering more than 200 new ocean products, processes and services.”⁷ The Ocean Supercluster funds research and development through two major programs: the Technology Leadership Project Program and the Innovation Ecosystem Projects and Activity Program. These programs support substantial research efforts, in excess of C\$1 million throughout Atlantic Canada and Quebec. It also convenes networking events among its members from across Canada.

The Canadian and Belgian clusters are examples of multi-sector clusters where many different types of industries take advantage of their location near one another. Other clusters are built around limited areas of research. An example is the Korea Marine Bio Cluster, a group of businesses and research organizations in and around Busan in southeastern Korea. This cluster focuses on creating a wide variety of products in the food and pharmaceutical industries from regional marine resources.

Given the leading role that cluster-based strategies play in blue economy development policies, Maine could benefit from a concerted effort to establish and develop a state-wide blue economy cluster organization. The key would be to ensure it represents the opportunities and existing entities up and down Maine’s long and varied coastline and provides critical infrastructure to formally link organizations and businesses that collectively comprise the full range of our blue economy.

Funding and Public Policy Support

The United States is behind many other nations in direct financial support for its blue economy, though there have been a few notable investments in the last decade. Most recently, as part of a grant program funded by the Inflation Reduction Act, the U.S. Department of Commerce awarded \$54.3 million to four consortia based in California, Florida, the Great Lakes, and Massachusetts. The Gulf of Maine Research Institute led a consortium of organizations in applying for the initial iteration of this grant, but their group was not selected as a finalist.

In addition to federal funding to support the blue economy, the federal government has taken important steps to advance broad policy and structure the government so that the U.S. is better positioned to compete globally. Congress has authorized various studies focused on particular sectors of the blue economy, including a recent global review of economic opportunities related

⁵ See <https://www.bluecluster.be/projects/application/roadmaps>

⁶ <https://oceansupercluster.ca/>

⁷ https://oceansupercluster.ca/wp-content/uploads/2023/10/OSC_AnnualReport_2023_Eng-1.pdf

to seaweed farming and seagrass restoration.⁸ Members of Congress have introduced several bills supporting development of the blue economy in recent years. Additionally, the White House Office of Science and Technology Policy has initiated interagency coordination strategies related to the ocean economy and the bioeconomy.

As these examples of blue economy initiatives in other states and countries indicate, there is momentum and opportunity to successfully develop and implement strategies related to the blue economy. Maine can build on its unique maritime legacy and position itself as a leader in blue economy innovation.

⁸ “Farming Seagrasses and Seaweeds: Responsible Restoration and Revenue Generation,” Interagency Working Group on Farming Seaweeds and Seagrasses, edited by Price, Nicole et al., 2024. Available at: https://www.ars.usda.gov/ARSUserFiles/np106/Seaweeds%20and%20Seagrasses/Aquaculture%20Congressional%20Report.v5_2024%2009-10%20MC_508%20compliance.pdf

Common Themes from Review of Existing Maine Policy Plans and Consultations

The work of the Task Force took place in the context of development plans, strategies, and roadmaps that have been developed over the past several years, some covering the broad Maine economy, some targeting specific subsets of the economy, and some targeting individual blue economy sectors. As required by legislation, the Task Force evaluated these reports, overlaying them to identify major themes, as well as commonalities and gaps that are relevant to its work. (See Appendix B for a full list of policy plans reviewed).

Maine's Blue Economy Sectors	Strategy/Plan	
Commercial fishing and seafood	SEA Maine	
Aquaculture and seafood	Aquaculture Roadmap & SEA Maine	
Marine vegetation (seaweed, algae, and seagrasses) - farmed and wild harvest	Aquaculture Roadmap addresses farmed seaweed, but not wild harvest; Maine Innovation Action Plan	
Offshore wind	Maine Offshore Wind Roadmap	
Marine propulsion systems and boatbuilding	N/A	
Marine biotechnology and life sciences	Mentioned in Maine Innovation Action Plan	
Marine research and ocean data	N/A	
Resilient coastal infrastructure	Mentioned in Maine Won't Wait and Infrastructure Task Force	
Defense and national security	Defense Industry Maine Strategic Plan	
Recreation and tourism	Included in Maine State Comprehensive Outdoor Recreation Plan	

The Task Force notes – as the legislation also recognized – that several sectors relevant to Maine's blue economy do not currently have a development plan, strategy, or roadmap. The Task Force gained significant information from representatives of those sectors during its meetings, consultations, and site visits. In addition to Task Force meetings, it also convened over a dozen consultations with specific blue economy sectors at which it heard from over 100 individual participants. While this effort was as comprehensive as possible given the time constraints of the process, the Task Force was not able to gain perspective from some key stakeholders (see Appendix C for a full list of consultations and participants).

The combined information gained from these efforts identified several common contextual themes that are categorized and summarized below.

A list of outstanding recommendations from existing reports are also called out in the recommendations section below.

Access to the Ocean

As more and more uses are found for ocean resources, the competition is intensifying for space on, in, and around the ocean. Much of the competition concerns government policies for deciding who can occupy what areas and for what purpose. As the value of coastal property increases, maintaining access to the water for both legacy industries and emerging uses is leading to conflicts and complexity.

Key Issues:

- *Property value:* Dramatic increase in the value of waterfront property has left communities struggling to maintain control over working waterfront infrastructure. Coastal property owners interested in protecting their viewsheds, many of whom are not year-round residents, may have less understanding of the value of working waterfronts to the economic viability of small towns along Maine's coastline, thus presenting challenges to new and existing ocean users.
- *Ongoing loss of working waterfront property:* In a 2023 report, the Island Institute noted that of Maine's more than 5,000 miles of coastline, less than 20 miles remained that could be classified as working waterfront.⁹ Maintaining Maine's working waterfront is a key element of climate resilience outlined in the state climate action plan *Maine Won't Wait 2024*.
- *Extreme weather:* An increase in extreme weather events and rising sea levels as a result of climate change threaten the viability of existing infrastructure used to access the ocean. Destruction during the winter storms of 2023-24 clearly exposed this stress point and was highlighted by the recent Infrastructure Rebuilding and Resilience Commission.
- *Shoreside competition:* Emerging or expanding ocean uses, including aquaculture operations, offshore wind development, and marine carbon dioxide removal may lead to competition for shoreside services and actual or perceived conflicts with existing industries such as commercial fishing.

Community Involvement, Workforce, and Infrastructure

To reach its economic potential, development of Maine's blue economy must be a shared responsibility among state and Tribal governments, businesses, nongovernmental organizations, and citizens. This work will involve addressing many challenges, including those that apply not just to the blue economy, but across the spectrum of economic activity.

Key Issues:

- *Population demographics:* Population shifts in coastal communities are trending toward fewer young people, and an increase in older, retired folks along with an increase in

⁹ <https://www.islandinstitute.org/2023/02/22/to-save-the-last-20-miles-of-maine-s-working-waterfront-we-need-to-update-the-law/>

seasonal or part-time residents and remote workers.¹⁰ These groups tend to have greater interest in keeping the coast the way it is and minimizing the growth of industries.

