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Tides of Opportunity: An analysis of the blue economy and its application to U.S. National Marine Sanctuaries

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Tides of Opportunity

An analysis of the blue economy and its application to U.S. National Marine Sanctuaries

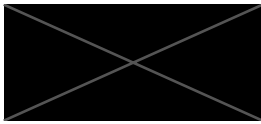
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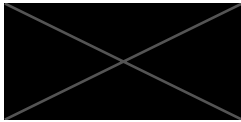


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Background

The blue economy is an area of growing investment and evolution across industries, governments, and communities. The rising global population coupled with rapid development in technology and trade has spurred governments across the world to look to the ocean for new sources of economic growth.¹ The Organization for Economic Cooperation and Development (OECD) estimates that the global ocean economy will reach over USD\$3 trillion by 2030, doubling in value from 2010.² While the ocean has historically been seen as an endless source of protein and extractive resources, the impacts of climate change are revealing the fallacy of this long-held assumption. Ocean acidification, warmer temperatures, and rising sea levels are resulting in habitat and biodiversity loss, extreme weather patterns, and changes to fish stock compositions and migration patterns.³ As a result of these changes, it is increasingly important to ensure a sustainable coexistence between humans and marine ecosystems. By developing a blue economy that prioritizes not only economic growth, but also the health of the environment and the livelihoods of local communities, it is possible to build a lasting blue economy for generations to come.

Conservation organizations like the National Marine Sanctuary Foundation can play a critical role in helping to make this a reality. As the official non-profit partner of the Office of National Marine Sanctuaries, the National Marine Sanctuary Foundation (the Foundation) has the unique opportunity to facilitate the implementation of innovative blue economy initiatives throughout the U.S. sanctuary system by leveraging its expertise and relationships across government and public-private partnerships. By combining the Foundation's ~ 20 years of experience with existing U.S. and international frameworks and best practices, the National Marine Sanctuary Foundation can lead the way in designing and launching impactful blue economy programs, projects or initiatives that benefit sanctuary economies while also advancing its conservation, education, outreach, and innovation goals. A framework for sustainable blue economy initiatives is therefore a helpful tool to develop conservation programs that meet both the needs of local communities and broader environmental goals while also generating revenue in innovative, equitable ways.

A Brief History of the Blue Economy

The term "blue economy" is relatively new to the global stage. Gaining traction during the 2012 UN Conference on Sustainable Development (Rio +20), the idea of a blue economy grew from the earlier concept of a "green economy", which had been used in the prior decade as a way to describe nature in economic terms.⁴ However, by the time of Rio +20, green economy terminology was widely criticized as a way to justify taking land and resources for environmental purposes, without consideration of equity and the impacted communities.⁵ In an effort to apply

¹ OECD, *The Ocean Economy in 2030*. (2016).

² *Id.*

³ *Id.*

⁴ Silver et al., "Blue Economy and Competing Discourses in International Oceans Governance." (2015).

⁵ Scoones, "Green Grabbing." (2013).

lessons from green economy concepts to ocean-specific goals, stakeholders at Rio +20 introduced blue economy terminology as a way to encourage investment into a more diverse range of ocean opportunities.⁶ The result was a working blue economy concept, categorized into four distinct groups, with related applications (table 1):

Table 1. Original categories and applications of the blue economy

| Category | Application |
|---|--|
| Oceans as natural capital | Related to ecosystem services and the importance of valuing these non-market services |
| Oceans as good business | Underscored the power and potential of public-private partnerships |
| Oceans as integral to Pacific Small Island Developing States (SIDS) | Framed oceans as integral to small island life and economy |
| Oceans as small-scale fisheries livelihood | Promoted oceans as central to the livelihoods and well-being of all coastal people and communities |

Source: Silver et al., “Blue Economy and Competing Discourses in International Oceans Governance.”

Following the conference, blue economy terminology, along with terms like “blue growth,” spread in popularity and began to be applied in different ways across nations and industries.⁷ However, many in the scientific community criticized the exploitative risks of the blue economy and called for firm commitments to sustainable, equitable practices.^{8,9} Noted examples of the risks related to unchecked economic growth included exposing marginalized groups to pollution, displacing local populations, economic inequality, human-rights abuses, and damage to social and cultural norms.¹⁰ In response, prominent organizations including the World Bank, the European Commission, UN agencies, and the OECD partnered with several countries to establish frameworks that evolved the scope of a blue economy to be one that is truly sustainable rather than solely focused on economic gains.¹¹

Defining the Blue Economy

The definition and scope of the blue economy continues to differ across countries and organizations. For example, the World Bank defines the blue economy as “the sustainable use of ocean resources for economic growth, improved livelihoods and jobs, and ocean ecosystem

⁶ Silver et al., “Blue Economy and Competing Discourses in International Oceans Governance.” (2015).

⁷ Mulazzani and Malorgio, “Blue Growth and Ecosystem Services.” (2017).

⁸ Bennett et al., “Towards a Sustainable and Equitable Blue Economy.” (2019).

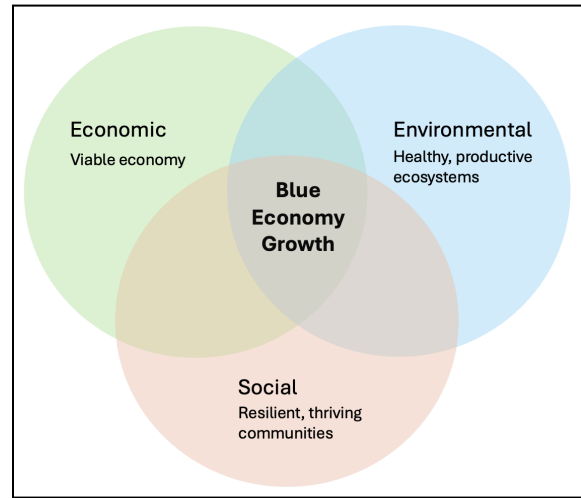
⁹ Voyer et al., “Shades of Blue.” (2018).

¹⁰ Bennett et al., “Towards a Sustainable and Equitable Blue Economy.” (2019).

¹¹ le Gouvello and Simard, “Towards a Regenerative Blue Economy. Mapping the Blue Economy.” (2024).

health”¹² while the European Commission defined the term in a 2018 report as “all economic activities related to oceans, seas and coasts.”¹³

While a precise definition for the blue economy has yet to be universally established, the National Oceanic and Atmospheric Administration (NOAA) defines the blue economy in its FY22-26 Strategic Plan as the “sustainable use of ocean resources for economic growth, improved livelihoods, and job creation.”¹⁴ Despite the differences in verbiage, there is a growing call from the scientific community and many international agencies to approach the blue economy as a three-pronged concept consisting of environmental sustainability, economic growth, and social equity.¹⁵



Said another way, rather than viewing the blue economy solely as the summation of all ocean-related economic activities, NOAA and other partners are prioritizing the transformation of the global ocean economy to a sustainable blue economy comprised of revenue-driving activities that:

- (a) are derived from ocean-based industries,
- (b) improve the livelihoods of coastal communities, and
- (c) preserve the health of marine and coastal ecosystems.

The result is a triple bottom line of economic, social, and environmental performance, elevating the importance of environmental and social consequences in the quest for economic growth.¹⁶



Component 1: Economic Viability of Ocean-based Industries

Similar to the variations in blue economy terminology, the scope of industries that are included in the blue economy differ substantially by country. A study from the OECD found that the number of existing ocean industries in any given country can range from as few as six in the United States to 33 in Japan.¹⁷ Industries are commonly categorized into either “established” or “emerging” groups with the former including industries that have traditionally contributed to the maritime economy and the latter being newer, more innovative areas made possible through advancements in technology and data availability like artificial intelligence and modeling (table 2).

