Environmental Studies Program: Studies Development Plan | FY 2024–2025

Field	Study Information
Title	Understanding Impacts of Offshore Carbon Sequestration on the Marine Environment: Informing Operational Management Needs Through Focused Literature Review and Synthesis
Administered by	New Orleans Office
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Procurement Type(s)	Contract
Performance Period	FY 2024–2025
Final Report Due	December 2025
Date Revised	May 10, 2023
Problem	BOEM has new regulatory authority to lease and manage sub-seabed carbon dioxide (CO_2) sequestration (CS) on the Outer Continental Shelf (OCS). Information on potential environmental impacts to the human, marine, and coastal environment from CS activities and best available monitoring methods and protocols is needed to inform leasing and management decisions.
Intervention	Perform an extensive, global literature review and synthesis for each BOEM region on the potential impact producing factors from CS activities; the potential impacts on the human, marine, and coastal environment; and the monitoring that will be required during each phase of a CS project.
Comparison	Prior BOEM-funded research on CS detailed recommendations for best management practices for CS in OCS sub-seabed, but with a focus on operational considerations like reservoir selection and CO_2 transportation.
Outcome	Region-specific information to aid BOEM's ongoing program development and various operational needs.
Context	Nationwide, with a focus on the Gulf of Mexico (GOM) due to the higher likelihood of initial activity in that region.

BOEM Information Need(s): The INVEST in America Act (i.e., Bipartisan Infrastructure Law) of 2021 amended the Outer Continental Shelf Lands Act's (OCSLA's) leasing provisions to authorize the Department of Interior (DOI) to grant leases, easements, and rights-of-way on the OCS for the purpose of carbon sequestration (See 43 U.S.C. § 1337(p)(1)), granting BOEM management authority over carbon sequestration (CS) in sub-seabed reservoirs on the OCS. Rulemaking efforts are currently under way to establish regulations to implement a nationwide OCS CS Program.

BOEM needs environmental information to inform its rulemaking, program development, and national and regional policy. The new CS Program will cover all aspects of a full program from pre-leasing activities through site closure including pre-lease geological and geophysical exploration, leasing,

planning, site characterization, drilling, installation, injection operations, risk management, monitoring, and decommissioning. BOEM needs information on the potential impact producing factors from CS activities; the potential impacts to the human, marine, and coastal environment; the monitoring that will be required during each phase of a CS project; and the most effective monitoring methods and protocols for each potentially impacted environmental resource during each project phase.

The only prior BOEM-funded study on the topic (Smyth and Hovorka 2018) details recommendations for best management practices (BMPs) for CS in sub-seabed reservoirs, but with a focus on operational considerations like reservoir selection and CO_2 transportation. The BMPs report does not provide sufficient detail on potential environmental impacts including direct, indirect, and cumulative effects that are needed to inform the OCS-wide NEPA and other environmental analyses needed at every decision point along this program from rule promulgation to pre-lease resource analysis, lease planning, leasing, plan approvals, and permit approvals. This environmental information is also needed to inform lease stipulations, conditions of approval for plans and permits, risk management and monitoring strategies, national programmatic policy, and region-specific program/operational guidance.

Background: Carbon dioxide (CO_2) is the most commonly produced, atmospheric greenhouse gas. Carbon sequestration is the process of capturing, transporting, and storing atmospheric carbon dioxide. It is an important method of reducing the amount of CO_2 in the atmosphere with the goal of reducing global warming (climate change) impacts created by the greenhouse gas effect. CO_2 capture and storage is an essential part of current climate mitigation models (IPCC 2005, NAS 2019, NAS 2021, IEA 2021, US State Dept 2021) and the United States' goal to mitigate the climate change crisis and reach net-zero carbon emissions by 2050. The Council on Environmental Quality (CEQ) recently issued a memorandum in the Federal Register to relevant Federal agencies to provide guidance on the facilitation of reviews associated with the deployment of CO_2 capture, utilization, and storage (CCUS) projects and CO_2 pipelines, and to support their efficient, orderly, and responsible deployment (87 FR 8808). BOEM needs the environmental information from this research to implement the CEQ recommendations and conduct adequate NEPA analyses. The development of this study's scope and deliverables will be coordinated with an anticipated Gulf Region CS EIS analysis to maximize both regional and national utility.