- *Balancing heritage industries with emerging opportunities:* Expanding and emerging industries such as aquaculture and offshore wind could assume larger and larger roles in the blue economy, but their impacts are much less familiar than other traditional uses, and in some cases can be perceived as threatening existing uses.
- *Culture:* The “independent spirit” endemic to Maine’s coastal culture – as exemplified by the lobster industry which has maintained an owner-operator model to limit consolidation – creates trade-offs. The prioritization of independent operation presents challenges to scalability that could otherwise attract investment and create revenue growth. In some cases, traditional practices and relationships in legacy industries such as commercial fishing can serve as a barrier to entry for newcomers and innovation.
- *Infrastructure limitations:* Coastal communities often face a dearth of infrastructure and logistics including working waterfront facilities (wharves and piers as well as shoreside facilities for processing, storing, and buying and selling products), utilities (access to high-speed internet, clean water, and affordable power), and housing and human resources. In particular, the loss of processing capacity to other states and in some cases across the border to Canada represents a risk.
- *Skilled workforce:* Attracting a larger, technically skilled workforce. While Maine has a high-quality network of schools and universities with programs relevant to the blue economy, the capacity is insufficient to provide the number of skilled workers a robust blue economy will demand.
- *Cost-of-living:* Affordability of healthcare, childcare, and housing affects all aspects of Maine’s economy. While solutions are beyond the scope of the Task Force to address, these concerns were raised consistently in the roadmaps, Task Force meetings, and consultations.

Regulatory and Social License

In the reports and throughout the consultations, authors and participants highlighted permitting processes as barriers to growth. There will always be tension between parties that desire a more streamlined, facile process and those who desire a more precautionary, measured approach. The pace of permitting is also tied to an extensive set of environmental laws and regulations established by the Legislature. Navigating this delicate balance between stakeholder engagement and expeditious development will be a key challenge.

¹⁰ Article slated for publication in Feb 2025: National Oceanic and Atmospheric Administration, Office for Coastal Management. 2025 Coastal America: A Demographic and Economic Picture. Monterey, CA: Center for the Blue Economy. Available at: <https://cbe.miis.edu/publications/>

Key Issues:

- *Regulatory strategy:* Most regulations about who gets to use the ocean were established when there was much less demand for shoreline and ocean space and were written to place the burden on new users in preference to historical users. This can tend to disadvantage new and expanding industries.
- *Maine's competitive edge:* State agencies, including the Department of Marine Resources and the Department of Environmental Protection, have made some improvements to their permitting processes in recent years, but the general consensus among stakeholders is that Maine lags other states in terms of efficiency in processing permitting applications. This dynamic is seen as a particular concern for the aquaculture industry due to the volume of lease applications. It is important to note that the volume of aquaculture permit applications that require processing in Maine is substantially higher than other states.
- *Community support:* There is an inherent complexity between permitting and social license. If permitting agencies act more quickly or approve more permits, this could be perceived as disenfranchising individuals or groups that may oppose establishment or growth of certain industrial activities. This, in turn, can lead to backlash, lawsuits, and ultimately, slower progress.
- *Access to permits:* Maine's commercial fishing industry is struggling to acquire and retain permits and access to quota for some important species. A transition to transferable permits and quota allocation in the groundfish fishery has led to consolidation of this fleet in southern New England, and Maine fishermen have little access to quota or permits for species like black sea bass that are moving into a warming Gulf of Maine.

Market Development

Various policy plans and consultations noted economic development, including the development of new markets, as a primary goal.

Strategies offered to advance this goal include:

- *Maine's brand identity:* Expanding and growing the Maine brand as a way of commanding higher prices for Maine goods and services and creating communications tools to develop consistent, fact-based narratives about the benefits of expanding the use of Maine's marine economy. Such information will be critical to bolster the Maine brand, assuage fears about emerging opportunities, and counterbalance misinformation and outdated narratives.
- *Value added products:* Developing new products from ocean resources to extract additional value from what Maine businesses already produce. Examples include pharmaceuticals derived from ocean resources, such as Marin Skincare's line of products created from glycoproteins found in waste products from lobster processing, and expansion into new categories of processed food products.

- *Domestic markets*: Creating the infrastructure and marketing plan development to expand market access and connect Maine products to additional consumers.
- *Export markets*: Exporting emerging technology and expertise. Maine is in the process of developing new technologies for ocean use which should be used to Maine's benefit but should themselves become products for export. Maine's development of floating platforms for deepwater offshore wind is a large-scale example.

Sustainability & Climate Action

Sustainability is a fundamental part of the blue economy concept, and it appears in two aspects. The first is the traditional notion of operating within natural limits so as not to deplete key resources. This includes the need for careful, forward-looking management of resources by government and industry and a desire for the ocean economy to benefit all parts of Maine, including more rural and remote communities. The second aspect reflects the imperative for action in the face of climate change. Collectively, the impacts of climate change present numerous sustainability issues and potential development opportunities, particularly off Maine's shores as the Gulf of Maine is warming faster than almost any other ocean surface on the planet.

Key Issues:

- *Rising water temperatures*: The distribution and composition of marine species, including those of importance to commercial fishing and harvesting is changing as waters warm and acidify.
- *Renewable energy*: Increasing demand for renewable or zero-carbon electricity production provides an opportunity for Maine to play a significant role in developing offshore wind capacity, though this is controversial with some groups. In particular, the commercial fishing industry remains staunchly opposed to offshore wind development.
- *Electric propulsion*: The imperative to reduce use of fossil fuels means many seagoing vessels are exploring opportunities to change their propulsion system to low- or zero-carbon options. This is part of the broader decarbonization mission identified in the *Maine Won't Wait* state climate action plan.
- *Marine carbon dioxide removal*: The ocean is expected to play a major role in managing the amount of carbon in the atmosphere through carbon storage and sequestration in marine ecosystems. The potential for ecosystems in Maine to play a role in carbon dioxide removal efforts is still under investigation. A great deal of research and experimentation on this topic is taking place in and around the Gulf of Maine, including in Maine, meaning Maine is well-positioned geographically to be a player in this field.
- *Extreme weather events*: The recent increase in extreme weather events has highlighted major threats to coastal communities in the form of large-scale flooding

and storm surges. Adapting to this threat will require substantial reconstruction and potentially relocation efforts.

Finance

The need to find capital to start or grow a business and to expand successful businesses to serve larger markets is a constraint on potential growth. Maine entrepreneurs are burdened by the fact that Maine has low venture capital investment volume¹¹ and relatively few investors as compared with other states, and fewer yet that are familiar with industries like the blue economy, and this dynamic makes securing funding a significant barrier.