¹² The World Bank, “What Is the Blue Economy?” (2017).

¹³ Directorate-General for Maritime Affairs and Fisheries (European Commission) and Joint Research Centre (European Commission), “The 2018 Annual Economic Report on EU Blue Economy.” (2018).

¹⁴ NOAA, “Building a Climate Ready Nation. NOAA FY22-26 Strategic Plan.” (2022).

¹⁵ Voyer et al., “Shades of Blue.” (2018).

¹⁶ NOAA, “NOAA Aquaculture Strategic Plan (2023–2028) | NOAA Fisheries.” (2022).

¹⁷ OECD, *The Ocean Economy in 2030*. (2016).

Table 2. Blue economy industries

| Established | Emerging |
|--|---|
| Capture fisheries and aquaculture Seafood processing Shipping Ports Shipbuilding and repair Offshore oil and gas (shallow water) Marine manufacturing and construction Maritime and coastal tourism Marine business services Marine R&D and education | Open water aquaculture Deep-water + ultra deep-water oil and gas Ocean renewable energy Marine and seabed mining Maritime safety and surveillance Marine biotechnology High-tech marine products and services |

Source: adapted from Ralph Rayner, *London School of Economics*, 2021

Looking ahead, rising incomes coupled with upward consumption trends point to a greater demand for marine tourism along with a shift in dietary habits towards fish and other marine products.¹⁸ The OECD and its partners estimate the bulk of global ocean economic growth by 2030 to come from maritime and coastal tourism (26%), offshore oil and gas (21%), and port activities (16%) while commercial aquaculture and fisheries will contribute the largest growth to the global ocean workforce.¹⁹ Additionally, scientific and technological advances are expected to play a crucial role in the advancement of the blue economy.²⁰ From the dramatic increase in both the quantity and quality of marine-related data to the development of robust, sophisticated modeling and sensors, the breadth of opportunity to bring new tools and products to market is only just being revealed.²¹



Component 2: Social Responsibility

Alongside the projected growth from both established and emerging industries, blue economy frameworks centered around coastal communities are critical to building a more equitable ocean economy for several reasons. The acutely felt impacts from climate change, the often long-standing economic dependence on local fisheries, and the growing privatization of coastal land are just three of many reasons why community-centered programs should be at the heart of a blue economy.

First, coastal areas are most at risk from the effects of climate change, including sea level rise and intense weather.²² The increasing frequency of flooding and inundation of commercial and natural capital pose a severe threat to communities who rely on the ocean for their livelihood.²³ According to NOAA, nearly 40% of the U.S. population lives in coastal communities with

¹⁸ *Id.*

¹⁹ *Id.*

²⁰ OECD, *The Ocean Economy in 2030*. (2016).

²¹ Spinrad, "The New Blue Economy." (2021).

²² Kildow, "OP/ED: The Importance of the New Blue Economy to a Sustainable Blue Economy: An Opinion." (2021).

²³ *Id.*

approximately 7 million people living within 6 feet (1.8m) above current sea level.²⁴ In addition to impacts on recreation, tourism, and fisheries, additional risks include the devaluation of personal property, the inability to obtain insurance or refinance a mortgage, and an increased reliance on disaster relief programs.²⁵

Second, the livelihoods of local and Indigenous communities have long been tied to artisanal and subsistence fishing. Small-scale fisheries differ significantly from industrial fisheries as they often consist solely of locally based operations with catch destined exclusively for human consumption.²⁶ Additionally, nearly half of the global workforce behind these fisheries are women, who are often unrecognized, unpaid, or underpaid.²⁷ The catch data from artisanal and subsistence fisheries are rarely reported by FAO member countries, and as such, small-scale fisheries are often left out of policy and management conversations in global forums.²⁸ Additionally, the rapid pace of global fishery privatization and expansion across the high seas has exposed small-scale fisheries to intense competition.²⁹

Finally, ocean-based development has raised criticisms as a means of “ocean grabbing” or “coastal grabbing” that privatizes resources away from local users.³⁰ Research indicates that spatial displacement under the guise of blue growth initiatives, particularly related to aquaculture and tourism, have detrimental effects on local access, water quality, and overall well-being.³¹

With these factors in mind, it is essential that blue economy programs are centered around improving the livelihoods of coastal communities through the lens of local and Indigenous knowledge, priorities, and needs. This includes co-developing a shared vision and language, building capacity for participation and co-management, recognizing customs, rights, and tenure, and ensuring sustainable infrastructure through access and tools.³²



Component 3: Environmental Stewardship

The ocean is the world’s largest ecosystem, providing oxygen, food, medicine, storm protection and trade infrastructure for a growing global population.³³ A critical constraint on the further development of the blue economy is the continued deterioration in the health of marine ecosystems.³⁴ According to the United Nations, the ocean has absorbed 90% of the heat generated by rising greenhouse gas emissions and 30% of carbon emissions.³⁵ The consequences of this absorption include ocean warming, acidification,

²⁴ Rodziewicz et al., “Housing Market Impairment from Future Sea-Level Rise Inundation.” (2022).

²⁵ *Id.*

²⁶ Pauly, “A Vision for Marine Fisheries in a Global Blue Economy.” (2018).

²⁷ Bennett et al., “Blue Growth and Blue Justice.” (2021).

²⁸ Pauly, “A Vision for Marine Fisheries in a Global Blue Economy.” (2018).

²⁹ Cohen et al., “Securing a Just Space for Small-Scale Fisheries in the Blue Economy.” (2019).

³⁰ Bennett et al., “Blue Growth and Blue Justice.” (2021).

³¹ *Id.*

³² Evans et al., “Putting Coastal Communities at the Center of a Sustainable Blue Economy.” (2023).

³³ United Nations, “Oceans - United Nations Sustainable Development.” (2024).

³⁴ OECD, *The Ocean Economy in 2030*. (2016).

³⁵ UNFCCC, “Urgent Climate Action Is Needed to Safeguard the World’s Oceans.” (2021).

deoxygenation and sea level rise – all which carry severe impacts on ocean and coastal life.³⁶ In addition to climate change, ocean pollution from plastic, chemicals, nutrients, and wastewater threaten marine life at all trophic levels, water quality, and the food web.³⁷ Therefore, any blue economy program must integrate activities to protect, repair, and restore marine and coastal ecosystems in order to ensure the health and vitality of the ocean’s ecosystem services for future generations.

U.S. Frameworks to Inform the Blue Economy

NOAA and its counterparts have prioritized the development of the United States’ blue economy through strategic plans, new programs, and research investment. The examples that follow outline the strategies these agencies have applied for U.S. aquaculture, ocean and coastal modeling, and community engagement.

The National Oceanic and Atmospheric Administration Framework

Setting the stage is [NOAA’s 2022 - 2026 Strategic Plan](#), which includes the acceleration of growth in an information-based blue economy as a top strategic goal. Coining the term “New Blue Economy”, NOAA is calling for increased investment in the acquisition, development, and accessibility of data to address societal challenges and spur responsible economic growth.³⁸ While the New Blue Economy places information and data at the core of its definition, the priorities to support it align with the three overarching components of the blue economy defined previously: economic viability, social responsibility, and environmental stewardship.



Strengthen existing blue economy sectors by improving adaptive fishery management, expanding sustainable marine tourism and recreation opportunities, supporting sustainable development of offshore wind energy, and contributing to the improved safety of maritime transportation.³⁹



Improve resilience of coastal communities and economies by advancing forecast effects of sea level rise, reducing risk from coastal and environmental hazards, and supporting responsible coastal development⁴⁰



Protect and restore marine life and ocean, coastal and Great Lakes ecosystems through species-specific conservation, advancing science to improve management efforts, and advance locally led conservation and restoration efforts⁴¹

³⁶ *Id.*

³⁷ The Ocean Panel, “Transformations for a Sustainable Ocean Economy. A Vision for Protection, Production and Prosperity.” (2020).

