



Netherlands Enterprise Agency

# *Exploring the blue economy in coastal New England:*

*Opportunities for collaboration with the Netherlands*

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## **Introduction**

### **Why the Blue Economy matters**

The ocean offers a great and attractive deal of variety: extensive natural resources and opportunities for economic growth, workforce deployment, innovation and research and development. In the last few years, the ocean has become a more popular solution, and is incrementally viewed as indispensable, for solving the problems that follow from climate change and other challenges that our planet is facing, such as a diminishing energy supply and food supply. Even though the ocean might be able to help in tackling these challenges, there needs to be a great deal of innovation to use 100 percent of the resources that the ocean is able to give. This is important because the oceans are already exploited to a large extent with, unfortunately, negative side-effects. Think about overfishing, pollution and more in general, dangers to the ocean's biodiversity. Another problem is that, if we want the ocean to help us to tackle challenges, certain parts of the ocean need to be used for a range of purposes and so we all must work together to work symbiotically.

### **Defining the Blue Economy**

The World Bank defines the blue economy as “the sustainable use of ocean resources for economic growth, improved livelihoods and jobs and ocean ecosystem health”.<sup>1</sup> It is widely agreed upon that the blue economy consists of a variety of components: fisheries, aquaculture, defense, tourism and recreation, alternative ways of energy generation, ports and shipping and maritime biotechnology. Some would argue that this is not an exhaustive list. Naturally, the significance of each component differs in every country and in every area, and the significance of each component might also differ when speaking to different individuals within a specific area. Not all components are perceived as a part of the blue economy everywhere. The term ‘blue economy’ is, in that sense, a fluid term; individuals, organizations and even governments might have different perspectives on what the term ‘blue economy’ entails.

In New England, there is a wide understanding of what the blue economy entails - especially since the ocean is, and always has been, a large part of the economy and of the economic development in the area. Judith Underwood, CEO and Co-Founder of Blue Institute Labs, suggested that an applicable term for New England would be ‘Blue England’; New England is characterized by its ties to the ocean and its economy is in many ways interconnected with the oceans.

### **About this report**

This New England ecosystem study of the blue economy zooms in on the states of coastal New England: Maine, New Hampshire, Massachusetts, Rhode Island, and Connecticut. The ecosystem of each state is discussed by highlighting blue economy companies, certain projects or research projects, and governmental support. The first chapter discusses the blue economy in the Netherlands, and what the Netherlands is looking for going into the future, and the last chapter is an outline of possibilities for the Netherlands in the blue economy domain of New England and other considerations. For every state, four components of an ecosystem are discussed:

- Ecosystem stakeholders
- Specific projects or activities in the region

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<sup>1</sup> [What is the Blue Economy? \(worldbank.org\)](https://www.worldbank.org/blueeconomy)

- Developments in research
- Governmental support



*Figure 1: New England's Coastal States*

Even though it is desired to give a complete and correct overview of the ecosystem, the information that is given of each of the components of the blue economy in this report does not represent the full scope of the ecosystem: discussing all blue economy stakeholders in New England is outside of the scope of this study. The focus of this report will be on stakeholders and activities that stand out in the field of sustainability and innovation and that may be of interest for the Netherlands. These stakeholders and activities will be in the spheres of environmentally friendly design of, for example, offshore wind turbines, sustainable 'blue' technology, 'blue' innovation, alternative ways of energy generation and sustainable aquaculture. As stated in the paragraph above: The Netherlands is not necessarily interested in making a 'larger' blue economy, but a more sustainable blue economy.

## **Methodology**

This report is based on desk research, interviews with blue economy stakeholders and visits to blue economy companies all over the region. We conducted interviews with stakeholders from a variety of sectors and from different blue economy hubs. A list of all interviewees is included at the end of this report.

## **Why this report**

The Netherlands Innovation Network in Boston is part of the Dutch Ministry of Economic Affairs and Climate Policy. We work with innovative startups, companies, research institutes and universities from the Netherlands that are tackling the societal challenges of our time and facilitate their exploration of innovation opportunities in the Northeast of the US. Hence, we explore all kinds of opportunities in New

England. We believe that by sharing knowledge, and working together, we can strive more efficiently for a common purpose: taking care of each other and of our planet. Exploring collaboration in the blue economy sphere may lead to healthier oceans and a more sustainable planet earth.

## The Netherlands and the blue economy

The Netherlands has been making use of the North Sea for centuries: from fishing to recreation, shipping, sand extraction, oil and gas production, and, of course, to offshore wind. It took careful spatial planning to assign certain areas of the small Dutch portion of the North Sea to, for example, sailing routes, offshore wind, and sand extraction. The North Sea is one of the most intensively used seas of the world.<sup>2</sup> The Netherlands is one of the pioneers of offshore wind and is planning on doubling the offshore wind capacity by 2030 for the transition to sustainable energy.<sup>3</sup> Besides offshore wind, the Netherlands leads the way in offshore seaweed and oyster farming and is doing research on offshore solar energy.

A 2022 policy document commissioned by the Dutch Ministry of Infrastructure and Water Management, the Ministry of Agriculture, Nature and Food Quality and others sets out the vision of the spatial planning of the North Sea for the upcoming five years.<sup>4</sup> It describes the pressure factors of the daily use on the North Sea, which are underwater sounds, plastic pollution, and the negative effects of fishing. The overall position that is taken in the report is that the Netherlands should focus on making the current blue economy with the North Sea more sustainable. The focus should not be on how the North Sea can be exploited even more, but on making the ocean healthier than it is now so that the North Sea can be used for all sorts of economic activity for many more generations to come. In other words, it is a call for a transition to a 'new blue economy' or a 'sustainable blue economy'.

One way to do this is by focusing on synergies: combining offshore wind and aquaculture (co-location), nature reinforcement by oyster beds and extracting energy from the sun and tidal currents. Because of this specific interest, innovations that concern synergies will be highlighted in this report. Other themes that require attention, according to the policy document, are a focus on sustainable aquaculture, alternative forms of energy generation (like offshore solar energy) and bluetech.