Key Issues:

- *Access to state funding:* It has been common in other states and countries for the blue economy's growth to be significantly supported by public funding from both the regional and federal levels. In other states, seed funding from the state government has served as a catalyst, unlocking private investment and attracting larger federal grants. Maine Technology Institute, the Finance Authority of Maine and Maine Venture Fund all play this role in Maine, but do not contribute the magnitude of capital needed. Evaluating Maine's existing business financing support programs to identify ways to attract more capital to blue economy focused companies and organizations is critical.
- *Access to philanthropic funding:* Private and philanthropic entities have begun taking more of an interest in the potential of the blue economy, including in Maine. Scientific research organizations, universities, and other entities have had success in developing components of the blue economy, but Maine has yet to develop the collaborative framework and partnerships to coalesce into a fully-formed blue economy cluster that can compete with other leading states.
- *Federal funding:* Each of the past two presidential administrations has created grant programs through the Economic Development Agency and NOAA that have invested tens of millions of dollars in organizations to promote the blue economy. None of that funding has come to Maine. Particularly given the current roles of members of Maine's Congressional delegation, there is now an opportunity to position Maine's blue economy to compete with more established states such as Washington, Rhode Island, Alaska, Mississippi, and California.

Research Institutions

Maine is fortunate to have numerous institutions with research missions related to the ocean including institutions of higher education. These organizations are highly valuable to the state and geographically dispersed. From the University of New England in York County to the Downeast Institute in Washington County to the University of Maine System in locations

¹¹ <https://www.statista.com/statistics/424167/venture-capital-investments-usa-by-state/#:~:text=In%202023%2C%20the%20state%20that,nearly%2021.65%20billion%20U.S.%20dollars.>

throughout the state and many places in between, Maine is a growing ocean science research powerhouse. Maine's research institutions also comprise a significant source of high-quality employment.

Key Issues:

- *Collaboration*: Maine's research community could benefit from improving and formalizing collaboration and coordination among institutions. Some of this is being addressed organically, such as the establishment of the Maine Marine Science Consortium, an effort to bring together leaders from Maine's research organizations initiated by the Bigelow Laboratory for Ocean Sciences.
- *Collective expertise*: Leveraging the collective expertise of these multiple organizations will be key to enabling the state to compete effectively with larger, more established regional efforts coordinated through organizations such as Woods Hole and Scripps.

The Blue Economy in Maine

A Description of Maine's Blue Economy

Data about the ocean economy indicate the breadth of industries and activities that can be included in the blue economy but do not fully reflect the strength of Maine's blue economy assets. Maine has unique attributes that make it an important location for the development of blue economy businesses and economic activity and is uniquely positioned with abundant ocean and coastal resources.

Maine has:

- a geographic location between the northern European hubs of the blue economy and the markets of the U.S. east coast, making it home to the first ports vessels encounter heading west from Europe.
- deepwater ports that serve a wide variety of shipping and maritime transportation needs;
- some of the only deepwater offshore areas under state control along the Atlantic seaboard allowing state regulators to permit, test, and potentially develop deepwater activities without going through a full federal permitting process;
- a workforce of experienced ocean users populating a coastline dominated by small towns home to independent thinkers and operators;
- access to abundant living marine resources for wild capture and cultivated harvest;
- a culture of marine and maritime heritage and an ingrained ethic of sustainability;
- a network of research organizations and academic institutions with a history of innovation in construction, materials development, and creative use of natural resources; and
- a thriving and historic industry of ship and boatbuilding.

These strengths position Maine as a potential leader in growing its blue economy by finding new ways to build on our legacy industries such as ship- and boatbuilding, marine and coastal construction, marine research and education, commercial and recreational fishing and harvesting, aquaculture, and transportation; and creating opportunities for sustainable growth in emerging sectors such as new data technologies, marine biotechnology, climate adaptation, and renewable energy.

Building from the definition outlined in legislation, the Task Force has opted to describe Maine's blue economy as follows:

Maine's blue economy is a sustainable and equitable ocean economy that optimizes innovation to expand economic opportunities in our coastal communities. It is grounded in Maine's unique marine 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 communities’ socio-cultural priorities and without negatively impacting social, environmental, and cultural aspects of the community.

Opportunities to Grow Maine’s Blue Economy

Maine’s blue economy strengths align with global megatrends in climate resilience, marine defense, and demand for food. The state has unique capabilities, assets, and opportunities that will serve future growth, including in the fields of biotechnology, biobased products and composites, ocean data and monitoring, renewable energy and propulsion, and seafood and living marine resources. If nurtured, they will yield sustainable and climate positive solutions and products that bring value to local communities and the overall economy.

Opportunities in Blue Economy Sector Strategies Previously Identified

The Task Force conducted a careful review of all existing reports and roadmaps and identified a series of key recommendations applicable to development of Maine’s blue economy more broadly. These are enumerated in the Recommendations section below. Industries and sectors not addressed further in this section of the report, but that remain a vital part of Maine’s blue economy, include commercial fishing, aquaculture, and offshore wind and renewable energy.

New and Emerging Opportunities in The Maine Blue Economy

Marine Research and Ocean Data

A rapidly growing portion of the ocean-related economy over the past decade has been oceanographic research. Part of this has been basic science, and part what is called “operational oceanography” or ocean observing. This expansion is taking place in major research institutions as well as private sector companies that build and operate research technologies, or collect, analyze and publish ocean data.

Maine is already well positioned with key assets in these fields, particularly after developments over the past few decades. These include the founding and growth of the Gulf of Maine Research Institute, the expansion of the Bigelow Laboratory for Ocean Sciences, the establishment of the Roux Institute at Northeastern University, and growth in marine programs at the University of Maine, Maine Maritime Academy, the University of New England, Bowdoin College, and Colby College. These organizations provide research capacity and activity critical to meeting the needs identified by many of those with whom the Task Force consulted.

NOAA’s most recent assessment found that the private sector employed over 325,000 people nationally and had \$8 billion in gross output in marine research and data services.¹² It refers to

¹² NOAA 2021 The Ocean Enterprise 2015-2020: A Study of the New Blue Economy Business Activity. <https://doi.org/10.25923/e6w1-w084>.

this sector of the blue economy as “The Ocean Enterprise.” Maine has been a small player in this field but has a long history. The Gulf of Maine Ocean Observing System established in the 1990s was the first of its kind and became the cornerstone of what is now a national network of ocean observing entities. In recent years, Maine-based organizations have once again begun to grow at a fast pace, supported by our robust network of research organizations.

Marine Biotechnology

Marine biotechnology is a broad and rapidly developing field of research and development in which understanding of the molecular biochemistry of marine organisms is translated into commercially viable products, primarily as ingredients in food, nutraceutical, or pharmaceutical applications.¹³ There are also applications in aquaculture and commercial fisheries. The opportunities in marine biotech are driven by the significant diversity of marine life as well as rapidly growing research in such fields as molecular chemistry and bioinformatics. The field is large and comprises organizations in many different industries. As such it is difficult to pin down the size of this sector either nationally or in Maine.

The Bigelow Laboratory for Ocean Sciences and Mount Desert Island Biological Laboratory are two examples where Maine is already engaged in marine biotech research. MDI Biological Laboratory has over a century of using marine organisms as models for human systems in order to accelerate the discovery of new medicines. Bigelow, MDI Biological Laboratory and several other Maine organizations have partnered on a large-scale multi-year project to investigate uses for marine algae, a field in which Bigelow is a world leader.¹⁴ One major purpose of this National Science Foundation-funded project is exploring ways to use marine algae and move production towards commercialization. This work connects to another opportunity: commercial uses of macroalgae.