³⁸ Spinrad, “The New Blue Economy.” (2021).

³⁹ NOAA, “Building a Climate Ready Nation. NOAA FY22-26 Strategic Plan.” (2022).

⁴⁰ *Id.*

⁴¹ *Id.*

In addition to this five-year plan, NOAA also has a [detailed strategy for sustainable aquaculture](#) that demonstrates how an emerging industry can successfully deliver on the triple bottom line of the blue economy. For example, the strategic plan provides the following framework to support the budding U.S. aquaculture industry:⁴²

Vision: a thriving, resilient, and inclusive U.S. aquaculture industry that supports jobs, expands access to nutritious domestic seafood, and reinforces healthy coastal and ocean ecosystems in a changing environment

Values: stewardship, scientific excellence, collaboration, diversity and inclusion, integrity, sustainability

Goals:

1. Manage sustainably and efficiently
2. Lead science for sustainability
3. Educate and exchange information
4. Support economic growth and viability

The U.S. Integrated Ocean Observing System Strategy

Building on the need to produce, integrate, and share reliable, high-quality data, the U.S. Integrated Ocean Observing System (IOOS) has centered its [2023 - 2026 Strategic Plan](#) on information collection and dissemination. Guided by the core principle of ensuring the exchange of information is open-access and easy, IOOS is focused on developing model predictions that support a wide range of users, providing user-driven products and tools, and increasing reach through partnership and stakeholder engagement.

One example of the IOOS in action is the Coastal and Ocean Modeling Testbed (COMT). The COMT focuses on testing and evaluating coastal and ocean models to improve their accuracy and reliability for various applications such as weather forecasting, climate research, marine resource management, and hazard response.⁴³ The COMT also helps to facilitate community building within the scientific community through the upleveling to modeling skills, refinement of shared goals, and collaborative feedback.⁴⁴ With twelve completed projects since the first round of funding launched in 2013 and five currently in progress, the COMT has played a crucial role in accelerating the transition of research to operations in the field of ocean monitoring in two key ways:⁴⁵

1. Evaluating technology that currently exists by conducting comparison analyses, assessing suitability for various use cases, developing guidance for pilot projects, and determining the resources required to operationalize the technology
2. Developing new technology to fill gaps in existing technology

⁴² NOAA, "NOAA Aquaculture Strategic Plan (2023–2028) | NOAA Fisheries." (2022).

⁴³ IOOS, "Coastal and Ocean Modeling Testbed." (2024).

⁴⁴ Luettich et al., "Introduction to Special Section on The U.S. IOOS Coastal and Ocean Modeling Testbed." (2013).

⁴⁵ *Id.*

In alignment with NOAA's New Blue Economy strategy, the COMT 2024 funding round will focus on projects related to the United Forecast System, coastal resilience, and ecosystem and community modeling.⁴⁶

The Office of National Marine Sanctuaries Strategy

NOAA's Office of National Marine Sanctuaries (ONMS) outlines a [strategic framework for 2022 - 2027](#) that emphasizes the importance of preserving the ocean's resources for future generations. While the strategic goals do not prescriptively address the blue economy, the ONMS framework focuses primarily on social responsibility and environmental stewardship components in the following ways:⁴⁷



Increase and broaden public support for ocean conservation and the sanctuary system, invest in infrastructure to meet current and future system-wide needs, and ensure an inclusive and innovative workplace



Ensure healthy and resilient sanctuaries and other marine protected areas, protect more areas of national and international significance, and deepen understanding of sanctuaries

One example of how this strategy materializes is through a recent [2023 report](#) that investigated the knowledge, attitudes, and perceptions of saltwater recreational anglers that use Gray's Reef National Marine Sanctuary (GRNMS). Collating the responses from over 350 surveys, the report summarizes informative sociodemographic characteristics related to user activities, perceptions, and overall concerns regarding the health of the sanctuary.⁴⁸ These results not only help to inform ecosystem management policies, but can also provide valuable insights into how potential blue economy initiatives can support the most pressing needs of the sanctuary and the people who rely on it.

International Frameworks to Inform the Blue Economy

Several prominent international organizations have also developed strategies and frameworks to aid in the development of a sustainable blue economy. From the various UN agencies like the UN Environment Program and the Food and Agriculture Organization to multi-country coalitions like the Ocean Panel, the following examples outline blue economy tools designed for policy and governance forums.

⁴⁶ IOOS, "The U.S. IOOS Enterprise Strategic Plan." (2024).

⁴⁷ Office of National Marine Sanctuaries, "Five Year Strategy for the National Marine Sanctuary System 2022-2027." (2022).

⁴⁸ Office of National Marine Sanctuaries, "Knowledge, Attitudes, and Perceptions: Gray's Reef National Marine Sanctuary." (2023).

The United Nations Sustainable Development Goals

The United Nations Sustainable Development Goals (SDGs) are a set of 17 interconnected priorities that aim to address global challenges and promote sustainable development in economic, social, and environmental dimensions.⁴⁹ SDG 14 “Life Below Water” is the most relevant to the blue economy as it pertains to the conservation and sustainable use of oceans, seas, and marine resources. While SDG 14 is not prescriptive in how a blue economy should operate, it does offer the following targets that blue economy programs can integrate in an effort to align with the broader global ocean goals:⁵⁰



Increase the economic benefits to developing areas through the sustainable use of marine resources and provide access for small-scale artisanal fishers to marine resources and markets



Increase scientific knowledge, research, and technology for ocean health by allocating a percentage of total research budget to research of marine technology



Prevent and significantly reduce marine pollution, sustainably manage and protect marine and coastal ecosystems, minimize and address the impacts of ocean acidification, and conserve at least 10% of coastal and marine areas

The UN Environment Program Sustainable Blue Economy Initiative

Building off the UN SDGs, the efforts of the United Nations Environment Program (UNEP) are more specifically geared to help countries build sustainable blue economies. UNEP’s Sustainable Blue Economy transition framework provides a top-down government approach to creating a blue economy using a “Rapid Readiness Assessment” tool. Two examples of rapid readiness assessments carried out by UNEP and its partners are in [Trinidad and Tobago](#) and in [Antigua and Barbuda](#). While the UNEP tools range from assessments to financial measurement guidelines, the initiative’s core goal to create sustainable ocean-based economic, social and environmental benefits aligns to the three pillars of the blue economy in the following ways.⁵¹



Work across the financial community to provide guidance and frameworks to ensure investment, underwriting and lending activities are aligned to the UN Sustainable Development Goal 14, apply circular economy approaches, and create valuation tools to assist countries with mapping marine and coastal ecosystems and their services

⁴⁹ United Nations Department of Economic and Social Affairs, “THE 17 GOALS | Sustainable Development.” (2015).

⁵⁰ United Nations Department of Economic and Social Affairs, “Goal 14.” (2023).

⁵¹ UN Environment Programme, “Enabling Sustainable, Resilient and Inclusive Blue Economies.” (2020).