A report by the OECD, that sets out the ocean economy in 2030, confirms that international collaboration on maritime technology (or 'blue technology') and science is needed to stimulate innovation and the sustainable development of the blue economy. The OECD describes that governments play an important role in this collaboration. It is discussed that government policies concerning the blue economy all around the world should be analyzed and compared, mostly when it comes to its effectiveness in stimulating and supporting technological 'blue' innovations. On top of that, the OECD advises that international networks should be created to exchange experiences and stipulates the importance of innovation incubators in which different countries work together. The gross added value of the blue economy in Europe is now estimated on 500 billion euros a year but it will grow exponentially in the future.<sup>5</sup>

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<sup>2</sup> [Samenwerken aan de Duurzame Blauwe Economie \(arcgis.com\)](https://www.arcgis.com)

<sup>3</sup> [Netherlands ramps up plan for doubling offshore wind capacity by 2030 | Reuters](https://www.reuters.com)

<sup>4</sup> [Programma-Noordzee-2022-2027-VAWOZ-2030.pdf \(rvo.nl\)](https://www.rvo.nl)

<sup>5</sup> [De blauwe economie in Nederland \(sdgnederland.nl\)](https://www.sdg-nederland.nl)

## Coastal New England and the blue economy: an ecosystem study of New England

New England, a region on the East Coast of the US, consists of seven states; five of them have a coastline and border the Atlantic Ocean. The biggest city in New England is Boston in Massachusetts, a historic city that borders the ocean. The Greater Boston area is known for its educational institutions, like Harvard, MIT, Northeastern, Boston University, Tufts, UMass Boston, Boston College and many more. After the arrival of the pilgrims in Plymouth, Massachusetts, in 1620, the ocean has been playing a key role in New England's society. The ocean has always been important for its commerce, food supply and defense industries. In the summertime, the people of New England have always flocked to the ocean to enjoy the beaches, to fish, and to enjoy seafood. In other words, the ocean is both economically and culturally tied to New England.

### Blue economy sectors

The sectors that stand out in the blue economy of New England are tourism and recreation, shipping, fishing, defense and, more recently, offshore wind. Fisheries have been driving the economy of the Northeast from even before the American Revolution.<sup>6</sup> Likewise, since the arrival of the pilgrims in Plymouth, the coast of the Northeast has been a site of naval defense. There are many corporations that are (still) active in these sectors, with an emphasis on seafood supply and marine defense technology. On top of that, in New England, there are many innovation technology start-ups that are scattered throughout the region, with Boston as the strongest hub<sup>7</sup>. These companies focus on all different kinds of new sustainable technologies though many of them are still small and in their research phase.

### Workforce

The workforce of New England consists of almost 8 million people.<sup>8</sup> The workforce of New England is considered one of the most intelligent, highly educated workforces of the country because of the historic density of academic institutions and headquarters of large corporations. However, the workforce is aging and there are still large gaps between rural New England areas, with high rates of unemployment compared to the urban regions. On top of this, because of the innovative character of the region, "New England is home to a large number of fast-growing, high-skill industries with jobs that require a postsecondary credential".<sup>9</sup> Blue economy experts in the region agree that the biggest hurdle for the growing blue economy is workforce development, which makes it necessary to actively think about solutions for this problem.

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<sup>6</sup> [History & Management of NE Groundfish Fishery | NSC \(northeastseafoodcoalition.org\)](https://www.northeastseafoodcoalition.org/)

<sup>7</sup> Boston is perceived as the most significant blue innovation hub because of its strong start-up ecosystem and academic institutions and the already established cleantech community. It is also simply the biggest city in New England.

<sup>8</sup> [New England - Labor Force Statistics : New England Information Office : U.S. Bureau of Labor Statistics \(bls.gov\)](https://www.bls.gov/new-england-labor-force-statistics)

<sup>9</sup> [ED619620.pdf](#)

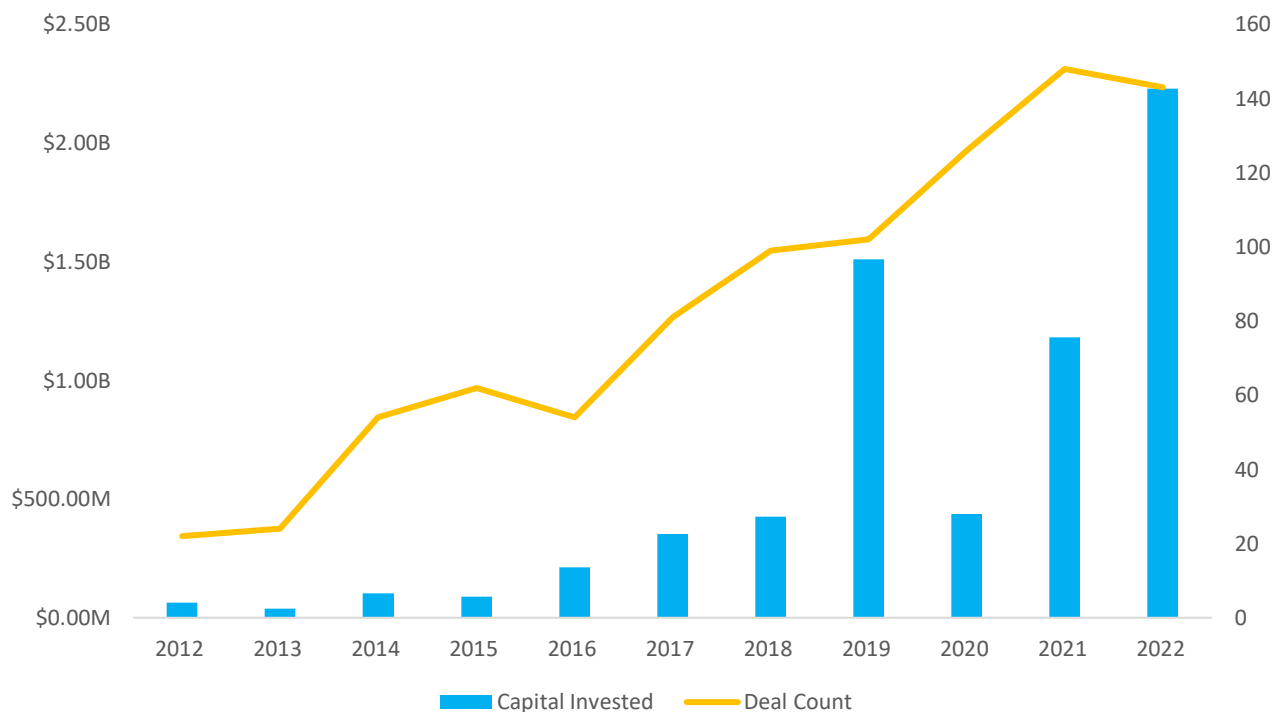


### Distinct strengths and competitive advantages of the New England region

UMass Amherst is currently working on a blue economy ecosystem study of the North Shore of Massachusetts.<sup>10</sup> The 'North shore' is the shore from the border of New Hampshire down to Boston. UMass sets apart distinct strengths and competitive advantages of the blue economy of the Northern shore of Massachusetts, some of which apply to the whole New England region:

- Strong history, culture, and existing Blue Economy strengths around fisheries, boatbuilding, coastal tourism, and recreation.
- Dozens of supporting NGO and public institutions producing research, managing marine and coastal resources, educating our children and public, and convening dialogues
- Easy access to local and international transportation (highway, rail, air, ferry)
- Ongoing state investment in developing marine science and technology R&D, and applications.
- Access to premier education and research institutions and talent
- Front door to Boston's finance, life sciences, and tech innovation economy

### Blue economy investments in New England



*Graph 1: amount of capital invested and deal count of venture capital in the blue economy - Pitchbook*

The graph above shows the amount of capital invested and the deal count of venture capital backed privately held companies in the sector of the blue economy in the states of Connecticut, New Hampshire, Maine, Rhode Island and Massachusetts. The blue economy industries that are represented

<sup>10</sup> [North Shore Blue Economy Vision Forward brochure \(umass.edu\)](#)

in this graph are companies that operate within the areas of aquaculture, fishing, seaweed, aquafarming, ocean conservation, offshore energy and shipping.

The graph clearly shows a strong growth of the capital investments and the deal count within the New England blue economy. There is a dip in investment in 2020, likely due to the COVID-19 pandemic, but the staggering growth quickly returned. The last ten years shows that there is a massive growth in the New England blue innovation sphere, and it is safe to assume that this trend will continue. This trend is particularly interesting because it shows how important it is for innovation technology to have private investment funding. Private investment makes it possible for this technology niche to grow, and to spur further innovation, research, and development.

The following sections zoom in on the blue economy ecosystems of the New England coastal states.

### **Massachusetts**

The Commonwealth of Massachusetts is known for its history, its numerous world-renowned education institutions, and the large life sciences and health sector. Boston is Massachusetts' largest city by population, and the coastline is over 1500 miles long. The tourism industry is also a large sector in the summer months, with tourists' flocking to the picturesque islands of Nantucket and Martha's Vineyard, and Cape Cod.

#### Ecosystem stakeholders

It is safe to say that the bluetech ecosystem in the Boston is emerging, thanks to the many innovative startups that have Boston as their homebase.

Boston based *SeaAhead* is a blue technology start-up incubator that builds programs that launch startups and help them grow, that catalyzes an active network of founders, industry leaders, technical experts and key stakeholders, and that invests in startups. *SeaAhead* estimates that in 2030, there will be a 91 percent increase in the number of impact-driven ocean startups.<sup>11</sup> Examples of startups that are part of the SeaAhead community are: *Akua*, a company that creates different kind of food of kelp, *Bladebug*, a company that develops advanced robots to help technicians with the inspection and repair of offshore wind turbine blades and *SHYp*, a company that created the first electrolyser to use sea water to produce hydrogen.<sup>12</sup>

BLUE Institute Labs is a women and veteran owned public benefit corporation headquartered in Massachusetts with footing in Newport, RI and now Maine. Since its inception in 2017 BLUE has catalyzed 24+ later stage bluetech startups through its BLUE Incubator program providing: expert industry speakers; access to funding; DOD dual-use; network introductions; with targeted support for women and BIPOC entrepreneurs. It's sister interdisciplinary non-profit BLUE Institute, based on Cape Cod, facilitates a virtual, free, advanced topics program called BLUE Excelerator. This three-month program for early-stage startups has had 21 companies graduate since 2020 and are now welcoming another 11 into the BX3 Cohort, three of them being Dutch startups. BLUE Institute Labs is also creating the waterfront Blue Innovation Center, an "open-access" business development, shared labs and in-water testing capability innovation cluster destination for regional, national and international startups, students, and ecosystem actors from industry, academia, and government. BLUE's mission is to break

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<sup>11</sup> [SeaAhead \(sea-ahead.com\)](https://sea-ahead.com)

<sup>12</sup> [About - Story \(akua.co\)](https://akua.co); [BladeBUG: Advanced robotics for turbine maintenance](https://bladebug.com) ; [SHYp \(shypbv.com\)](https://shypbv.com);

down silos, educate, and collaborate on innovative blue economy solutions for healthy and secure oceans.

*MITRE* in Bedford, MA is a new, blue technology testing facility that wants to aid blue technology companies by providing them with a large test tank and other testing facilities and, in 2023, an enhanced lab facility. By having access to a testing facility there is no need for costly, risky, at-sea testing anymore.<sup>13</sup>

*Propellor VC* is accelerating ocean-climate companies by investing in early-stage innovative startups in the field of blue technology. It has a partnership with Woods Hole Oceanographic Institution that is in Cape Cod, Ma to ensure that investment goes to the most promising technology. Brian Halligan, founder of Propellor, is quoted saying that “only a fraction of the venture capital dollars that have flooded into climate tech flow to the seascape of ocean-based solutions” but stipulates the importance of the ocean for climate change solutions.<sup>14</sup>

### Activities or projects in the region

Massachusetts’ largest approved offshore wind project, Commonwealth Wind, was supposed to aid to the state’s ability to meet its 2030 clean energy targets. Massachusetts has ambitious offshore wind goals for the transition to sustainable energy. However, inflation drove up construction costs and the development came to a standstill. Experts worry about the future of the viability of offshore wind in the state because of financial hardships.<sup>15</sup>

Around Cape Cod and Martha’s Vineyard, a handful of farmers are pioneering kelp production in Massachusetts. There are several UMass kelp production research projects ongoing.<sup>16</sup>

### Research

Engineering professors at Tufts University are actively trying to show the offshore wind industry and the Massachusetts state government that there are environmentally friendly ways to deploy offshore wind. The professors believe that there must be a transition in the American offshore wind industry to environmentally friendly ways of attracting offshore wind energy because without such a transition all life in the ocean will be destroyed in thirty years. According to them, environmentally friendly designs are the future. Dan Kuchma, engineering professor at Tufts, notes that the environment has to be taken into account when designing, for example, offshore wind turbines, but that it is not widely practiced because of the higher costs. In order for that to happen, there must be more integrated projects with the industry, the government and academics. As of now, many areas of offshore wind are not being touched upon yet in the US because of a lack of cooperation. More public investment and more involvement of academic institutions is needed in the future.