Marine Vegetation

Maine harvests and grows more seaweed than any other state in the nation. While seaweed is currently making headlines for its potential for use in all kinds of products, marine vegetation has long been a valuable product in Maine’s blue economy. Rockweed has been harvested from Maine shorelines for more than a century to turn into soil conditioners and animal feed and is now the primary seaweed species used in the biostimulant market. More recently, aquaculture of kelp and related macroalgae has emerged as a fast-growing subset of aquaculture, creating products suitable as food for humans, livestock, and pets, nutraceuticals, construction materials, fabrics, plastics, and pharmaceuticals among other uses.¹⁵

A new source of economic value from marine vegetation has come about from the role of vegetation in addressing climate change. The vegetated shorelines of coastal wetlands provide flood control benefits against sea level rise-enhanced flooding. Wetlands vegetation and underwater eel grasses also store and sequester carbon dioxide and provide critical habitat for

¹³ Daniotti, S., & Re, I. (2021). Marine Biotechnology: Challenges and Development Market Trends for the Enhancement of Biotic Resources in Industrial Pharmaceutical and Food Applications. A Statistical Analysis of Scientific Literature and Business Models. *Marine Drugs*, 19(2), 61. <https://doi.org/10.3390/MD19020061>

¹⁴ <https://www.bigelow.org/news/articles/2024-08-27.html>

¹⁵ World Bank. 2023. Global Seaweed: New and Emerging Markets Report. Washington: World Bank.

other species. These values make the conservation and restoration of wetlands and eel grasses a growing part of the coastal construction industry; a special activity category was created to track this industry in the Marine Economy Satellite Account, a database created by NOAA to track statistics on 10 sectors of the national blue economy (for additional data on blue economy sectors, see Appendix D).

In addition to seaweed and algae, seagrasses represent a burgeoning opportunity to restore habitats, absorb carbon dioxide, and address issues of water quality. The Casco Bay Estuary Partnership at the University of Southern Maine manages eelgrass conservation and restoration projects. Funding is expected to expand as wetlands and eelgrasses enter carbon markets at the local and national level.

Resilient Coastal infrastructure

As sea levels rise and incidents of extreme weather become more frequent, making coastal infrastructure more resilient to our changing climate will require substantial investment and generate economic activity. Part of this will include understanding and leveraging the role of wetlands and other natural shorelines in reducing flood damage. This potentially substantial benefit can be realized in both coastal and riverine shorelines. As more attention is being directed at how to adapt to sea level rise, this reduction in flood damage is gaining attention.

Natural infrastructure such as wetlands and marine vegetation can provide flood protection without some of the disadvantages of hard engineered structures like seawalls and riprap that can save some properties but damage adjacent ones and often lead to ever lengthening areas of armored shorelines that in turn exacerbate erosion. There is significant research into the development of hybrid systems that combine natural and engineered solutions to gain the benefits of both types of systems.

The storms of later 2023 and early 2024 were a preview of what the future may hold for Maine shoreline and coastal communities. Significant investments in repairing and reducing damages from climate-enhanced flooding will be needed in the next two decades but could be mitigated to some extent by investment in cost-effective shoreline protection systems. Success in this would not only improve the resilience of Maine's coastline but may create products which can be made in Maine and sold around the world. Both the Governor's Commission on Infrastructure Resilience and Rebuilding and *Maine Won't Wait*, the state's climate action plan, note the importance of resilient communities.

Maritime Propulsion Systems and Sustainable Boatbuilding

Maine has over four centuries of boatbuilding history, and it has been a center of innovation through multiple generations of technologies, from wood to steel to fiberglass to composites. The next generation of technology for boats is already here, and it includes two areas of innovation.

One is a movement toward construction materials sourced from more natural products, in some cases from forestry or potentially seaweed and algae. The University of Maine is home to the largest 3-D printer in the world, and it is working with Maine's forestry and boatbuilding industries to develop novel, sustainable marine construction practices. In 2022, the University 3-

D printed two new boats made from a wood-based plastic as prototypes for the U.S. Marine Corps.

The second is a movement toward decarbonization of maritime propulsion systems. Globally, most of the attention in this field has been on oceangoing cargo fleets and cruise ships, but there is an array of recreational and work boats that will also switch away from fossil fuels in the coming years, opening opportunities in their construction and retrofitting. With experience in markets from small recreational boats to larger working boats, Maine is again well positioned to be a leader in this global movement. Hodgdon Yachts in Southport recently constructed an all-electric powerboat for the Maserati company in Italy.¹⁶ There are also large opportunities for marinas to shift to servicing electric and hybrid boats and outboard motors.

Other Ocean-Related Industries Not Considered by the Task Force

The timeline and the Task Force composition did not leave adequate resources to address issues in two sectors that play a significant role in the blue economy, but also extend into non-ocean-related activities: 1) defense and national security, and 2) recreation and tourism. There are components of each of these sectors that meet the definition of Maine's blue economy, and given their size and scope, they deserve mention here and could be areas to further explore in any future work of the Task Force.

Defense and National Security

The defense and national security sector, particularly in shipbuilding, dominated by Bath Iron Works (BIW) and the Portsmouth-Kittery Naval Shipyard, is the largest ocean economy sector in Maine measured by value added. Shipbuilding in Maine is shaped primarily by Department of Defense policies. But there are many suppliers to BIW in Maine supplying a variety of input parts. A 2019 plan for the defense industries done for DECD noted that many of the 152 companies involved in defense are looking to diversify their customer base.¹⁷ Connections with the rest of the Maine blue economy may enable this. There are also important potential connections between the workforce in the defense industry in Maine and the rest of the blue economy.

Recreation and Tourism

Recreation and tourism is the largest ocean economy sector by employment. It permeates coastal Maine and is a critical connection between the Maine economy and the ocean, but it is different from other sectors. Where creating new private sector businesses is a challenge for other sectors, the creation of new businesses is a constant fact in recreation and tourism which has very dynamic markets and start-ups. Recreation and tourism also requires much more active involvement from local level organizations such as chambers of commerce. It also competes with other blue economy sectors for access to infrastructure and ocean space, which can lead to conflicts that require careful consideration and negotiation.

¹⁶ <https://www.media.maserati.com/releases/1855>

¹⁷ Stone & Associates. 2019. Strategic Plan for the Defense Sector in Maine. Augusta: Maine Department of Economic and Community Development

The Future of Maine's Blue Economy

The Task Force identified three key themes to categorize and articulate these opportunities into a vision for the future of Maine's blue economy: Innovation, Collaboration, and Investment.



Innovation

The blue economy comprises inherently forward-looking opportunities, which will be developed through innovation of emerging industries and encouraging and incentivizing legacy industries to incorporate new practices and efficiencies to take advantage of global, national, and regional trends. Here, Maine's centuries-old legacy of making a living from the ocean often aligns with the mission of laboratories, universities, and independent businesses. These stakeholders seek to leverage our human and natural resources to build the blue businesses of the future, while supporting the workers and communities that are already deeply invested—emotionally and economically—in their work.

Throughout its review, the Task Force was comprised of, and engaged with new and legacy businesses and industries. They all share the need to adapt to a future that will be different from yesterday or even today, collecting and processing more data than ever before to better understand oceanographic conditions and patterns, strengthening and evolving to reflect the changing physical dynamics of our coastlines and weather patterns, or adapting to shifting population dynamics and availability of critically important species like lobster, groundfish, and shellfish.