Objectives: To conduct a literature review and synthesis from a variety of vetted sources with relevant, up-to-date, and state-of-the-science information on potential impact producing factors from CS activities; the potential impacts to the human, marine, and coastal environment; the monitoring that will be required for each environmental resource during each phase of a CS project; and the most effective monitoring methods and protocols for each potentially impacted resource.

A summary will be provided for each OCS region (total 2.5 billion acres) that will aid BOEM's ongoing program development and various operational needs. In addition to the environmental information in the above paragraph, each regional summary will also provide sufficient detail on potential environmental impacts including direct, indirect, and cumulative effects specific to each region. The summary will also include region-specific recommendations for mitigation measures to minimize potential impacts to each environmental resource, as appropriate. This information is needed at the region-specific level to inform the NEPA and other environmental analyses needed at every decision point along this program from pre-lease resource analysis and lease planning, leasing, plan approvals, and permit approvals. This environmental information is also needed to inform lease stipulations, conditions of approval for plans and permits, risk management and monitoring strategies, national programmatic policy, and region-specific program guidance. The summaries will also identify knowledge gaps that will provide clear need and direction for future field and laboratory-based studies.

Methods: The study will compile existing global knowledge via literature review and synthesis on potential impact producing factors from CS activities; the potential impacts to the human, marine, and coastal environment; the monitoring that will be required during each phase of a CS project; and the most effective monitoring methods and protocols for each potentially impacted resource. Resources may include existing laws, regulations, guidance, best management practices, scientific literature, etc. Sub-seabed CS has already taken place in Norway, Australia, and Brazil and is under consideration in U.S. State waters. The Federal government (e.g., Department of Energy), industry, and academia are currently performing new, relevant research on the topic. Relevant information from current onshore projects that may translate to the offshore, may also be included.

This study will entail compiling, vetting, and analyzing available information on CS impacts in human, marine and coastal environments, then synthesizing it to create useful resources that address BOEM's needs programmatically and across all regions. Appropriate SME input will be included throughout development of the statement of work and duration of the project to maximize utility of the final deliverables. Future potential study needs will also be identified and recommended to address identified knowledge gaps via field, laboratory, or modeling analyses.

Specific Research Question(s):

1. What information and data are currently available on the potential impact producing factors associated with offshore CS activities?
2. What information and data are currently available on the potential environmental impacts from offshore CS activities to the human, marine, and coastal environments?
3. What information and data are currently available on the potential scale and impacts of leakage from sub-seabed CO_2 sequestration reservoirs and pipelines? Are there any known impacts of this CO_2 leakage on air quality?
4. What are the known impacts of induced seismicity from sub-seabed CO_2 sequestration activities to benthic biota and other components of the marine environment?
5. What information and data are currently available regarding potential environmental impacts from CS activities in the onshore environment that can be translated to the offshore environment?
6. What are the most effective monitoring methods and protocols for each potentially impacted environmental resource for each phase of a CS project (pre-injection, during injection, and post-injection) for each OCS region (Atlantic, Gulf of Mexico, Pacific, Alaska)?
7. What are region-specific recommendations for mitigation measures to minimize potential impacts to each environmental resource from each phase of CS activities?
8. What are region-specific BMPs for monitoring each environmental resource during each phase of a CS project?
9. What are the gaps in understanding that may affect the efficacy of monitoring protocols and methods for the environmental resources of the OCS?

Current Status: N/A

Publications Completed: N/A

Affiliated WWW Sites: N/A

References:

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