Deliver equitable and inclusive processes and outcomes; and provide frameworks that assist with capacity building



Increase the application of nature-based solutions such as blue carbon approaches, assist countries in designing policy that protects, restores, and regenerates healthy ecosystems, and foster climate stability and resilience through integrated marine management


One example of a tool stemming from UNEP’s efforts is the creation of [14 finance principles](#) for banks, insurers and investors to follow when investing in blue economy ventures.⁵² These principles promote SDG 14 (Life Below Water) highlighted above while also providing tangible guidelines for what ocean-specific financing should look like. While financially-oriented at their core, the following 14 principles also weave in social responsibility and environmental stewardship at essential components (table 3):⁵³

Table 3. UNEP Sustainable Blue Economy Finance Principles

| | Principle | Description |
|--|-------------|--|
| | Systemic | Endeavor to identify the systemic and cumulative impacts of investments, activities and projects across value chains |
| | Diversified | Recognizing the importance of small to medium enterprises in the Blue Economy, endeavor to diversify investment instruments to reach a wider range of sustainable development projects |
| | Impactful | Support investments that go beyond the avoidance of harm to provide social, environmental and economic benefits from our ocean for both current and future generations |
| | Inclusive | Support investments that include, support and enhance local livelihoods, and engage effectively with relevant stakeholders |
| | Partnering | Partner with public, private and non-government sector entities to accelerate progress towards a sustainable Blue Economy, including in the establishment and implementation of coastal and maritime spatial planning approaches |

⁵² UN Environment Programme, “The Sustainable Blue Economy Finance Principles.” (2018).

⁵³ *Id.*

| | | |
|---|-----------------|--|
| | Cooperative | Cooperate with other financial institutions and relevant stakeholders to promote and implement these principles through sharing of knowledge about the ocean, best practices for a sustainable Blue Economy, lessons learned, perspectives and ideas |
| | Transparent | Make information available on investment activities and the related social, environmental and economic impacts (positive and negative) |
|  | Protective | Support investments that take all possible measures to restore, protect or maintain the diversity, productivity, resilience, core functions, value and the overall health of marine ecosystems, as well as the livelihoods and communities dependent upon them |
| | Science-led | Seek to develop knowledge and data on the potential risks and impacts associated with investment activities, as well as encouraging sustainable finance opportunities in the Blue Economy |
| | Precautionary | The precautionary principle will prevail, especially when scientific data is not available |
| | Solution-driven | Endeavor to direct investment from innovative commercial solutions to maritime issues that have a positive impact on marine ecosystems and ocean-dependent livelihoods |
| | Purposeful | Endeavor to direct investment to projects and activities that contribute directly to the achievement of Sustainable Development Goal 14 and other Sustainable Development Goals especially those which contribute to good governance of the ocean |
| Other | Compliant | Support investments, activities and projects that are compliant with international, regional, national legal and other relevant frameworks which underpin sustainable development and ocean health |
| | Risk-aware | Endeavor to base investment decisions on holistic and long-term assessments that account for economic, social and environmental values, quantified risks and systemic impacts |

Source: adapted from <https://www.unepfi.org/blue-finance/the-principles/>

The Blue Growth Initiative

[The Blue Growth Initiative](#) is a program launched by the Food and Agriculture Organization (FAO) in 2013 with the goal of leveraging fisheries and aquaculture development to improve the livelihoods of people in rural and coastal communities. The Blue Growth Initiative is built around the three components of sustainable blue economy development defined earlier: economic viability, social responsibility, and environmental stewardship.⁵⁴



Promote best practices in aquaculture management, enhance the resilience of aquaculture systems to climate change, and support value chain development by promoting market access for small-scale producers, and improving post-harvest handling and processing practices.



Strengthen the capacity of governments, fisheries organizations, and other stakeholders to implement sustainable fisheries and aquaculture management practices through training, technical assistance, and knowledge sharing initiatives.



Promote ecosystem-based management approaches, establish marine protected areas (MPAs), implement measures to reduce pollution and habitat degradation, and promote responsible and sustainable fisheries management practices

One significant output from this initiative is the publication of the “Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries in the Context of Food Security and Poverty Eradication” in 2015 ([SSF Guidelines](#)).⁵⁵ The SSF Guidelines emphasize the need to protect the rights of small-scale fishers and their communities, ensure equitable access to resources, promote gender equality, and enhance the sustainability of fisheries management practices.⁵⁶ Additionally, they encourage the implementation of participatory and community-based approaches to fisheries management, as well as the integration of traditional knowledge and practices into decision-making processes.⁵⁷

One key learning from the creation of the SSF Guidelines is the value in establishing an online multilingual platform alongside the written resource in order to support the implementation of the guidelines and enable ongoing dialogue with small-scale fishers and non-governmental organizations (NGOs).⁵⁸ This platform, called The SSF Hub, provides a place for fishers to share experiences, voice concerns, and raise feedback in a way that can be consolidated in order to influence decision makers at policy forums such as the [small-scale fishers summit](#).

⁵⁴ FAO, “Achieving Blue Growth. Building Vibrant Fisheries and Aquaculture Communities.” (2018).

⁵⁵ FAO, “Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries in the Context of Food Security and Poverty Eradication.” (2015).

⁵⁶ *Id.*

⁵⁷ *Id.*

⁵⁸ SSF Hub, “SSF Hub Partner Reflections.” (2022).

The Ocean Panel for a Sustainable Blue Economy

Established in 2018, the Ocean Panel is a consortium of leaders from 17 countries working to transition the global ocean economy to a sustainable blue economy. In 2020, the panel established 74 priority actions across five pillars of ocean health, ocean wealth, ocean equity, ocean knowledge, and ocean finance to guide this transformation and provide measurable goals for each one.⁵⁹ While a complete list of the 74 priorities are detailed in [the report](#), the following summarizes the actions into the Ocean Panel’s five distinct pillars (table 4).⁶⁰

Table 4. Summary of the Ocean Panel priorities

| Pillar | Priority Actions Categories |
|-----------------|---|
| Ocean Health | <ul style="list-style-type: none"> ● Reduce greenhouse gas emissions ● Protect and restore marine and coastal ecosystems ● Reduce ocean pollution |
| Ocean Wealth | <ul style="list-style-type: none"> ● Sustainable ocean food, energy, tourism, transport, and new industries |
| Ocean Equity | <ul style="list-style-type: none"> ● Promote equal opportunity for people to benefit from the ocean ● Enable equitable access to resources, support fair distribution of benefits and protect the most vulnerable from further risks of harm |
| Ocean Knowledge | <ul style="list-style-type: none"> ● Build ocean literacy and skills ● Develop and integrate ocean accounts into national accounts for economic tracking ● Harness ocean science, technology, and data |
| Ocean Finance | <ul style="list-style-type: none"> ● Direct public sector financing and development assistance to investments in the sustainable ocean economy ● Guide, de-risk, incentivize and monitor investment in sustainable ocean activities to increase transparency and ensure reporting consistency |

Source: summarized from “Transformations for a Sustainable Ocean Economy. A Vision for Protection, Production and Prosperity.”

Guiding each one of these priority action categories are 9 principles:⁶¹

1. **Alignment:** must be aligned to various international frameworks set by the UN, the Convention on Biological Diversity, and the Paris Agreement
2. **Inclusiveness:** respect and protect human rights, gender equality, and local and indigenous community participation
3. **Knowledge:** must be informed by the best available science, including indigenous knowledge

⁵⁹ The Ocean Panel, “Transformations for a Sustainable Ocean Economy. A Vision for Protection, Production and Prosperity.” (2020).