In its existing network of businesses, research institutions, universities, nonprofit organizations, and governance expertise, Maine possesses many of the resources needed to leverage our history to progress toward a prosperous and sustainable future.



Collaboration

Strengthening partnerships between and among state agencies, research institutions, and the private sector will foster innovation across blue economy sectors and boost Maine's competitive advantage among peers domestically and internationally. This report has previously referenced the opportunities and challenges that come from our dispersed array of coastal communities. This creates an environment that is as ripe for collaboration as it is for individualized innovation.

Maine lacks a single location clearly positioned to serve as the hub of a potential cluster. Instead, we have numerous smaller entities that each play individualized, specific roles in developing our blue economy. Because each entity understands that it cannot be expected to be all things to all industries, they necessarily rely on collaboration to fill gaps and compete on a national or international scale.

Fortunately, relationships among organizations involved in this work, many of which were represented on the Task Force, are typically quite collegial and mutually supportive. Technology has overcome some of the most important barriers to collaboration. However, many of the partnerships that have emerged tend to be *ad hoc* rather than organized and prescribed. This is one area where additional incentives and engagement from state government could be beneficial.

 *Investment*

Finally, there is an opportunity for federal, state, philanthropic, and private investment to bridge funding gaps that are hindering blue economy innovators from scaling technologies that will be responsible for launching new industries and helping Maine's heritage industries evolve to meet future challenges. Maine is currently behind other states in leveraging these funds, but we have all the components necessary to close the gap.

These broad themes should form the basis of Maine's blue economy strategy as implemented by public, private, and nonprofit organizations. However, there are specific actions that the Task Force recommends be undertaken, as described below.

Task Force Recommendations

The various development plans, strategies, and roadmaps that exist in Maine have laid a solid foundation for next steps, which include developing a Blue Economy Strategy for Maine. The strategy should include many of the elements identified in this report, as well as further defining possible actions. A well-developed Blue Economy Strategy will provide Maine with opportunities to sustainably use the ocean while growing its blue economy.

The Task Force makes the following specific recommendations to support growth of Maine's blue economy and increase Maine's competitiveness domestically and globally.

1. Establish a Maine Center for the Blue Economy.¹⁸

The presence of a unifying cluster-style organization, established through a public-private partnership, creates an enabling environment that fosters blue economy growth. Launching such an organization would position Maine for greater success in acquiring funding and attracting innovators and start-ups to take advantage of the state's strengths. It would do this by fostering coordination among stakeholders, supporting entrepreneurship and commercialization of research, facilitating access to investment capital, executing community engagement and education programming, and ensuring Maine's strategies are aligned with national and global trends.

Next steps include:

- Develop authorizing legislation directing establishment of a Maine Center for the Blue Economy.
- Its blueprint should include shared facilities such as processing equipment, cold storage and freezing facilities, bioreactors, test pools, 3-D printing, and data processing at strategically identified locations along Maine's coast.
- The organization should also sponsor or direct development of roadmaps for blue economy industries that lack such plans. This could include ocean data and information companies as well as boatbuilding and marine vegetation.
- Allocate seed funding to be matched or supplemented by congressionally directed spending and federal and philanthropic grants.

2. Create a blue economy focus among existing state development and finance programs and prioritize investments in blue economy research, development, and commercialization.

The nature of the blue economy means it includes areas of responsibility across state agencies and departments. As such, it will require a concerted effort on behalf of leaders within the state government to recognize and act on these opportunities. This also extends to funding allocations that otherwise might not be crafted in such a way that blue economy entities are clearly eligible to receive them.

¹⁸ N.B.: The Bioscience Association of Maine has submitted legislation to establish and provide \$4 million to stand-up a Maine Life Science Innovation Center which defines life sciences to include elements of the blue economy identified in this report (e.g., marine biotechnology, marine vegetation, and data) and which has a similar proposed function to the Maine Center for the Blue Economy.

Next steps include:

- Designate a point person within State government to support the development of Maine's blue economy and communicate to stakeholders about availability of funding and additional support.
- Conduct a review of state agencies with a goal of clarifying which agencies and state government roles should coordinate on blue economy initiatives, optimizing regulatory processes, providing targeted industry support, and fostering strong community relations.
- Conduct a review of Maine's public and private financial incentives (e.g., tax and spending policy) and funding organizations (e.g., Maine Technology Institute, Financial Authority of Maine, Maine Venture Fund, etc.) to identify funding opportunities and improvements to prioritize growth of the blue economy in Maine.

3. Form a blue economy education and training council to coordinate curriculum and research opportunities across Maine's research organizations, including commercialization of research.

Blue economy workforce supply was a major concern throughout the Task Force's consultations and in the existing roadmaps and plans. Currently, workforce development takes place in many public and private educational institutions primarily in higher education. Adding training programs of direct relevance to blue economy industries will lead to more availability of workers and keep more young Mainers in state to take good paying jobs in their communities.

Next steps include:

- Support the efforts of the Maine Marine Science Consortium already established by Maine's major research and education organizations to facilitate cooperation in research activities.
- Fund a state program to help Maine-based research institutions fulfill match obligations to access of federal and philanthropic funding.
- Expand access to scientific research journals which are available only through very limited and expensive paywalls.
- Create a blue economy education and training council with input from the University of Maine, the Maine Department of Education, and other entities, tasked with expanding the number of slots in current workforce development programs, expanding and refining curricula, and sharing scientific resources.

4. Continue the work of the Blue Economy Task Force.

The work of the Task Force was effective but highly constrained by the tight deadline established in the enabling legislation. There is much more work left to do to reach additional contributors and stakeholders, provide additional evidence of opportunities, develop more granular and targeted recommendations, and foster greater understanding of blue economy opportunities, particularly in more rural and remote communities.

Next steps include:

- Extend the term of and funding for the Task Force with a mandate to expand coordination with key stakeholders (e.g. Tribal leaders, industry leaders, municipal governments, etc.).
- Authorize the Task Force to develop a Blue Economy Strategy and oversee the following:
 - Assemble a database of current blue economy organizations, capacities, and activities to understand which entities are engaged in which sectors, and to further explore risks and opportunities in this area.
 - Determine how to structure, fund, and define a mandate for a blue economy center as described in Recommendation 1.
 - Work with relevant state agencies to further explore issues identified in this report such as continuing to improve effectiveness and efficiency of permitting systems as noted in the 10 Year Economic Development Strategy.
 - Facilitate establishment of the blue economy education and training council (see Recommendation 3), including plans to expand blue economy education to K-12 curricula.
 - Develop a specific list of investments to be prioritized to further develop Maine's blue economy.

5. Act on key recommendations from existing policy plans.

The Task Force includes by reference many excellent ideas that have emerged from existing plans for the diverse sectors of the blue economy. Many of those recommendations that have not yet been implemented would contribute to growing Maine's blue economy.

