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## **Executive Actions to Ensure Safe and Responsible Ocean Carbon Dioxide Removal Research in the United States**

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**EXECUTIVE ACTIONS TO ENSURE  
SAFE AND RESPONSIBLE OCEAN  
CARBON DIOXIDE REMOVAL  
RESEARCH IN THE UNITED STATES**

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By Romany M. Webb and Korey Silverman-Roati

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The Sabin Center for Climate Change Law develops legal techniques to fight climate change, trains law students and lawyers in their use, and provides the legal profession and the public with up-to-date resources on key topics in climate law and regulation. It works closely with the scientists at Columbia University's Climate School and with a wide range of governmental, non-governmental and academic organizations.

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## I. Introduction

There is now broad scientific consensus that carbon dioxide removal (CDR) will be needed, alongside deep emissions cuts, to achieve global temperature targets. According to the Intergovernmental Panel on Climate Change (IPCC), we must reach net-zero carbon dioxide emissions in the early 2070s to limit temperature increases to 2°C above pre-industrial levels, and by the early 2050s to hold temperature increases to 1.5°C.<sup>1</sup> In almost all modeled scenarios, CDR is needed to achieve net zero emissions, leading the IPCC to conclude that CDR is “unavoidable.”<sup>2</sup> The extent of required CDR will depend on how quickly emissions are cut; the longer emissions cuts are delayed, the more CDR will be needed.<sup>3</sup>

Scientists have proposed a number of land- and ocean-based CDR approaches, and recent years have seen increased scientific and policy interest in ocean-based approaches. According to a 2022 report by the U.S. National Academies of Sciences, Engineering, and Medicine (NASEM), the ocean holds “great potential” for additional uptake and longer-term sequestration of carbon dioxide.<sup>4</sup> The 2022 NASEM report explored a range of possible strategies for increasing the ocean’s role as a carbon sink, including:

(1) Ocean fertilization, which involves adding iron, nitrogen, or phosphorous to the surface ocean to stimulate the growth of phytoplankton that uptake carbon dioxide and convert it into organic carbon.<sup>5</sup>

(2) Artificial upwelling, which involves installing vertical pipes in the ocean to transport nutrient-rich water from the deep ocean to the surface, and thereby stimulate the growth of phytoplankton. As in ocean fertilization, the phytoplankton uptake carbon dioxide and convert it into organic carbon, which may end up stored in the deep sea.<sup>6</sup>

(3) Seaweed cultivation and sinking, which involves growing kelp and other macroalgae that take up carbon dioxide as they grow and store it in biomass, which can later be sunk into the deep ocean to sequester the carbon it contains.<sup>7</sup>

(4) Ocean alkalinity enhancement, which involves adding alkalinity to ocean waters, typically by discharging ground silicate or carbonate rock, which then reacts with carbon

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<sup>1</sup> IPCC, Summary for Policymakers, in *Climate Change 2022: Mitigation of Climate Change. Contribution of Working Group III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change 1*, 23 (P.R. Shukla et al. eds, 2022), [https://www.ipcc.ch/report/ar6/wg3/downloads/report/IPCC\\_AR6\\_WGIII\\_SPM.pdf](https://www.ipcc.ch/report/ar6/wg3/downloads/report/IPCC_AR6_WGIII_SPM.pdf).

<sup>2</sup> *Id.* at 36.

<sup>3</sup> *Id.*

<sup>4</sup> Scott C. Doney et al., *A Research Strategy for Ocean-based Carbon Dioxide Removal and Sequestration 2* (National Academy of Sciences, Engineering, and Medicine, 2022), <https://nap.nationalacademies.org/read/26278/chapter/1>.

<sup>5</sup> For more information about ocean fertilization, see *id.* at 77-102.

<sup>6</sup> For more information about artificial upwelling, see *id.* at 103-126

<sup>7</sup> For more information about seaweed cultivation, see *id.* at 127-180.

dioxide in the water, converting it into other forms of dissolved inorganic carbon and thereby enabling the ocean to absorb additional carbon dioxide from the atmosphere.<sup>8</sup>

(5) Electrochemical ocean CDR, which encompasses a range of techniques that use electricity to drive chemical reactions that result in carbon removal. As an example, electricity may be used to separate ocean water into basic and acidic streams. The basic stream can then be added back into the ocean to increase the alkalinity of the water, enabling it to uptake additional carbon dioxide from the atmosphere. The acidic stream can be treated to strip out carbon dioxide, which can then be sequestered onshore or in sub-seabed geologic formations.<sup>9</sup>