Woods Hole Oceanographic Institution is a world-renowned research institute based in Massachusetts that focuses on ocean research and education. It aims to bring scientists and engineers together and it hopes to push research of the ocean in hopes of exploring all its possibilities.<sup>17</sup>

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<sup>13</sup> [MITRE Labs | MITRE](#)

<sup>14</sup> [Accelerating ocean-climate companies | Propeller \(propellervc.com\)](#)

<sup>15</sup> [A wind project promised Mass. cheap power. Then came inflation | WBUR News](#)

<sup>16</sup> [Greens from the Ocean - Woods Hole Sea Grant \(whoi.edu\)](#)

<sup>17</sup> [Who We Are - Woods Hole Oceanographic Institution \(whoi.edu\)](#)

## Governmental support

The MIT Sea Grant College Program is a Federal-Institute partnership that brings the research and engineering core of the Massachusetts Institute of Technology to bear on ocean-related challenges. Funded by the National Oceanic and Atmospheric Administration, the National Sea Grant College Program promotes the conservation and sustainable development of marine resources through research, education, and outreach.<sup>18</sup>

With grants, investments, and consulting services, Massachusetts Clean Energy Center (MassCEC) funds climate solution innovation to meet Massachusetts emission reduction goals while growing the state's clean energy economy.<sup>19</sup>

Project BEACON of UMass Boston was awarded 820,000 dollars in 2022 by the Seaport Economic Council (a division of the state government of Massachusetts) to advance the bluetech ecosystem. Project BEACON (Bluetech, Energy, Aquaculture Coastal and Ocean Needs) aims to unite tech and innovation hubs across the state. The new facilities at UMass Boston will facilitate bluetech startups and there is a partnership with *SeaAhead*.<sup>20</sup>

The majority of the Massachusetts blue economy experts that were interviewed for this report mentioned the importance of the newly elected Massachusetts governor, Maura Healey. The direction Massachusetts will take in the future when it comes to offshore wind and investments in sustainability largely depends on Healey and her goals. Climate change and the clean energy transition are supposed to be top priorities for her, as is discussed on her website. Experts hope her election will lead to a boost in the blue innovation sphere.

## Massachusetts take-aways

- Massachusetts, and in particular the greater Boston area, is the bluetech hub in New England. However, Judith Underwood of Blue Institute Labs describes the bluetech ecosystem in Massachusetts as somewhat fragmented, but that the bluetech ecosystem is promising, and emerging. The sense of 'togetherness' could grow and there are opportunities for more collaboration between different states, universities, incubators and start-ups, which is also stipulated by Tufts professors. Judith also mentions that the term 'bluetech' is not widely known, and that it would help to make the term more common to gain interest of investors.
- Currently, there is a lack of investment by private investors and experts state that it is 8 to 10 years behind cleantech when it comes to investments being made.

## **Rhode Island**

Rhode Island, the smallest US state by area, has 400 miles of coastline and is known for its quaint seaside towns and long beaches. Rhode Island is a popular vacation destination with fresh seafood and lots of activities on the water. The state capital, Providence, is a cultural and educational hub for the state. Almost 10 percent of the workforce in Rhode Island works in the blue economy.

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<sup>18</sup> [Woods Hole Sea Grant \(whoi.edu\)](https://www.whoi.edu/page.do?pid=35&tid=5&cid=1254)

<sup>19</sup> [Home | MassCEC](https://www.masscec.com/)

<sup>20</sup> [820K Grant to Boost BlueTech Innovation at UMass Boston - UMass Boston \(umb.edu\)](https://www.umb.edu/news/2022/08/20/820K-Grant-to-Boost-BlueTech-Innovation-at-UMass-Boston)

## Ecosystem stakeholders

The Rhode Island Hub (RI hub) is a soft-landing spot for international bluetech companies. It has programs around different specific topics and highlights dual use technology<sup>21</sup>. *The blue innovation campus* enables companies to get on the water and use demonstration sites to test their technology. It is open to multiple industries which helps mimicking a ‘real world’ environment. Rhode Island Commerce is teaming up with the University of Rhode Island to provide these innovation spaces.<sup>22</sup>

The Blue Innovation Symposium has been a focal point of annual industry updates on blue innovation for nine years. In 2021, its founder created the Blue Venture Forum, a program based in Newport that connects existing blue technology companies, investors, and resource providers with emerging blue technology firms.

Jaia Robotics, a successful start-up from Rhode Island, designs micro-sized, high-speed, aquatic data collection robots called JaiaBots.<sup>23</sup> Start-up Juice Robotics, based in Middletown, RI, acts in the same sphere; it also produces small and light technology that is used for data collection under water.<sup>24</sup>

Regent Craft is a start-up based in Newport, RI, that develops and manufactures all-electric, passenger-carrying, wing-in-ground-effect vehicles to service coastal routes.<sup>25</sup>

## Activities or projects in the region

When studying and discussing the blue economy in Rhode Island, one sector stands out immediately: offshore wind. Rhode Island is ambitious and Jamie Buck from Rhode Island Commerce explains that Rhode Island wants to be the epicenter of offshore wind within the US. Rhode Island already has a good offshore wind system in place, like the Block Island wind farm, which contains the first five wind turbines placed in the US and which is the first commercial offshore wind farm in the US. Rhode Island wants to boost offshore wind even more in their state. The sector is expected to create 20K-35K fulltime jobs on the East Coast by 2028, with associated capital investments estimated over \$70B. On top of that, Rhode Island will be the first state in the country to commit to 100 percent renewable energy by 2033.<sup>26</sup>