⁶⁰ *Id.*

⁶¹ *Id.*

4. **Legality:** the UN Convention on the Law of the Sea is the legal basis for all ocean activities
5. **Precision:** a lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation
6. **Protection:** a net gain approach must be applied to ocean uses in order to help sustain or restore the health of the ocean
7. **Resilience:** must enhance the resilience of the ocean and the ocean economy
8. **Solidarity:** the need for access to finance, technology and capacity building for developing countries, especially Small Island Developing States and Least Developed Countries must be taken into account
9. **Sustainability:** the production and harvesting of ocean resources must be sustainable and support resilient ecosystems and future productivity

While the Ocean Panel utilizes a five-pillar framework versus the three-pronged blue economy framework leveraged in previously discussed examples, there remains a common thread of economic viability, social responsibility, and environmental stewardship running through its strategy. The Ocean Panel's priorities can easily be rearranged to fit the simplified three-pronged model as follows:



Develop and integrate ocean accounts into national accounts for economic tracking, direct public sector financing and development assistance to investments in the sustainable ocean economy, and incentivize investment in sustainable ocean activities



Enable equitable access to resources, support fair distribution of benefits and protect the most vulnerable from further risks of harm, build ocean literacy and skills, and promote equal opportunity for people to benefit from the ocean



Reduce greenhouse gas emissions, protect and restore marine and coastal ecosystems, and reduce ocean pollution

Summary of Blue Economy Frameworks

There are many different frameworks and strategies related to building a blue economy. At the international level, policy and governance are often the focus of a blue economy strategy while U.S. organizations have designed models that are tailored more specifically to programs or distinct industries. Similarly, each strategy weighs the three components of a blue economy differently. For example, ONMS places a greater emphasis on environmental stewardship and social responsibility while economic viability is a top priority of UNEP's strategy. As such, there isn't a one-size-fits-all framework that can be easily applied across any organization or industry. By developing a framework that meets the individual goals of an organization and upholds the

economic, environmental, and social priorities of a blue economy, the ocean economy can evolve into a sustainable blue economy where the health of the ecosystem underpins the delivery of economic and social benefits for years to come.

Blue Economy Case Studies

While frameworks and strategies are powerful tools to elicit transformation, the true measure of impact comes from action. The following examples highlight both grassroots and government-led programs that support economic development without compromising on environmental sustainability and equitable community engagement. Key best practices and hallmarks of success have been noted, to inform future BE efforts by US and state agencies.

Local Examples

The first two case studies demonstrate blue economy principles at a local level. In the first, an oyster farm in Maine is experimenting with ways to farm in an environmentally conscious manner without jeopardizing the economic performance of the business. In the second, a local town in Northern California is using thoughtful community engagement methods to build support for transitioning its industries to a sustainable blue economy model.

Sustainable Oyster Farming on Deer Isle, Maine

Summary: Deer Isle, Maine is a small island with a population of almost 3,000 people whose economy depends predominantly on fishing and aquaculture activity.⁶² Typically, floating oyster ranches are made of vinyl-coated trap wire with four or six sections to hold plastic mesh bags with two large plastic pontoon floats.⁶³ With the growing impact of climate change and the increasing level of marine debris, [Deer Isle Oyster Co](#) is working to reduce the environmental impact of oyster and kelp aquaculture by prototyping new gear types that are less reliant on plastic.

Prototype Examples: three years of research and development of gear and harvesting processes has resulted in different plastic-free designs with varying levels of success

- Different materials tested: aluminum for the ranches, mushroom buoys made from hemp chafe inoculated with mycelium, cedar box frames, basalt mesh, hemp line or rubber line instead of zip-ties
- Piloted processing methods: use solar to power sorting and wash stations

Takeaways:

- **It doesn't have to be fancy:** implementing a sustainable blue economy business model doesn't have to take years of planning and analysis. For small, local businesses, adjustments to its processes can be tested in relatively real-time and without requiring significant capital investment

⁶² "Deer Isle-Stonington Maine Chamber of Commerce | Visitor Info." (2024).

⁶³ Barrows, "Plastic Free Sea Farming." (2024).

- **Trial and error takes time:** research and development efforts are time consuming and are often incremental to the daily work that small fisheries are already juggling. It's critical to manage expectations, establish long-term investment, and test new ideas incrementally rather than looking for quick, sweeping wins
- **Look back to look forward:** learning from and integrating traditional practices can help inform new ways of doing business including nature-based solutions for gear and harvesting
- **Education is a powerful tool:** merging storytelling with cuisine and tourism is an effective combination when trying to educate consumers on sustainable sea-to-table best practices. Deer Isle Oyster Co holds oyster tasting events where locals and tourists are invited to eat oysters and learn about how and why the company puts sustainable practices on par with earning a profit
- **Don't forget the swag:** educational and community events are often great opportunities to sell thoughtfully produced merchandise such as beanies, t-shirts, stickers, and other local products.

2022 Blue Economy Symposium & Learning Festival

Summary: In 2022, members of California Sea Grant and the city of Fort Bragg held a four-day [symposium and learning event](#) to discuss the needs and opportunity for developing a blue economy in Mendocino County.

Event Scope:

- The first two days were centered around panels and presentations related to blue economy infrastructure, fisheries, aquaculture, and entrepreneurship and workforce development ([Agenda](#) for reference)
- The last two days were activity focused with the goal of immersing participants in the core enterprises of Mendocino County. Examples included tidepooling with a California State Parks Interpreter, attending a fish market to talk with local fishers, and a visiting an interactive kelp exhibit ([Agenda](#) for reference)

Impacts:

- Symposium discussions urged the city to apply for a grant, which secured the necessary funds to prepare a “Blue Economy Visioning, Resiliency and Implementation Plan”
- A new coalition was formed between city council members, tribal members, local academic institutions, private businesses, and researchers to help move blue economy ideas forward
- The community identified the top investment priorities related to fishery infrastructure and marine science and education⁶⁴

Takeaways:

⁶⁴ California Sea Grant, “Summary & Key Takeaways from the 2022 Blue Economy Symposium & Learning Festival.” (2022).

- **Start where you are:** events like this are an impactful way to bring together community stakeholders, agencies, and industry experts to share information about the current state of a defined area/community. This is one way to start the process of defining a clear vision for the future of a local blue economy and identifying paths forward that fit the needs of the community
- **Additional investment:** many blue economy undertakings will require new infrastructure and permitting, which is often dependent on funding and public-private partnerships in order to be efficiently implemented
- **It takes a village:** sustaining and enhancing a blue economy requires combining locally-informed action with the broader coastal community's commitment and external support. This event had buy-in from local government, indigenous community members, and business folks along with facilitation support from California Sea Grant

Public-Private Partnership Examples

The next three case studies highlight more mature blue economy programs that rely on partnerships between government and private organizations. From U.S. examples based in San Diego and Washington State to an influential coalition in Africa, these programs showcase viable blue economy approaches that combine technology innovation with cutting-edge science and well-developed funding pipelines.

San Diego's Blue Tech Bay

Summary: The [Port of San Diego](#) is an active leader in developing San Diego's blue economy through its aquaculture and blue technology program. It provides funding, permitting, and environmental review, and access to Port-controlled land in San Diego Bay.

Aquaculture: In partnership with NOAA, the Port of San Diego conducted one of the first [aquaculture opportunity analyses](#) in United States port waters. The report identified optimal sites, potential shellfish and macroalgae species, and gear thresholds while also highlighting potential operational constraints and expansion opportunities.⁶⁵ The referenced report is a valuable example that the Foundation can leverage when it is ready to explore sanctuary-specific programs.

Examples of the Port of San Diego's aquaculture programs are as follows:

- [Sunken Seaweed](#): an aquaculture start-up piloting a submerged pilot seaweed farm in port-owned waters. Beyond learning about the commercial viability of different species, results from the pilot project are helping assess the ecosystem services related to seaweed aquaculture from carbon sequestration and bioremediation to improving water quality and ecosystem productivity.⁶⁶
- Shellfish nursery using the Floating Upweller System technology ([FLUPSY](#)): a floating barge that serves as a shellfish nursery, growing oysters from seed to juvenile stage.

⁶⁵ NOAA and Port of San Diego, "Aquaculture Opportunities in San Diego Bay." (2018).

⁶⁶ "Blue Economy | Port of San Diego." (2024).

