

Environmental Studies Program: Ongoing Study

Field	Study Information
Title	Belmont Forum-coordinated International Collaborations: Assessment Framework For Successful Development Of Viable Ocean Multi-Use Systems (MULTI-FRAME) (NT-20-09b)
Administered by	Office of Environmental Programs
BOEM Contact(s)	Thomas Kilpatrick (thomas.kilpatrick@boem.gov)
Procurement Type(s)	Interagency Agreement
Conducting Organization(s)	National Science Foundation
Total BOEM Cost	\$133,350
Performance Period	FY 2020–2025
Final Report Due	April 2025
Date Revised	October 26, 2023
Problem	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.
Intervention	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.
Comparison	Comparing competing approaches, techniques and outcomes among themselves and in their outputs produced at different geographical locations and scales is highly desired.
Outcome	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.
Context	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 will explore ocean multi-use, which refers to the shared use of common ocean spaces for different purposes. Multi-use marks a sharp turn from the practice of exclusive resource rights and holds the promise of mitigating conflict over ocean-based resources, with socioeconomic benefits for a wide range of stakeholders. Case studies from the United States and other countries will be considered; management best practices and open source tools will be developed. MULTI-FRAME is part of the Belmont Forum Collaborative Research Action (CRA) *Oceans 2018: Transdisciplinary Research for Ocean Sustainability*.

Objective(s): Systematic analyses of how ocean multi-use can lead to ocean sustainability, via examination of case studies.

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. How can the practice of multi-use lead to ocean sustainability?

2. What are some of the common challenges from ocean multi-use case studies, and what have been some of the innovative solutions?

Current Status: The domestic portion of Multi-Frame started in August 2020. A mid-term meeting was held in June 2023. The Belmont Forum Collaborative Research Action (CRA) Oceans 2018, Transdisciplinary Research for Ocean Sustainability, is co-sponsoring a session on ocean sustainability in the Global South at United Nations COP28 (late 2023).

Publications Completed:

Lukic I, Tephany JG, McCann J, Hodson C, Thomas J-B, Rebours C. 2023. Ocean multi-use blueprints collection. <https://www.belmontforum.org/archives/resources/multi-frame-ocean-multi-use-blueprints-collection>

McCann J, Walsh JP, Lukic I, Tephany JG, Thomas J-B, Rebours C, Diederichsen S, Scherer M, da Cruz Weiss CV, da Veiga Lima FA, et al. 2023. Ocean multi-use assessment approach (MUAA). https://www.belmontforum.org/wp-content/uploads/2023/09/20230329_Multi-Use_Assessment_Approach_FINAL_.pdf

Thomas J-B, Juell-Skielse E, Grondahl F, Rebours C, Tephany JG, Trouillet B, McCann J, Hodson C, Walsh JP, Diederichsen S, et al. 2023. Transferability report: a comparison of multi-use cases. https://www.submariner-network.eu/images/3_Projects/Multi-frame/MU_Transferability_Report.pdf

Thomas J.-B., Juell-Skielse E., Grondahl F. 2023. Multi-use case study brief: Sweden. Multi-Frame Project. KTH Stockholm. https://bfe-inf.org/wp-content/uploads/2023/09/FINAL-CASE_STUDY_BRIEF-SE-formatted_compressed.pdf

Affiliated WWW Sites:

MULTI-FRAME site: <https://www.multi-frame.eu>

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

What is Ocean multi-use? https://www.submariner-network.eu/images/5_Videos/What_is_multi-use_withoutsub_.mp4

MULTI-FRAME project video: <https://www.youtube.com/watch?v=Crmue9-AHp4&list=PLq4USJlxTB6TmEhTMTa5aH04gbfbftH5j&index=10>

References: None