## Research

Bluetech is emerging, and the Rhode Island Commerce Corporation deems it a ‘huge priority’ in Rhode Island. Universities in Rhode Island especially pay a lot of attention to bluetech. As the RI Commerce Corporation mentioned, “In Rhode Island, there is a deep, historical, and connected knowhow of all components of the blue economy and research has always been focusing on the crossover between industries”. Roger Williams University has a shellfish program which directly engages with industry and studies microalgae.<sup>27</sup>

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<sup>21</sup> [Home - RIHub](#)

<sup>22</sup> [Rhode Island Commerce | Business Support & Development \(commerceri.com\)](#)

<sup>23</sup> [Jaia Robotics, Inc.](#)

<sup>24</sup> <https://juicerobotics.com>

<sup>25</sup> <https://www.regentcraft.com/>

<sup>26</sup> <https://governor.ri.gov/press-releases/governor-mckee-signs-historic-legislation-requiring-100-rhode-islands-electricity-be>

<sup>27</sup> [Microalgae Production | Roger Williams University \(rwu.edu\)](#)

## Governmental support

An example of the state government supporting the blue economy is that to grow the state's aquaculture sector, Senators Jack Reed and Sheldon Whitehouse delivered federal funding to the marine aquaculture science program of Roger Williams University to advance shellfish aquaculture: "portions of the funding will purchase equipment to establish a histology lab to support the development of coastal resilience through shellfish aquaculture disease".<sup>28</sup>

URI is also doing studies on offshore wind and environmental concerns. For example, studies have been done on underwater sounds of the construction of offshore wind farms.<sup>29</sup>

Besides offshore wind and aquaculture, defense, with companies like Navatek and research by URI, is also an important component of the blue economy for Rhode Island. However, defense is outside of the scope of this ecosystem study with regards to the Netherlands.

## Rhode Island take-aways

- Rhode Island is committed on acting for climate change. However, Rhode Island has not set clear social environmental goals yet. It could use the help of the Netherlands to experiment through innovations. Innovation could, and should, be more pushed by a hands-on 'let's innovate' culture. Siu-Li Khoe of Rhode Island Commerce explains that: "when a test goes wrong, there must be improvements made and tests should be performed again". In Rhode Island, this innovation and 'testing culture could use a boost.
- Rhode Island has a bluetech ecosystem and a thriving seafood industry. In the blue technology sphere, there is a focus on dual use technologies.
- Rhode Island's number one problem when it comes to the future of the blue economy is workforce development. This is why, for example, the URI research foundation is actively trying to get communities involved by including classes about the ocean in all schools.
- Rhode Island is actively trying to make their blue economy stronger and more sustainable. It is important to note the inclusiveness of this effort and the focus on equity: a blue economy for everyone.<sup>30</sup>
- The offshore wind sector in Rhode Island could benefit from the knowledge and expertise of the Netherlands in boosting their offshore wind industry, especially when it comes to environmental concerns and nature inclusive design of offshore wind.

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<sup>28</sup> [Rhode Island's oyster sector gets US government boost | The Fish Site](#)

<sup>29</sup> [The Underwater Sound from Offshore Wind Farms – Offshore Renewable Energy \(uri.edu\)](#)

<sup>30</sup> For more information on how Rhode Island is making this transition: [Grow Blue](#)



Figure 1: Block Island offshore wind farm

## Maine

The culture of the state of Maine surrounds around the ocean and a sense of ‘togetherness’. For generations, the livelihoods of the people from Maine largely depended on the ocean. Maine is a resource driven economy. Therefore, all Maine inhabitants want to work together to create a blue economy that is sustainable, so that many generations to come still can work with the ocean in their daily lives. It also needs to be resilient for the people so that they can continue to work and live on the water.

### Ecosystem stakeholders

The *New England Ocean Cluster*, that aims to foster collaborative relationships among marine-focused businesses and entrepreneurs with the aim of generating environmentally and economically sustainable ideas, is a start-up incubator based in Portland, Maine.<sup>31</sup> Ocean related start-ups come together in a beautifully designed ‘hus’, a place right in the harbor where a collaborative environment is supported. One of the start-ups that has an office in the hus is *Everything Seaweed* – a company that adds value to



Figure 2: The New England Ocean Cluster

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<sup>31</sup> [Home | NE Ocean Cluster \(newenglandoceancluster.com\)](https://www.newenglandoceancluster.com)

cellular seaweed by bioengineering and biorefining seaweed. It is the only company on the East Coast that works in this space and no one ever did this at scale before. It is an adequate replacement for toxic chemicals and plastics. Another company in the hus is *Finsulate*, that surrounds around a Dutch invention of anti-fouling surfaces in water.

Stationkeep, also based in Portland, ME, develops seafloor investigation and construction equipment.<sup>32</sup>

Kelson Marine, again based in Portland, ME, is an ocean engineering company that offers design and risk-mitigation engineering: it helps humans use oceans 'for good'. One of the focus points for Kelson Marine is co-location: combining aquaculture and windfarms for example. Kelson Marine also started thinking about floating solar, but the process for developing the understanding for the technology has just started.

The Ocean Renewable Power Company (ORPC), also based in Portland, engineers the technology of generating power from moving water and tidal currents. A project opportunity where the expertise and knowledge of the Netherlands would come in are flood control barriers. A number one concern of the ORPC is the possible negative effect on fish of their devices. However, the design of the turbines is safe and might even make a positive environmental impact.<sup>33</sup>

### Activities or projects in the region

In the Fall of 2022, an offshore seaweed farming design was demonstrated off the coast of Maine. Funded by ARPA-E (an energy research investor based in Washington Dc), and a product of the collaboration of the *University of New Hampshire*, *Stationkeep* and *Kelson Marine*, this demonstration was the first step towards seaweed farming advancing to enormous scale in offshore waters.<sup>34</sup>

### Research

*The Gulf of Maine Research Institute* is a non-profit marine science center and research institute. One of their projects, in the sphere of coastal resilience, aims to establish flood thresholds and to improve tide predictions in coastal Maine communities. Sea level rise is increasing the frequency of high tide flooding and so flood thresholds should be created to make reliable tide predictions.<sup>35</sup>

Another project by the *Gulf of Maine Research Institute* that is being conducted right now focuses on the warming ocean in the Gulf of Maine and studies how this effects the ecosystem, which will provide valuable information for the fishery and aquaculture industry.<sup>36</sup>