The goal of the pilot is to demonstrate that shellfish nursery operations in San Diego Bay are feasible, however permitting challenges have delayed the pilot to date⁶⁷

Blue Tech: Another core element of the Port of San Diego’s blue economy program is Blue Economy Incubator (BEI). The goal of the BEI is to remove obstacles for entrepreneurs by providing pilot project resources including access to test sites, funding, key assets, permitting and entitlement assistance.⁶⁸ BEI outcomes since May 2023 include:

- USD\$1.7 million in committed funding
- 4 completed projects related to debris removal, drive-in hull cleaning practices, and smart marina technologies
- 5 in-flight projects related to resilient shoreline infrastructure, shellfish and seaweed aquaculture, and water and sediment remediation technologies
- Provided use of Port-owned property, assisted with obtaining all necessary regulatory and operational permits, coordinated the installation of the pilot projects, and helped with community and media relations

Takeaways:

- **Play to your strengths:** the Port of San Diego is well positioned to lead these two blue economy initiatives due to its expertise in government processes and regulations, access to assets and testing sites, and relationships across various institutions
- **Establish accessible processes:** the Port’s BEI team has created a [clear and fair process](#) for applying to the incubator with guidance on each component of the application and visibility into each step of the review process
- **Set clear objectives and performance indicators:** the Port clearly defines its role and offerings in the blue economy space while providing [progress reports](#) on the status of various investments
- **Measure impact:** in addition to tracking BEI funding, the Port completed an [economic impact report in 2019](#) detailing its contribution to the county through jobs and industry-specific revenue

Washington Maritime Blue and Build Back Blue

Summary: Washington Maritime Blue, a non-profit, aims to establish Washington State as a global leader in sustainable maritime practices and innovation by supporting blue tech entrepreneurship, maritime workforce development, and building strong partnerships between industry stakeholders, government agencies, academic institutions, and local communities.⁶⁹

Areas of Impact: the strategic focus areas of Washington Maritime Blue are Maritime Decarbonization, Ocean Renewable Energy, Sustainable Fishing & Seafood, Healthy Oceans, and Digital Transformations. The specific programs to support these areas are:⁷⁰

⁶⁷ *Id.*

⁶⁸ Port of San Diego, “Blue Economy Incubator Highlights.” (2023).

⁶⁹ “Washington Maritime Blue - WA Sustainable Maritime Strategy.” (2024).

⁷⁰ *Id.*

- [Blue Ventures](#): 4 different incubators providing varying levels of startup support for ocean-based climate solutions, resulting in the creation of over 500 jobs and USD\$450 million in funding
- [Joint Innovation](#): strategic initiatives and projects through public-private collaborations
- [Equity Engagement](#): creating accessible career pathways for underserved communities while also piloting a new “Try a Trade” event where students from Seattle public schools will get hands-on with maritime activities like operating the Vessel Bridge Simulator, setting off flares, heaving lines, learning knots, etc.
- [Build Back Blue](#): as a finalist in the EDA’s Build Back Regional Challenge, Washington Maritime Blue and its partners received funding to further develop economic and market studies, assist in workforce capacity building, and provide additional networking and career-building opportunities around the state
- Blue Hub: convening members, stakeholders, and partners to strengthen the knowledge base and thought leadership through various events

Takeaways:

- **Establish a location-specific strategy:** complete with a site-specific mission, vision, and framework that leverages direct input from stakeholders and aligns with UN SDGs, Washington State’s [blue economy strategy](#) is concrete, includes development pathways specific to its top industries, and identifies the tangible tools required to achieve its strategic goals
- **Mind the gap:** leverage external partnerships and subject matter experts to help mitigate gaps in strategy that are not the strength of the organization. Recognizing its knowledge gap in measurement methodologies, Washington Maritime Blue requested outside expertise to develop key performance indicators for its current and future blue economy projects ([example RFP](#))

OceanHub Africa

Summary: Based in Cape Town, [OceanHub Africa](#) (OHA) recognizes the tremendous potential of Africa’s blue economy while also being keenly aware of the threats of irresponsible ocean economic growth. OHA strives to further a sustainable blue economy in Africa by increasing the development and adoption of new ocean technologies and policies.⁷¹

Impacts: As the first entrepreneurial support organization in Africa dedicated to building a bluer economy, OHA has had tremendous impact in its first four years as demonstrated by the following milestones:

- Established 4 acceleration programs supporting 32 start-ups
- Secured USD\$10.3 million to support aquaculture, ocean-based energy production, circular economy, fishing management, and water sanitation projects
- Created over 300 jobs in blue economy sectors

⁷¹ “OceanHub Africa.” (2024).

- Supported the development of 21 micro-businesses in the coastal regions of Tanzania and Mozambique
- Initiated the [1000 Ocean Startups](#) project, which established a 37-member international coalition with the goal of backing at least 1,000 ocean startups by 2030⁷²
- Organized 5 [Ocean Innovation Africa Summits](#) to inspire entrepreneurs, garner private investment, and build partnerships across 59 countries⁷³

Takeaways:

- **Establish criteria for program selection rooted in blue economy principles:** OHA requires that startups must “illustrate a favorable influence on ocean sustainability, must be operational within the geographical boundaries of Africa, must run on a for-profit basis, have a scalable product or service available in the market and display clear innovation or have a disruptive business model.”⁷⁴ This criteria is in lock-step with OHA’s mission, values, and goals for building a blue economy in Africa.
- **Build on the learnings from pilots:** pilot programs are an informative way to assess feasibility and impact before committing to long-term investment. Before joining BFA Global and other partners in the support of [Africa Blue Wave](#), a pilot was held with a smaller cohort to help determine the potential impact. The pilot also gave investors the opportunity to see firsthand what is possible when combining young talent with access to resources and tools, which led to a further USD\$1 million investment to expand the program beyond the pilot region.⁷⁵
- **Get in the field:** it’s critical to not lose sight of the local community when designing innovative solutions to oceanic challenges. By integrating site visits into a multi-day workshop, entrepreneurs were able to observe the day-to-day lives of the people they were creating solutions for. Participant feedback noted the significance of involving local communities from the outset, tailoring the solution to the desires of users themselves, and being open to going back to the drawing board when field input alters the solution design.⁷⁶

Summary of Case Studies

These case studies provide tangible examples of the blue economy in action. Similar to the variability across U.S. national and international frameworks, the application of the blue economy to conservation programs and new business ventures varies depending on the size, goals, and resources of the organization. The takeaways highlighted in this section can serve as learnings for organizations like the National Marine Sanctuary Foundation to consider when designing a new revenue-generating initiative that relies on the health of the ocean and coastal communities for success.

⁷² “Ocean Innovation | 1000 Ocean Startups.” (2024).

⁷³ “Ocean Innovation Africa – Africa’s Blue Economy Summit.” (2024).

⁷⁴ Mutisi, “OceanHub Africa’s Fifth Accelerator Programme.” (2024).

⁷⁵ NewDawn, “BFA Global, FSD Africa and IUCN Launch Africa Blue Wave.” (2023).

⁷⁶ Merab, “From Watamu to the World.” (2024).

Feasibility Assessment

As the official non-profit partner of ONMS, the National Marine Sanctuary Foundation is well positioned to lead the way in launching blue economy initiatives across the U.S. sanctuary system. National marine sanctuaries are protected areas designated to preserve critical habitats, threatened species, and culturally significant heritage sites like shipwrecks.⁷⁷ While each sanctuary has different levels of protections in place, marine sanctuaries are natural classrooms, prized recreational spots, and home to valuable commercial industries.⁷⁸ This makes sanctuaries an ideal place to launch blue economy programs that not only benefit the sanctuary economies, but also advance conservation, education, and innovation goals.

By leveraging best practices from the technology sector along with literature reviews, the following section provides a two-phase framework for assessing the blue economy readiness of a sanctuary-specific project.

