

## Environmental Studies Program: Ongoing Study

Title	Belmont Forum-coordinated International Collaborations: Assessment Framework For Successful Development Of Viable Ocean Multi-Use Systems (MULTI-FRAME) (NT-20-09b)
Administered by	Headquarters
BOEM Contact(s)	Thomas Kilpatrick ( <a href="mailto:thomas.kilpatrick@boem.gov">thomas.kilpatrick@boem.gov</a> )
Procurement Type(s)	Interagency Agreement
Conducting Organization(s)	National Science Foundation
Total BOEM Cost	\$133,350
Performance Period	FY 2020–2024
Final Report Due	November, 2023
Date Revised	September 17, 2021
PICOC Summary	
<i><u>Problem</u></i>	The World Ocean has been experiencing unprecedented change in physical, chemical and biological variables, since more than half a century ago, which has produced an associated response in resource sustainability. This environmental change needs to be monitored and better understood to support defensible management decisions on natural resources.
<i><u>Intervention</u></i>	Responsible management decisions on natural resources require increased understanding of current trends and change patterns. Effective and efficient natural resource management decisions, including tools, frameworks and techniques, need consistency across different domains and international borders including but not limited to conflict avoidance and mitigation.
<i><u>Comparison</u></i>	Comparing competing approaches, techniques and outcomes among themselves and in their outputs produced at different geographical locations and scales is highly desired.
<i><u>Outcome</u></i>	Increased understanding of ocean trends and change patterns, conceptualizations, conflict avoidance and mitigation tools, ecosystem management frameworks, and monitoring techniques aimed at detecting abrupt change and via cumulative effects.
<i><u>Context</u></i>	The global ocean including the United States OCS

**BOEM Information Need(s):** BOEM needs to find pathways to ocean sustainability to keep up with current environmental trends and ecosystem pattern changes, including but not limited to species abundance and distribution, habitat quality and location and ecosystem functions. To achieve this BOEM requires access to the latest ecosystem management tools, techniques and approaches to support well-informed decisions on natural resource use.

**Background:** The oceans contribute to food security and nutrition, maritime trade and transportation, tourism and other ocean-based economies, thus creating work and livelihoods for millions of people around the globe. In addition, currents and temperature gradients of the oceans have a paramount

influence on all climate systems on Earth. Due to over-exploitation, insufficient governance and large-scale climate-related changes the oceans are under severe and multiple stresses, creating complex and often unpredictable feedbacks. These stresses not only threaten the oceans and all life forms within the seas, but also the human populations that, directly or indirectly, depend on the oceans. Defining targets for ocean health and sustainability, establishing an international knowledge base needed to maintain and improve the health of ocean systems, and developing systems to predict and respond to changes and disasters to and from ocean systems, all represent critical research needs. In addition, the capacity to chart a course from the knowledge of ocean systems to the changes in policies, practices, governance, and behaviors that will sustain those systems will depend on transdisciplinary research focused on scalable, integrated approaches and solutions that can speak to decision-makers and citizens around the world. The United Nations Sustainable Development Goal no. 14 (Conserve and sustainably use the oceans, seas and marine resources for sustainable development) sets the overall framework for this study profile (as well as other relevant SDGs). Because the challenge is complex, there is a need for integrated, interdisciplinary and cross sectoral approaches, bringing together natural and social sciences, as well as policymakers, resource managers, industries, citizens and other societal partners. The research community will need to integrate models, observation systems, analytics and experiments, as well as communication strategies, to create the knowledge required to map pathways and identify trade-offs in conserving ocean health for the benefit of human societies. To inform decisions for a sustainable future, there is a pressing need to develop systems approaches in which interactions between complex social and biophysical systems are integrated.

MULTI-FRAME is jointly funded to the level of \$1.5 M by: 1) French National Research Agency (ANR); 2) Germany Federal Ministry of Research and Education (BMBF); 3) Research Council of Norway (RCN); 4) Swedish Research Council for Sustainable Development (FORMAS); 5) Swedish International Development Cooperation (SIDA – a Sweden-led consortium of African Nations); 6) U.S. National Science Foundation; and 7) U.S. Bureau of Ocean Energy Management. The research partners are: 1) Pro-sustainable projects GmbH, Germany; 2) SUBMARINER Network for Blue Growth EEIG, Germany; 3) Federal University of Santa Catarina, Brazil; 4) Royal Institute of Technology in Stockholm, Sweden; 5) University of Rhode Island, United States; 6) Møreforsking Ålesund AS, Norway; 7) Eduardo Mondlane University - Museu de Historia Natural, Mozambique; and 8) University of Nantes, France.

**Objectives:**

- Identify pathways toward a sustainable and equitable use of oceans.
- Account for and minimize impacts of human activities.

**Methods:** To achieve the above objectives the work needed should incorporate or address models, scenarios and pathways that can ensure the sustainability of the use of marine resources, including ecosystem services, and can be used by policy developers and regulatory authorities to assess the sustainability of such use. Research addressing this topic should include investigations on the interactions between stressors; biological processes such as range shifts and biodiversity changes; and ocean dynamics, such as circulation, temperature, and sea level changes. The research should include societal models - e.g., how changing patterns of migration, population, and human behavior act or will act as drivers of global change in ocean systems, and how changes in ocean systems will affect societies. In addition, response strategies should be included that demonstrate how vulnerability can be reduced, and how resilience in social systems can be better assessed and improved.

**Specific Research Question(s):**

1. What are the pathways leading to ocean sustainability?
2. What are the impacts caused by different human activities and how could they be minimized?

**Current Status:** The domestic portion of Multi-Frame started in August 2020. NSF hosted a teleconference with participants across the globe on June 18, 2021, where several PIs reported delays due to the Covid-19 pandemic.

**Publications Completed:** None

**Affiliated WWW Sites:**

[Belmont Forum Ocean Sustainability Hub: MULTI-FRAME](#)

[Assessment Framework for Successful Development of Viable Ocean Multi-use Systems \(Multi-Frame\) award information.](#)

**References:** None