The University of Maine, the state's only public research university, has a research and innovation initiative called MARINE that aims to bring all stakeholders in the blue economy in Maine together. A recent study of UMaine showed the benefits that seaweed and algae can have on a human diet and the environment – another benefit of seaweed farming.<sup>37</sup>

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<sup>32</sup> [A Better Way – Stationkeep](#)

<sup>33</sup> [Home - ORPC](#)

<sup>34</sup> [LinkedIn](#)

<sup>35</sup> [Home - Gulf of Maine Research Institute \(gmri.org\)](#)

<sup>36</sup> [Ecosystem Impacts of Warming - Gulf of Maine Research Institute \(gmri.org\)](#)

<sup>37</sup> [Planet Forward cites UMaine research about seaweed - UMaine News - University of Maine](#)



## Governmental support

The Maine Department of Energy helps funding organizations like Kelson Marine and the ORCP. The State of Maine is, as is described by several stakeholders in the area, supportive of blue economy funding because of the aggressive climate change targets that are set by the state.

Maine Angels is a group of investors that invest in innovative start-ups, also in the ocean domain and work together with state funding agencies focused on Maine businesses.

## Maine take-aways

- One of the challenges of the fish industry in Maine is that because of the changing temperatures of the ocean, lobster, and cod (and possibly other resources) might move to different waters. This means Maine's enormous lobster industry is endangered and alternative resources of the ocean should be extensively studied to secure the livelihoods of many people in Maine that rely on fishery. Seaweed farming can be perceived as a possible solution and it still in the research phase in Maine. This is one of the reasons why aquaculture is taking off in Maine and will rapidly grow in the future.
- It also should be mentioned that in Maine, when it comes to offshore wind, there is much focus on floating offshore wind (instead of anchored offshore wind) because of its deep waters off the coast and the whale population. Anchored wind farms will usually not work in the deep waters and so floating wind is the focus point for Maine for the future. However, floating wind is also still very much in the research stage in Maine. Maine is the only state on the East Coast that has these unique ocean conditions, and since that floating offshore wind is not cornered yet by anyone in the world as of now, the US, and in particular Maine, has a chance to be a global leader in offshore floating wind.
- Maine's economic development has always relied heavily on the ocean. However, what is new and emerging for Maine, is the idea to add value to commodities. Where Maine's blue economy used to be all about sustaining the population, a new chapter in which both food and non-food commodities are used more widely than self-sustainability has begun. According to blue economy experts in Maine, Maine is still in the process where it could use some help with adding value.

## **New Hampshire**

New Hampshire, one of the few states that has no sales tax, only has a short, but pristine, coastline of 18 miles. New Hampshire inhabitants are lucky to live in a state where they have access to the ocean and to the mountains: the White Mountain National Forest in the middle of the state is a popular place for hiking. There are small coastal communities and beach towns on the short New Hampshire coastline, where people love to spend their summers by watching whales, seabirds, and eating seafood.

## Ecosystem stakeholders

The blue economy stakeholders in New Hampshire are mostly connected to research centers of the NH universities. These are discussed below.

### Activities or projects in the region

Oyster aquaculture is the fastest growing seafood industry in New Hampshire. The two estuaries on the New Hampshire coast contain unique and diverse ecosystems for the oyster aquaculture. All oyster farming is conducted exclusively by aquaculture: there is no wild harvest.<sup>38</sup>

In 2021, researchers of the University of New Hampshire together with fishermen tested the 'aqua fort': a self-contained aquaculture system that allows multiple species to grow at the same time within and around a single floating structure. It is supposed to be a new model for sustainable, small-scale finfish aquaculture.<sup>39</sup>

The School of Marine Science and Ocean Engineering of the University of New Hampshire is working on whale friendly aquaculture farms by decreasing possible entanglement of the endangered whales in the Gulf of Maine. They are using a new type of line that is made out of fiberglass that will easily break when a whale would swim in the farm. The farm would be ruined, of course, but the whale would be unharmed.<sup>40</sup>

Even though the coast of New Hampshire is very short, The University of New Hampshire is also very much engaged with coastal resilience: it has a coastal habitat restoration team that is engaged in the restoration of dunes and partners with Sea Grant to achieve shared goals in climate adaptation.<sup>41</sup> There is even competitive grant funding for coastal community and habitat resilience projects.

### Research

With the Judd Gregg Marine Research Center and the Jere A. Chase Ocean Engineering Laboratory, the University of New Hampshire actively contributes to blue economy research in New England.<sup>42</sup> New Hampshire only has a coastline of 13 miles but cannot be forgotten when discussing the New England blue economy.

The University of New Hampshire is also involved in the research and development of wave, tidal and ocean current energy. They are part of the Atlantic Marine Energy Center (AMEC), that is sponsored by the Department of Energy, to power the blue economy.<sup>43</sup>

### New Hampshire take-aways

- New Hampshire is involved with oyster aquaculture and coastal resilience research.
- Despite the short coastline, New Hampshire has a significant potential for offshore wind and wants to serve as an important part of the offshore wind supply chain in the Gulf of Maine. However, there are no wind turbines right now mostly because there are no clean energy procurements in the State.
- As of now, there are no bluetech companies located in New Hampshire. That is not to say that academia, like UNH, is not engaged with blue technology.