- The Task Force particularly notes the role that the ocean plays in Maine food systems. Wild harvested and cultivated fish, shellfish, and seaweed are key foundations of Maine's national reputation for quality food and for innovative cuisine. (*SEA Maine Roadmap* and *Maine Aquaculture Roadmap*).
- Members of the Task Force support accelerated investment in renewable energy, including offshore wind, and the ancillary services and resources that support renewable energy development. But it is to be noted that the commercial fishing industry, while supportive of renewable energy in general, remains strongly opposed to offshore wind development and not all members of the Task Force were supportive of this recommendation. (*Maine Offshore Wind Roadmap*, *Maine Won't Wait*, and *Maine Commission on Infrastructure Rebuilding and Resilience*)
- Address climate change impacts through infrastructure resilience and adaptive measures (*Maine Offshore Wind Roadmap*, *Maine Won't Wait*, and *Maine Commission on Infrastructure Rebuilding and Resilience*)
- Address the workforce shortage by expanding training programs, increasing affordable housing options, and enhancing job quality in key sectors. (*Maine Economic Development Strategy 2020-2029*, *Maine Jobs & Recovery Plan*, *Maine Won't Wait*, and *Defense Industry Maine Strategic Plan*).

- Simplify and streamline permitting processes to facilitate economic development while maintaining environmental standards (*Maine Aquaculture Roadmap*, *Maine Offshore Wind Roadmap*, *Maine's 10-Year Economic Development Strategy*).
- Foster collaboration and partnerships by expanding cross-sector partnerships among public, private, non-profit, and educational organizations to diversify Maine's economy and ensure resilience (multiple reports, including the *Maine Economic Development Strategy* and *SEA Maine Roadmap*).
- Invest in infrastructure to secure long-term access to working waterfronts and coastal areas for industries like fishing, aquaculture, and offshore wind (multiple reports, but primarily *SEA Maine Roadmap* and *Maine Offshore Wind Roadmap*).
- Engage local communities in planning and decision-making, particularly in infrastructure projects, to ensure alignment with cultural, environmental, and economic goals (*Penobscot Indian Nation Comprehensive Economic Development Strategy*).
- Increase investments in workforce training programs and affordable housing to attract and retain talent across Maine (*Maine Economic Development Strategy 2020-2029*, *Maine Jobs & Recovery Plan*, *Maine Won't Wait*).
- Prioritize the rebuilding and climate-proofing of coastal and inland infrastructure damaged by storms and rising sea levels (*Maine Commission on Infrastructure Rebuilding and Resilience*).
- Implement a transparent, efficient, and adaptive permitting system to reduce barriers while balancing environmental protections (*Maine Aquaculture Roadmap*).
- Leverage innovation in seafood and marine technology to develop new markets, strengthen the blue economy, and increase export opportunities (*SEA Maine Roadmap*).
- Integrate sustainability into all economic initiatives, focusing on renewable energy and carbon reduction to meet long-term climate goals (*Maine Won't Wait* and *Maine Offshore Wind Roadmap*).
- Expand access to federal and state funding for small businesses and infrastructure projects, ensuring equitable distribution across sectors and communities (*Maine Economic Development Strategy 2020-2029* and *Maine Jobs & Recovery Plan*).
- Enhance investments in science and technology to drive innovation, particularly in renewable energy and marine industries (*Maine Innovation Economy Action Plan*).

Conclusion

Maine's blue economy stands at a pivotal moment, with immense opportunities to leverage its rich maritime heritage, abundant natural resources, and innovative research institutions. The findings of the Blue Economy Task Force highlight the need for a strategic, collaborative, and well-supported approach to drive sustainable growth in both legacy industries and emerging sectors. By fostering innovation, strengthening partnerships, and securing critical investments, Maine can position itself as a national leader in the blue economy, creating resilient coastal communities and long-term economic prosperity. The recommendations outlined in this report provide a clear path to ensure that Maine capitalizes on its strengths, addresses key challenges, and builds a future where its ocean-based industries thrive in an evolving global economy.

Appendices

Appendix A: Task Force Membership and Consulting Team

- **Maine Department of Economic & Community Development (staff)**
 - Office of Business Development (Charlotte Mace), Co-Chair
- **Representatives of public and private research institutions:**
 - Aquaculture Research Institute (Deborah Bouchard)
 - Gulf of Maine Research Institute (Blaine Grimes), Co-Chair
 - University of Maine (Jake Ward)
 - Bigelow Laboratory for Ocean Sciences (Beth Orcott)
 - University of New England (Charles Tilburg)
 - Maine Aquaculture Innovation Center (Chris Davis and Anne Langston Noll)
 - Maine Maritime Academy (Brendyn Sarnacki)
- **Businesses that are innovating in various blue economy sectors:**
 - Blue Trace (Chip Terry)
 - Cianbro (Parker Hadlock)
 - Atlantic Sea Farms (Liz MacDonald)
 - Lyman-Morse (Matthew Graham)
 - ORPC (Nathan Johnson)
 - Eimskip (Tryggi Mar Magnusson and Gylfi Sigfusson)
 - Hodgdon Yachts (Audrey Hodgdon)
 - Maine Renewable Energy Association (Eliza Donoghue)
 - Windward Development Group (Sean Ireland)
 - Washburn & Doughty (Kristen Danaher)
 - Kennebec River Biosciences (Bill Keleher)
- **Fisheries businesses:**
 - Luke's Lobster (Ben Conniff)
 - Greenhead Lobster (Allison Melvin)
 - Portland Fish Exchange (Robert Vanmeter)
 - Madeleine Point Oyster Farms (Thomas Henninger)
 - Acadian Sea Plants (Alison Feibel)
- **Aquaculture businesses:**
 - Cooke (Mike Szemerda)
 - Kingfish (Tom Sorby)
 - Atlantic Aqua Farms Ltd. (Jeff Auger)
- **Equity investors in blue economy businesses:**
 - Maine Venture Fund (Nina Scheepers)
 - CEI (Keith Bisson)
 - Bold Ocean Ventures (Tim Agnew)
- **President of the Maine Technology Institute or the president's designee:**
 - Brian Whitney
- **Other Participants:**
 - Governor's Office of Policy Innovation & The Future (Scott Kleiman)

- Maine Aquaculture Association (Sebastian Belle)
- Maine Coast Fishermen's Association (Ben Martens)
- Island Institute (Nick Battista)
- Maine International Trade Center (Dan Berger)
- New England Ocean Cluster (Chris Cary)

- **Blue Economy Task Force Consulting Team:**
 - Michael Conathan, Michael Conathan Consulting LLC
 - Laura Taylor Singer, SAMBAS Consulting LLC
 - Charles Colgan, Middlebury Institute for International Studies at Monterey
 - Dana O'Brien, BioHarbor Strategies LLC