Readiness Check

Before a specific proposal can be assessed, there are three key organizational components that need to be established for the project to be evaluated against:

1. A working definition of the blue economy that aligns with that of NOAA: “[the] sustainable use of ocean resources for economic growth, improved livelihoods, and job creation.”⁷⁹
2. A minimum criteria that a project must meet similar to the OceanHub’s funding criteria in the above case study. The criteria should align with ONMS and the Foundation’s mission, values, and goals for building a blue economy in the sanctuary system. One example could be that the minimum criteria for a proposed blue economy project to proceed is that it has (1) economic viability, (2) advances ocean conservation, and (3) improves the livelihoods of sanctuary communities. This criteria applies the economic, environmental, and social components of the blue economy framework to the specific charter of ONMS and the Foundation.
3. A set of goals or metrics for each sanctuary that inform how the components of a project will be weighed against each other. For example, one project may generate a high rate of return, but with marginal impacts to local workforce development, while a second project is extremely important culturally, but is expected to generate less revenue. By establishing a set of goals for each sanctuary, decision makers can make objective trade-offs across a portfolio of projects.

Exploration Phase

This first phase consists of gathering the necessary economic, social, and environmental baseline information and affiliated risks in order to understand the system and how it is functioning.

⁷⁷ US Department of Commerce, “National Marine Sanctuaries.” (2024).

⁷⁸ *Id.*

⁷⁹ NOAA, “Building a Climate Ready Nation. NOAA FY22-26 Strategic Plan.” (2022).

Due Diligence | Economic, Social, and Environmental Baselines

Understanding the economic, environmental, and social situation surrounding a sanctuary is essential to designing viable programs that directly address the opportunities in a specific area. Each of the following three assessments are a critical component to establishing such a baseline and informing thoughtful project design in the subsequent phase.



Market Assessment

Understand the need and demand for various economic opportunities

- Determine the current state of business, including what industries are operating in the area, how each one is performing, and what is the nature of relationships across the market/s
- Identify any external factors that may influence demand such as the political landscape, inflation and interest rates, and seasonal and cultural trends
- Forecast the market size and growth potential based on existing demand, the competitive landscape, and data from similar use cases
- Analyze the regulatory environment to understand what legal barriers to entry exist along with any compliance or reporting requirements
- Identify the target consumer groups and the affiliated willingness to pay for each group
- Determine the appropriate financial management structure and parameters in partnership with ONMS
- Assess the potential risks related to the market forecast and identified external factors
- Helpful tools include using a SWOT analysis framework, partnering with a local consultant, and leveraging subject matter experts to inform forecast assumptions



Community Assessment

Understand the socioeconomic and community dynamics of the area

Part I: Sociodemographic Analysis

Building off existing ONMS resources highlighted previously such as [the knowledge, attitudes, and perceptions report](#) for Gray's Reef National Marine Sanctuary, the next step is to develop an understanding of the community needs and priorities.

- Utilize [Community Engaged Research \(CEnR\)](#) and related [toolkits](#) to inform equitable community engagement practices
- Determine what gaps exist, if any, related to the community's capacity, knowledge, and resources surrounding the blue economy. A lack of capacity is often cited as a key

barrier to community engagement in blue economy efforts.⁸⁰ This can include a lack of knowledge, financial capital, education, skills, time, and interest⁸¹

- Select a method for assessing the socioeconomic impacts in the selected sanctuary using a variety of resources such as IUCN’s [“Review of methods for assessing the social impacts of conservation”](#), which details guidance on how to design a social impact assessment, determine the appropriate method/s, and overall best practices⁸²
- Engage in community discussions, surveys, and workshops to understand what your target consumers’ greatest needs are
- Analyze and rank each identified need in order of greatest demand
- Roughly forecast the quantitative and qualitative impacts of addressing each identified need

Part II: Stakeholder Analysis and Mapping

Based on the outputs from part one, identify all parties with a vested interest in the project and understand each group’s level of influence. A stakeholder analysis and mapping exercise is one way to gather this information.

Stakeholder Analysis: a list of all people and/or groups who are likely to be impacted

- Who: list anyone who is affected by the project or may contribute to it such as resource users, resource producers, investors, external partners, internal team members, etc.
- Level of Influence: identify the amount of power and impact each stakeholder can have on the success of the project using a high, medium, or low score
- Interests/Goals: determine the level of interest for each stakeholder and their expectations for the project outcome
- Commitment Level: gauge how invested each stakeholder is and what level of involvement he/she/they will be able to give to the project
- Engagement Category: designate each individual into one of the following types of engagement groups – informing, consulting, collaborating
- Suggested format: a table or list is useful way to organize this analysis, which will then feed into the stakeholder map below

Stakeholder Mapping: a useful exercise to visually understand the anticipated level of effort needed to effectively manage stakeholders

- Define each stakeholder’s relationship to the project by categorizing each one based on both their level of interest and level of influence in the project
- Based on the findings, determine where additional buy-in may be needed as well as estimate the level of effort that will be required to effectively manage those who will be critical to the success of the project (i.e. those with high interest and high influence)
- Outline any risks that may impact the level of buy-in of key stakeholders. For example, upcoming election cycles, planned retirements, or changes to job responsibilities

⁸⁰ Evans et al., “Putting Coastal Communities at the Center of a Sustainable Blue Economy.” (2023).

⁸¹ *Id.*

⁸² Suich and Dawson, “Assessing the Social Impacts of Conservation.” (2023).

- Suggested format: a four-by-four matrix with “Level of Interest” on the horizontal axis and “Level of Influence” on the vertical axis (Example: [Mapping 101 resource](#))



Environmental Assessment

Establish the environmental baseline of the marine ecosystem

- Determine the spatial and temporal boundaries, the environmental components to be assessed, and the level of detail and accuracy required
- Gather all available scientific data from relevant field studies, citizen science efforts, and government-sponsored databases
- Partner with local researchers, Indigenous community members, and frequent users of the sanctuary waters such as fishermen and divers to understand current management practices and needs
- Identify what the top ecosystem and habitat needs are in order to support new revenue-generating programs
- The [aquaculture environment analysis](#) identified in the Port of San Diego’s case study above can serve as an example of what components are helpful to analyze



Questions to consider

Take a pulse check with the following questions.

1. What information gaps exist? Are those gaps inhibiting buy-in from stakeholders?
2. What is needed to discover the missing information?
3. What is the current sentiment in the community related to the blue economy sector/s under consideration?
4. What threats and risks need to be addressed in order for projects to be as efficient as possible?
5. Is there a respected champion in the community already aligned to this initiative or a related industry? If not, who would be a good fit for such a role?
6. Have any critical stakeholders been identified as blockers to this field or area of work? If so, what is needed to shift their level of buy-in?
7. Is any group missing from the initial analysis?
8. What is the likelihood of the identified risks from each section? What actions can be taken to reduce or mitigate them?



Exit Criteria

Before moving to the next phase, the answer to the below questions should be “yes”.

1. Is there a program fit between the community needs, the market potential, and the Foundation's blue economy goals?
2. Has a complete stakeholder analysis and mapping exercise been completed?
3. Are all critical stakeholders supportive of this program moving forward?
4. Are community stakeholders available to serve on project steering committees and other deliberative and decision-making bodies?
5. Is now the right time to start on this project given the market environment, the community's capacity, and the bandwidth of critical stakeholders?

Design Phase

Once there is an understanding of the gaps, opportunities, and risks surrounding potential ventures in a sanctuary, the design phase is intended to be a creative and iterative time to create an actionable pilot project.