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<sup>38</sup><https://seagrant.unh.edu/our-work/aquaculture/oysters>

<sup>39</sup> <https://seagrant.unh.edu/blog/2021/12/aquafort-revolutionizing-local-aquaculture-new-hampshire-0>

<sup>40</sup> [Building Momentum for the Blue Economy | UNH Today](#)

<sup>41</sup> <https://seagrant.unh.edu/our-work/coastal-resilience>

<sup>42</sup> [Jere A. Chase Ocean Engineering Laboratory | Research Center | School of Marine Science and Ocean Engineering \(unh.edu\)](#)

<sup>43</sup> [The Atlantic Marine Energy Center \(AMEC\) \(amec-us.org\)](#)

## **Connecticut**

Bordering New York State, the first Europeans that arrived in the state of Connecticut centuries ago were people from The Netherlands. Connecticut has a coastline that is more than 300 miles long and is known for its countless coastal towns and prestigious universities like Yale University, located in New Haven. The ocean plays a large role in the economy of Connecticut: the blue economy grew 20% in the last 10 years. It is striking that the tourism and recreation sector employs 66% of the state's blue economy. The city of New London is considered the hub of the blue economy in Connecticut.<sup>44</sup>

### Ecosystem stakeholders

Groton, Connecticut, a town along the Thames River mouth and close to the ocean, prides itself as a bluetech hub<sup>45</sup>. The region supposedly attracted billions of dollars invested in bluetech, mostly in the defense and energy spheres. It is said that a huge growth is expected for the area and that Connecticut's Navel and Maritime Consortium is carefully strategizing and supporting the growth. The reason for the large defense sector is because the US Coast Guard's campus and academy and a US naval base are based on the shore in Connecticut. The first blue technology companies that were driving New London as a bluetech hub were Electric Boat's submarine contracts.<sup>46</sup>

An example of a company that is based in Groton is Thayer Mahan. While initially established to aid the defense industry, they now help the offshore wind industry with their expertise of ocean mapping to identify the most efficient sites in the ocean for wind turbines without harming ocean life.<sup>47</sup>

In the field of aquaculture, Stonington Kelp Company is one of the largest commercial seaweed farms in the state of Connecticut, selling food grade sugar kelp to local restaurants and shops: "our kelp absorbs carbon and nitrogen from the water while it grows resulting in a nutrient dense super food that helps clean the ocean".<sup>48</sup>

### Activities or projects in the region

Connecticut wants to be a leader in the US when it comes to offshore wind. The State wants to achieve net-zero carbon electricity by 2040 so it is actively boosting its offshore wind industry, with projects being developed by a joint venture of Eversource and Ørsted called 'Revolution Wind'.

To aid the state's ambitious offshore wind goals, the New London State Pier is under construction so it can become the first operational U.S.-based heavy-lift marine terminal that will accommodate offshore wind towers, nacelles and blades.<sup>49</sup>

Connecticut has the right assets to be leader in offshore wind. It has a long history with innovation and engineering, and it has a highly educated workforce. On top of that, wind speeds are consistently high, and it has the right ocean depths for anchored turbines. The boost in the offshore wind industry is said

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<sup>44</sup> [2022 Marine Economy Report - Connecticut \(noaa.gov\)](https://www.noaa.gov/economy/marine/2022-marine-economy-report-connecticut)

<sup>45</sup> <https://www.linkedin.com/pulse/where-next-silicon-valley-groton-connecticut-sam-eisenbeiser-aicp>

<sup>46</sup> <https://www.gdeb.com/about/locations/newlondon/>

<sup>47</sup> <https://www.thayermahan.com/>

<sup>48</sup> <https://www.stoningtonkelpco.com/>

<sup>49</sup> <https://statepiernewlondon.com/>

to have a positive effect for businesses and the community, however, the environment friendliness of the farms seems not to be discussed to a high extent in the presentation of the plans.<sup>50</sup>

### Research

The Connecticut Sea Grant aquaculture program is hoping to expand aquaculture practices in Connecticut. Research is being conducted on the commercial viability of seaweed. As of this moment, Connecticut is a major producer of shellfish, including oysters and clams, and this generates more than 30 million per year. The environmental conditions are changing in the ocean which forces the aquaculture researchers in Connecticut to consider other forms of produce or other force of hatchery.<sup>51</sup>

### Connecticut take-aways

- The blue economy of Connecticut is heavily focused on offshore wind, maritime defense technology, and tourism and recreation.
- The first US-based marine terminal that will accommodate offshore wind essentials is being constructed in Connecticut. Connecticut has ambitious offshore wind goals but there does not seem to be much focus on environmental friendly design of the turbines.

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<sup>50</sup> [https://ramboll.com/-/media/files/reh/awea\\_technical\\_poster\\_lis\\_v6.pdf?la=en](https://ramboll.com/-/media/files/reh/awea_technical_poster_lis_v6.pdf?la=en)

<sup>51</sup> <https://seagrant.uconn.edu/focus-areas/sustainable-fisheries/>

## **Opportunities for collaboration between New England and the Netherlands**

One of the main takeaways of this ecosystem study is that the blue economy of New England is slowly transitioning to a 'new' or 'sustainable' blue economy, with many local initiatives, strong research and scattered 'blue' hubs, but that blue innovation is still in its infancy with enormous potential to grow. That is not to say that it will not take off in the foreseeable future because there is much talent and willpower.

All blue economy experts that were interviewed for this report agree that the Netherlands is a global leader when it comes to offshore wind, coastal resilience, and other blue technology areas. There are a few domains in the blue economy sphere in New England in which the Netherlands could offer a helping hand.

### **Offshore energy generation**

First: offshore wind. Basically, all New England coastal states want to boost their offshore wind industry. Even though there is a drastic difference between the individual states when it comes to ocean conditions, legislation, and the extent to what already exists an offshore wind industry, all the states in New England want to learn from a global leader like the Netherlands. They could not only use some help when it comes to the business side of things, there is also a discrepancy between the value and standards of environment friendliness. Where the Netherlands already has a large part of the North Sea dedicated to offshore wind in which also the natural environment is considered, nature inclusive design of offshore wind turbines does not have a high priority in New England as of right now. All interviewees agree that in the US in general there is a smaller concern for the environment.

Even though the research of nature inclusive design by, for example, the engineering department of Tufts University and Tayer Mahan, might lead to more attention to these issues, there is still much room for improvement, especially considering that offshore wind is still taking off on the East Coast. Due to the ongoing debates about the costs of offshore wind, it can be wondered whether the states' hunger for boosting their offshore wind industries does not undermine the importance of nature inclusiveness. The Netherlands can help educate on the topic of taking care of the environment in combination with cost effectiveness. On top of that, the Netherlands has found opportunities for synergies in the North Sea of offshore wind farms and aquaculture, which will be discussed in the next paragraph on aquaculture.

Another point worth mentioning is that on opposite sides of the ocean, research is being conducted on alternative ways of energy generation besides offshore wind. New England has a couple of companies that are implementing structures to generate energy from wave and tidal currents, like the ORPC in Maine, and research projects at universities are thinking about offshore, floating solar energy. The Netherlands is very much interested in the latter, because of the less invasive nature of solar panels on the natural environment. Neither side of the ocean hosts a working offshore solar energy structure as of now.