Appendix B: List of Reports and Roadmaps

1. **Maine Economic Development Strategy**: A dynamic, flexible roadmap created in 2019 and updated in 2023. The non-partisan plan aims to foster collaboration among the public, private, non-profit, and education sectors to grow and diversify Maine's economy. The Department of Economic and Community Development is leading the initiative, in collaboration and partnership with other government agencies, business leaders, and private organizations. *Maine Department of Economic and Community Development, 2019 and 2023*.
2. **Maine Won't Wait**: Maine's four-year climate plan packed with actionable strategies and goals to emit less carbon, produce energy from renewable sources and protect our natural resources, communities and people from the effects of climate change. *Maine Climate Council, 2020 and 2024*.
3. **Maine Innovation Economy Action Plan**: The plan presents a vision for science and technology as drivers of economic opportunity across the state, including in the blue economy. It acknowledges the significant investments made to date and affirms the potential to realize even greater gains by replicating the proven success of partnerships among Maine researchers and innovators. *Maine Innovation Economy Advisory Board, 2023*.
4. **Maine Aquaculture Roadmap**: A ten-year plan that proposes four major goals and identifies over \$15 million in estimated resources needed to strengthen Maine's aquaculture sector and working waterfronts over the next decade. Each goal includes specific action items, which detail suggested organizations to undertake the actions and estimated funds required to accomplish them. *Maine Aquaculture Association, 2022*.
5. **Seafood Economic Accelerator for Maine (SEA Maine) Roadmap**: An industry-led initiative that brought together leaders in Maine's commercial fishing, aquaculture, seafood and marine economy. The roadmap and action plan are centered on economic growth, market and workforce development, and greater resiliency in Maine's seafood economy. *SEA Maine, 2023*.
6. **Maine Offshore Wind Roadmap**: A stakeholder-driven comprehensive plan that offers detailed strategies for Maine to realize economic, energy, and climate benefits from offshore wind, in conjunction with communities, fisheries, and wildlife of the Gulf of Maine. *Governor's Energy Office, 2023*.
7. **Maine Commission on Infrastructure Rebuilding and Resilience**: This Commission was established by Executive Order of Governor Mills following the extensive damage done to Maine coastal and inland infrastructure from storms in the winter of December 2023 and January-February 2024. The Commission issued an interim report in November 2024, with a final report due to be published in May, 2025.
8. **Maine Jobs & Recovery Plan**: The Maine Jobs & Recovery Plan is Governor Mills' plan, approved by the Legislature, to invest nearly \$1 billion in federal American Rescue Plan funds to improve the lives of Maine people and families, help businesses, create good-paying jobs, and build an economy poised for future prosperity. Since the plan went into law in 2021, its incentives have delivered \$211 million to thousands of Maine businesses, created workforce opportunities for 25,000 people, and invested in more than 400 infrastructure projects statewide. *Office of the Governor, 2021 and ongoing*.

9. **Penobscot Indian Nation Comprehensive Economic Development Strategy**: The creation of this document involved municipal government, community and business stakeholder engagement to revise the existing document. Guidelines and inspiration for much of this strategy were taken from the Economic Development Agencies and the National Association of Developmental Organizations, which contained specific guidelines and information on how Tribes can better construct plans that are centered around culture, values, needs and goals. Sections containing general population statistics, specific development and trade goals (divestment from pulp and paper products, development of quality of life infrastructure), cultural resilience as a result of recent natural disasters/COVID and evaluation frameworks were significantly updated from the previous strategic plan. *Penobscot Indian Nation, 2024-2029.*
10. **Defense Industry Maine Strategic Plan**: The objective of this effort was to develop a strategic plan to assist companies in the Maine defense supply chain to grow, diversify and enhance their resilience. The focus was to conduct research to identify defense company growth and diversification opportunities, as well as challenges and barriers to growth, and then recommend specific programs and investments that can assist Maine companies to reduce risk, accelerate growth and generate high quality/high wage jobs in Maine. The work tasks included research to identify companies that serve defense markets, 57 in-depth interviews with Maine companies, economic development organizations and recipients of OEA grants in other states (to identify lessons learned), as well as secondary research on key industries/sub-sectors of the Maine defense sector. *Stone and Associates and the Maine International Trade Center, 2019.*
11. **Maine's 10-Year Outdoor Economy Recreation Roadmap**: "This summary of Maine's 10-Year Outdoor Recreation Economy Roadmap is a guide to growing and diversifying Maine's \$3.4B outdoor recreation economy over the next ten years. It identifies trends, challenges, and opportunities facing the outdoor recreation economy and outlines a comprehensive suite of strategies to enable the continued success of this vital sector." DECD also has an Office of Outdoor Recreation that was established in 2019.

Appendix C: List of Consultations and Participants

* designates a member of the Blue Economy Task Force who also participated in a consultation.

Relevant State Agencies:

- Department of Marine Resources (Jeff Nichols and Meredith Mendelson)
- Department of Economic and Community Development (Charlotte Mace*)
- Office of the State Economist (Amanda Rector, State Economist, and Megan Baily)
- Governor's Office of Policy Innovation and Future (Scott Kleinman*)
- Governor's Energy Office (Stephanie Watson)

Public and Private Institutions:

- UMaine Aquaculture Research Institute (Deborah Bouchard*)
- UMaine MARINE initiative (Jake Ward*)
- Maine Aquaculture Innovation Center (Chris Davis*)
- Maine Maritime Academy (Brendyn Sarnacki*)
- Maine Sea Grant (Gayle Zydlowski)
- Roux Institute (Aileen Huang-Saad)
- Downeast Institute (Dianne Tilton)
- Bowdoin College Schiller Coastal Studies Center (Holly Parker)
- University of New England (Charles Tilburg*)
- Bigelow Center for Ocean Sciences (Beth Orcutt*)
- Advanced Structures and Composites Center (Habib Dager)
- UMaine Aquaculture Research Institute (Meggan Dwyer)

Aquaculture Industry:

- Atlantic Sea Farms (Liz MacDonald*)
- Sea & Reef Aquaculture (Soren Hansen)
- Everything Seaweed (Colin Hepburn)
- Oceans Balance (Mitch Lench)
- Muddy River Aquaponics (Matt Nixon)
- Salmonics (Veronica Achorn and Cem Giray)
- Madeleine Point Oyster Farms (Thomas Henninger)
- Acadian Sea Plants (Alison Feibel*)
- Cooke (Mike Szemerda*)
- Kingfish (Tom Sorby*)
- Atlantic Aqua Farms Ltd (Jeff Auger*)
- Vertical Bay (Andrew Peters and Struan Coleman)
- American Unagi (Sara Rademaker)
- Katahdin Salmon (Erik Heim)
- Bang's Island Mussels (Matt Moretti)
- Kennebec River Biosciences (Bill Keleher)
- Cooke Aquaculture (Greg Lambert and Jennifer Robinson)
- Muscongus Bay Aquaculture (Nellie Brylewski)

- Bar Harbor Shellfish Co. (Joanna Fogg)
- Nautical Farms (Morgan-Lea Fogg and Jake Patryn)
- Nauti Sisters (Alicia Gaiero)
- Pemaquid Oyster Co. (Chris Davis*)
- Hollander & de Koning (Fiona de Konig)
- Maine Aquaculture Association (Sebastian Belle*)

Commercial Fishing Industry and Related Organizations:

- Ready Seafood (Curt Brown)
- Maine Coast Fishermen's Association (Ben Martens*)
- Vessel Services (Alan Tracy)
- Island Institute (Sam Belknap)
- Maine Center for Coastal Fisheries (Alexa Dayton)
- The Nature Conservancy (Geoff Smith)
- Greenhead Lobster (Hugh Reynolds)
- Island Institute (Nick Battista*)
- Luke's Lobster (Ben Conniff*)