Project Buy-in | Stakeholder Engagement

- Engage stakeholders early in the design process to increase the likelihood of sustained buy-in, build knowledge capacity, and ensure the full range of objective and related options have been accounted for
- Partner with holders of local ecological knowledge to improve designs related to natural resource management
- Determine an open and transparent process for communicating and engaging with stakeholders, and likewise recording these interactions and outcomes, based on the needs of the project

Project Structure | Objectives, Metrics, Success Criteria, and Milestones

Part I: Objectives and Metrics

Establish concrete, measurable criteria

- Determine the “why” of the project
- Clearly define objectives that support the project's “why”
- Establish a set of measurable metrics and related monitoring / evaluation processes to understand progress and inform adaptive approaches
- Quantify the trade-offs and strive for efficient solutions, meaning an outcome of which it is not possible to improve in one objective without regressing in at least one other⁸³

Part II: Success Criteria and Milestones

Determine what success looks like and how to get there

- Establish a set of criteria the pilot must meet in order to be expanded or implemented on a longer-term scale
- Identify the project milestones, which may include but are not limited to, regulatory sign-off, ex-situ testing, workforce training, and progress checkpoints

⁸³ Burgess et al., “Five Rules for Pragmatic Blue Growth.” (2018).



Questions to consider

Take a pulse check with the following questions.

1. Have the full range of options been considered?
2. How do the identified objectives interact with each other?
3. What trade-offs exist and have they been communicated?
4. What forums or platforms will be available for participants to share knowledge and experiences as a way to learn from each other and overcome difficulties/impediments?



Exit Criteria

Before implementing the designed pilot, the answer to the following questions should be “yes”:

1. Have clear objectives been established?
2. Does the forecasted impact of the project align with the Foundation’s blue economy strategy and criteria?
3. Have distinct roles and responsibilities been documented and signed off on?
4. Has a sound program evaluation process and rubric been created?
5. Has a feasible measurement methodology been identified?
6. Does the project team include members from all stakeholder groups?
7. Is there an [equitable compensation structure](#) in place for the community's time and other contributions required for the project?
8. Does the project address and accommodate capacity issues within the community?

Additional Considerations

While the exploration and design phases are built upon [standard project management methodologies](#), the most important consideration when designing new programs is choosing which projects to execute.⁸⁴ Taking the time to establish clear objectives and metrics with affiliated checkpoints throughout the project lifecycle can help ensure a project delivers the expected quality and impact. Examples of ways to do this can be pulled from the previous case studies, such as creating clear application processes, templates, and review forums. In addition to ensuring consistent proposals, templates can also be designed as interactive tools that can assign a score to each component of a project based on a predetermined rubric to help guide decision-making.

Finally, similar to the application of adaptive management in marine protected areas, the same approach should be leveraged when piloting and expanding blue economy programs.⁸⁵ Monitoring and evaluation are key steps in the cycle of adaptive management that provide the information needed to adjust the project inputs in order to move closer to the intended

⁸⁴ Kinser, “The Top 10 Laws of Project Management,” 10. (2008).

⁸⁵ Bryce and Hunter, “Enhancing Climate Change Planning and Adaptive Management in Marine Protected Areas through Targets, Thresholds, and Social-Ecological Objectives.” (2024).

outcomes. By ensuring that the infrastructure is in place to monitor results, capture data, and forecast progress, the project team can adapt quickly to changing environments and layer in new components to the program as appropriate.

Recommended Areas for Further Exploration

In order to effectively implement and grow blue economy programs throughout the sanctuary system, it is essential to take into account the variables and needs of each individual sanctuary. While the scope of this project could not accommodate deeper analysis of site-specific requirements, the following recommendations are included for future consideration:

Identify and quantify blue economy industries operating in individual sanctuaries today

According to ONMS, almost USD\$8 billion is generated annually from fishing, research, and tourism/recreation activities across all national marine sanctuaries.⁸⁶ While high-level socioeconomic information is available for several sanctuaries ([fact sheet](#)), more detail is needed in order to identify the areas of greatest opportunity and impact for blue economy projects. As the Foundation solidifies its blue economy strategy, a deeper analysis of the socioeconomic drivers of selected sanctuaries should be prioritized.

Determine an appropriate valuation methodology for blue economy activities

In order to ensure accountability and transparency, a measurement and reporting mechanism is an essential component to tracking progress over time. Ideally the selected methodology would align and/or build upon existing valuation methods used by ONMS. It is critical that the selected valuation method enables like-for-like quantitative comparisons across time and location. One way blue economy activities are being measured at the national level are through satellite accounts, which feature statistics on sectors of the economy that depend on ocean and Great Lakes resources.⁸⁷ The OECD published [a report](#) exploring the methodologies of satellite accounting, which is a useful resource to understand the international landscape with regard to blue economy valuation.⁸⁸

Keep an eye on California Assembly Bill 1992 (AB 1992)

California Assembly Bill 1992 ([AB 1992](#)), introduced by Assembly Member Boerner, focuses on enhancing coastal resources through the authorization of blue carbon demonstration projects. A blue carbon demonstration project is defined as “the creation or restoration of coastal wetland, subtidal, intertidal, or marine habitats or ecosystems, including, but not limited to, wetlands and seagrasses, that can take up and sequester carbon.”⁸⁹ The bill would authorize the California Coastal Commission to permit blue carbon demonstration projects, and also require any applicant with a nonresidential development project that impacts coastal ecosystems to build or

⁸⁶ “Socioeconomics Fact Sheets | Office of National Marine Sanctuaries” s.d.

⁸⁷ NOAA, “Marine Economy Satellite Account.” (2024).

⁸⁸ Jolliffe, Jolly, and Stevens, “Blueprint for Improved Measurement of the International Ocean Economy.” (2021).

⁸⁹ “Bill Tracking in California - AB 1992 (2023-2024 Legislative Session) - FastDemocracy.” (2024).

contribute to a blue carbon demonstration project.⁹⁰ Additionally, the bill requires interagency collaboration for project development and sets standards for monitoring impacts.

If the bill passes, it would provide legislative support to establish demonstration zones in California that could provide opportunities to pilot carbon sequestration methods as a cost-effective way to slow the rate of climate change, while also protecting the coast, commercial fisheries and public health.⁹¹ With four sanctuaries (soon to be five) designated in California, it is worth exploring the potential intersection of new blue carbon demonstration projects, the Foundation's blue economy and restoration goals, and sanctuary priorities.

Conclusion

The evolution towards a more equitable and environmentally sustainable ocean economy is redefining the way blue economy programs are being designed. In the face of climate change and a growing global population, the challenge is to expand and transform the blue economy into one that enables social prosperity, protects the environment in perpetuity, and supports long-term economic development.⁹² As explored in this analysis, the ways to build such a blue economy can come from different programs and innovations. However, it is clear from the included case studies that social and environmental sustainability can exist alongside revenue-generating activities when implemented thoughtfully and equitably. To do so starts with equitable community engagement, sound science, and clear goals. Testbeds, pilots, and workshops are effective approaches to refine longer term initiatives while diverse stakeholder engagement can help ensure investments yield the greatest impact.

The National Marine Sanctuary Foundation has the opportunity to design and implement a blue economy strategy that carries forward this vision by leveraging its extensive conservation experience and its well-established public partnerships. Each sanctuary can leverage the best practices highlighted previously in order to create a unique blue economy program that serves the community and ecosystem in alignment with the ONMS management regulations. That could include launching a program that allows ocean-minded entrepreneurs to test their innovations in protected sanctuary waters or piloting novel multi-trophic sustainable mariculture methods in a sanctuary with established research partners. Either way, the blue economy frameworks analyzed in this paper coupled with the feasibility assessment serve as a guide and facilitation tool for the Foundation to apply as it develops its budding blue economy program.

⁹⁰ *Id.*

⁹¹ "2024 Ocean Day Lobby Packet." (2024).

⁹² The Economist Newspaper Limited, "The Blue Economy." (2024).

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