### **Aquaculture**

One of the ways in which the Netherlands is trying to obtain a 'sustainable blue economy' is by focusing on synergies: combining sectors in the North Sea with attention to the natural environment. An example of a synergy of offshore wind and aquaculture, developed by the Dutch Seaweed Company and the

University of Wageningen is the following: offshore wind turbines with nature inclusive erosion protection, oyster beds between the turbines, mussel nets on top of the oyster beds, a structure of seaweed lines, and cages for lobsters and crabs, all within an offshore wind farm. This is an example of nature inclusive design that is not widely implemented in New England (yet) and which is an opportunity to grow.

The newly formed interest in seaweed in New England is also aligned with the strong growth of seaweed farming in the Netherlands. The Netherlands is an expert<sup>52</sup> when it comes to integrated farming and propagation techniques of seaweed and New England seems to be a promising candidate for a large seaweed industry. Especially because of the warmer oceans due to climate change and the food crisis, expertizing in seaweed seems to be a smart move for a sustainable future. Moreover, at its best, seaweed is carbon neutral, contains many nutrients and can even be used for non-food purposes like *Everything Seaweed* in Portland, Maine proves. The same can be said about shellfish: on opposite sides of the ocean researchers are thinking about sustainable shellfish aquaculture.

### **Coastal resilience**

When discussing the blue economy and the Netherlands with the experts that were interviewed for this report, coastal resilience is a topic that often comes up. It is widely known that the Netherlands is an expert on rising water and climate change because most of the country sits below sea level and is gradually sinking. Dutch firms dominate the global market in high-tech engineering and water management. New England blue economy stakeholders indicate that they want to learn from the Netherlands, even though New England, of course, has its own strategies in place.

### **New England's strengths and possibilities**

A coordinated, systematic approach to innovation in the blue economy sphere seems not yet to be the case in New England. States seem to be working apart from each other, all with their own priorities and strengths. There is room to grow in the ability to design a see-through and masterplan for the growth in 'blue' innovation in the entire region. That is not to say there are not many promising, innovative companies with valuable ideas and designs located in this region. The strength of New England is the desire and willpower to do strong research, to innovate, and to be hands-on. For the companies that are ready for it, there are possibilities for them to do pilots and demonstrations in the Netherlands. The Netherlands is curious to learn about technologies that make the ocean healthier, and how we could be more sustainable. The Netherlands is delighted to listen to its counterparts on the other side of the ocean.

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<sup>52</sup> <https://www.agroberichtenbuitenland.nl/specials/voedselzekerheid/zeewier>

## Conclusion

Both the Netherlands and New England are culturally and economically tied to the ocean. Both regions use their oceans for a variety of different sectors that contribute to their respective economies. Both regions are also looking to transition their successful blue economies into more sustainable blue economies: a healthy ocean can help with a greener future.

In a 2022 policy document it is stated that the Netherlands is focused on a couple sectors when it comes to transitioning the blue economy: sustainable aquaculture, alternative forms of energy generation, and 'blue innovation'. Blue innovation or blue technology encompasses all innovation of ocean or water related technology. One important part of blue innovation is the focus on synergies: how different sectors can efficiently work together with a focus on sustainability.

New England has five ocean states: Maine, New Hampshire, Massachusetts, Rhode Island and Connecticut. Even though all states have different lengths of coastline, they all deem their blue economy important and have their own strategies in place to strengthen it. The blue economy in New England is promising and still very much in the growing phase. However, it does have all the ingredients for a thriving sustainable and innovation rich blue economy. Even though a regional approach is desired by many, the five states have different strengths and different focus points.

Maine is a resource-driven economy that is now focusing on the adding of value and that has an interesting blue innovation hub in Portland. It is also a promising state for floating offshore wind. New Hampshire has a very short coastline, but its universities are involved with blue economy research and coastal resilience. Massachusetts has a large blue innovation hub in the Boston area, with several incubators and many promising start-ups. Massachusetts also wants to boost its offshore wind industry. Rhode Island, 'the Ocean State', has the first offshore wind farm of the US and wants to further boost its offshore wind industry and has a blue innovation hub as well. Connecticut is focused on the naval defense industry and offshore wind: with its first US deep port for offshore wind, Connecticut wants to be at the forefront of offshore wind. Connecticut also has a blue innovation hub in Groton.

The OECD states that it is important that different countries work together when it comes to transitioning the blue economy. Blue innovation, still perceived as 'niche', is spurred by working together and sharing knowledge. There are several possibilities for collaboration between the two regions. There are possibilities for pilot demonstrations of start-ups in the Netherlands for sharing knowledge of cost-efficient nature inclusive design of, for example, offshore wind turbines or aquaculture farms. The Netherlands can also aid with the business side of innovative strategies for blue economy industries, and the Netherlands can share their extensive knowledge of coastal resilience.

## List of Interviewees

<b>Interviewee</b>	<b>Organization (position)</b>
Taylor Witkin	CIC (Implementation lead)
Harley Hayes	SeaAhead (Analyst)
Dana Eidsness	MITC (Director Maine North Atlantic Development Office)
Dan Kluchma	Tufts University School of Engineering (Professor)
Kevin Oye	Tufts University School of Engineering (Professor)
Siu-Li Khoe	Rhode Island Commerce (Vice President of Business Development)
Dick Soule	Rhode Island Commerce (Vice President of Business Development)
Jamie Buck	Rhode Island Commerce (Offshore Wind Supply Chain Manager)
Julianne Stelmaszyk	Rhode Island Commerce (Director of Food Strategy)
Tobias DeWhurst	Kelson Marine (Engineer)
Judith Underwood	Blue Institute Labs (CEO and Co-Founder)
Molly Douglas	Booz Allen Hamilton (Associate)
Hugh Cowperthwaite	Coastal Enterprises, Inc. (Senior Program Director)
John Ferland	ORPC (President)
Nathan Johnson	ORPC (Vice President)
Chris Cary	The Hus (Chief Operating and Marketing Officer)
Patrick Arnold	The Hus (Co-Founder and CEO)
Jessica Chalmers	Everything Seaweed (Founder)
Bernard Hidier	Finsulate (Co-Founder)



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