Investors:

- The Ocean Foundation (Mark Spaulding)
- Finance Authority of Maine (Jonathan Poole)
- Focus Maine (Leo Waterston)
- Windward Development (Sean Ireland*)
- Coastal Enterprise Inc. (Hugh Cowperthwaite and Amy Leshurr)
- Maine Venture Fund (Nina Scheepers*)
- CEI Ventures (Chandler Jones)
- Gulf of Maine Research Institute (Blaine Grimes*)
- Fletcher Media (Dianna Fletcher)
- Blue Ocean Ventures (Tim Agnew*)

Ocean Data:

- University of Maine (Jake Ward*)
- NERACOOS (Tom Shyka)
- Coastal Measures (Josh Humberston)
- New England Marine Monitoring (Mark Hager)
- MITRE (Hope Hopkins)
- Woods Hole Group (Bob Hamilton)
- Oceanicsdotio LLC (Nicholas Keeney)
- Blue Ocean Ventures (Tim Agnew*)
- Woods Hole Group (Rob Smith)
- Oceanfarmr (Ewan McAsh)
- Gulf of Maine Research Institute (Blaine Grimes*)

Islands and Remote Coastal Communities:

- Island Institute (Nick Battista*)
- Hurricane Island Center for Science and Leadership (Bo Hoppin)
- Maine Sea Coast Mission (John Zavodny)
- Hancock County Planning Commission (Averi Varney)
- Maine Island Trails Association (Brian Marcaurelle)
- Maine Development Foundation (Anne Schlitt)
- Department of Economic and Community Development (Charlotte Mace*)
- Sunrise County Economic Council (Charles Rudelitch)
- Stonington Economic Development (Linda Nelson)

Boatbuilding:

- Hodgdon Yachts (Audrey Hodgdon*)
- Washburn & Doughty (Kristen Danaher*)
- Maine Marine Trades (Stacey Keefer)
- Maine Composites Alliance (Steve Von Vogt)
- Strouts Point Wharf Co (Laura East)
- Back Cove Yachts (Kevin Burns)
- The Landing School (John Caron, Rachel King, Abbie Henrey and Greg Caruso)
- Shred Electric (Nick Planson)

Trade Associations:

- Maine Outdoor Brands (Brian Threlked)
- Maine Center for Entrepreneurs (Tom Rainey)
- Focus Maine (Leo Waterson)
- Maine and Company (Peter DelGreco)
- Maine State Chamber of Commerce (Patrick Woodcock)
- BioME (Agnieszka Carpenter)

Conservation Organizations:

- Natural Resources Council of Maine (Jack Shapiro)
- The Nature Conservancy (Connor Horton)
- Maine Coast Heritage Trust (Jeff Romano)

Tribal Nations:

- Penobscot Indian Nation (Michael Burgess, JD)

Appendix D: Additional Blue Economy Data

The broadest definition of the ocean economy in the United States can be found in the categories of the Marine Economy Satellite Account,¹⁹ a national economic account prepared by the Bureau of Economic Analysis. Industries and sectors in that account are shown in this table.

Living resources, marine	Warehousing and storage	Boating and paddling, offshore
Commercial harvest, seafood markets, and processing	Professional and technical services, marine	Sailing
Commercial harvest and seafood markets*	Minerals, offshore	Motorboating
Seafood processing	Oil and gas	Canoeing
Fish Hatcheries & Aquaculture*	Sand and gravel	Kayaking
Fish-based animal foods	Support services	Other boating and paddling
Pharmaceuticals, marine-based	Utilities, coastal	Other water activities
Construction, coastal and marine	Traditional electric power generation	Other coastal recreation
Conservation	Renewable electric power generation	Maritime museums and cultural institutions
Dredging	Ship and boat building	Beachgoing
Recreation facilities	Ship building	Amusement parks
Research and education, marine	Barges and other non-propelled ships	Hiking and camping
Scientific research	Military ships	RVing
National defense research and development (R&D)	Other ships	Photography
Federal nondefense R&D	Boat building	Other general expenses
State and local R&D	Fishing boats	Trips and travel, coastal
Nonacademic R&D	Tugboats and towboats	Eating and drinking places
Educational programs and courses	Outboard motorboats	Hotel and lodging places
Vocational training	Inboard motorboats	Travel arrangement services
Laboratories	Other boats	Transportation services
Transportation and warehousing, marine	Tourism and recreation, coastal and offshore	Amusement & Recreation Services NEC
Freight transportation	Guided tours	National defense and public administration
Passenger transportation	Water guided tours	National defense and coast guard
	Other scenic tours	Federal public administration
	Recreational fishing, offshore	State and local public administration

¹⁹ Marine Economy Satellite Account, National Oceanic And Atmospheric Administration.
<https://coast.noaa.gov/digitalcoast/data/marine-economy.html>

The Maine Ocean Economy

The measurement of the Maine ocean economy uses a different data set than the national marine account. It provides greater regional detail but less industrial detail. The value added contributions of the Maine industries in 2021 (the most recent data available) are shown in this table.

		Wages	GDP
Living Resources	Fish Hatcheries and Aquaculture	\$21,123,982	\$34,983,725
	Fishing	\$43,937,773	\$136,980,762
	Seafood Markets	\$74,959,805	\$201,609,478
	Seafood Processing	\$30,577,347	\$101,763,177
	Total	\$289,985,876	\$815,486,303
Marine Construction	Total	\$27,282,137	\$36,082,667
Marine Transportation	Marine Freight	N/D	N/D
	Marine Passenger Transportation	N/D	N/D
	Marine Transportation Services	\$7,367,646	\$10,640,222
	Search and Navigation Equipment	N/D	N/D
	Warehousing	\$95,205,357	\$125,719,516
	Total	\$177,855,284	\$238,214,596
Offshore Mineral Extraction	Limestone, Sand and Gravel	N/D	N/D
	Oil and Gas Exploration and Product	N/D	N/D
	Total	\$5,625,229	\$13,952,676
Ship and Boat Building	Boat Building and Repair	N/D	N/D
	Ship Building and Repair	N/D	N/D
	Total	\$1,637,575,820	\$1,551,657,626
Tourism and Recreation	Amusement and Recreation Services	\$33,882,160	\$63,597,276
	Boat Dealers	\$23,315,256	\$54,104,096
	Eating and Drinking Places	\$593,125,228	\$1,210,529,540

	Hotels and Lodging Places	\$195,536,869	\$500,033,163
	Marinas	\$44,575,283	\$82,837,902
	RV Parks and Campgrounds	N/D	N/D
	Scenic Water Tours	\$8,681,572	\$12,537,770
	Sporting Goods Manufacturing	N/D	N/D
	Total	\$1,866,849,386	\$4,072,679,960
	Zoos and Aquaria	\$15,352,435	\$65,180,487
Total Ocean Economy		\$4,072,920,309	\$6,753,296,962

Source: *National Ocean Economics Program, Center for the Blue Economy, Middlebury Institute for International Studies at Monterey. Available at: <https://www.oceaneconomics.org/>*