The 2022 NASEM report concluded that “[t]he present state of knowledge on many ocean CDR approaches is inadequate . . . to inform future societal decisions” about whether and how they might be used to address climate change.<sup>10</sup> Key questions remain about the efficacy of different ocean CDR techniques, including the net amount of carbon dioxide that can be removed from the atmosphere using each technique, and how long the removed carbon dioxide will be stored in the ocean. The NASEM report called for “[e]xpanded research including field research” to answer these questions.<sup>11</sup> In addition, according to the NASEM report, “[r]esearch is also needed to identify and qualify environmental impacts, risks, benefits, and co-benefits” associated with different ocean CDR techniques.<sup>12</sup> Initial work, based on laboratory experiments and modeling, suggests that ocean CDR approaches could have a range of non-carbon co-benefits. For example, ocean fertilization could increase fish stocks, seaweed cultivation could help to combat coastal eutrophication, and ocean alkalinity enhancement could mitigate ocean acidification (among other things).<sup>13</sup> However, each approach also presents environmental and other risks, with scientists expressing particular concerns about the potential for changes to surface and deep ocean biology.<sup>14</sup> For example, ocean fertilization in one area of the ocean could lead to a decline in biological production and oxygen consumption in other regions of the ocean,<sup>15</sup> and sinking seaweed in the deep sea could lead to increases in acidification, hypoxia, and eutrophication in those deep sea areas.<sup>16</sup>

Further research is needed to evaluate fully each ocean-based CDR technique. Many of the remaining scientific questions can only be answered through in-ocean research and, in some cases, relatively large-scale or long-duration field trials may be necessary.<sup>17</sup> This could raise a host of legal issues, since ocean-based activities are governed by a variety of international, national, and

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<sup>8</sup> For more information about ocean alkalinity enhancement, see *id.* at 181-208.

<sup>9</sup> For more information about electrochemical ocean capture, see *id.* at 209-238.

<sup>10</sup> *Id.* at 239-240.

<sup>11</sup> *Id.* at 239.

<sup>12</sup> *Id.*

<sup>13</sup> *Id.* at 256

<sup>14</sup> *Id.* at 6.

<sup>15</sup> *Id.* at 89.

<sup>16</sup> *Id.* at 140.

<sup>17</sup> *Id.* at 261-262.

subnational laws.<sup>18</sup> As the 2022 NASEM report noted, “a robust legal framework . . . is essential to ensure that [ocean CDR] research is conducted in a safe and responsible manner that minimizes the risk of negative environmental and other outcomes.”<sup>19</sup> At the same time, however, it is “important to avoid imposing inappropriate or overly strict requirements that could unnecessarily hinder ocean CDR research.”<sup>20</sup>

### **A. Challenges in the Existing Legal Framework**

The U.S. legal framework for ocean CDR is highly fragmented.<sup>21</sup> A variety of U.S. environmental and other laws could apply to research projects, depending on where they take place and the activities involved. In general, federal environmental law will apply to activities that take place within 200 nautical miles of the U.S. coast, and some federal laws will apply further out into the ocean if U.S. citizens are involved in the project or a U.S.-flagged ship is used.<sup>22</sup> Some projects might also be subject to tribal, state, territory, and/or local laws, but they generally have more limited application. For example, in most of the U.S., coastal states only have jurisdiction over ocean areas within 3 nautical miles of the coast.

At the federal level, ocean CDR activities are regulated under decades-old, general environmental laws that were developed with other activities in mind. Federal agencies have yet to fully explain—either in regulations or other guidance documents—how these existing laws will be applied to ocean CDR activities.

Prior studies have highlighted a number of challenges associated with regulating ocean CDR under existing general environmental laws.<sup>23</sup> In some cases, ocean CDR activities may be subject to multiple overlapping or duplicative permit and other legal requirements.<sup>24</sup> The time, cost, and complexity associated with navigating those requirements could hinder or entirely prevent needed ocean CDR research.<sup>25</sup> This may be especially true where permit reviews are not coordinated, requiring sequential agency review, with differing informational requirements and timelines.

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<sup>18</sup> For a detailed discussion of the legal framework for ocean CDR, *see* Romany M. Webb et al., *Ocean Carbon Dioxide Removal for Climate Mitigation: The Legal Framework* (Edward Elgar Publishing, 2023).

<sup>19</sup> Doney et al., *supra* note 4, at 54.

<sup>20</sup> *Id.* at 40.

<sup>21</sup> *Id.* at 41; Romany M. Webb et al, *supra* note 18.

<sup>22</sup> *See* Webb et al., *supra* note 18.

<sup>23</sup> Korey Silverman-Roati et al., *Removing Carbon Dioxide Through Ocean Fertilization: Legal Challenges and Opportunities* (2022), [https://scholarship.law.columbia.edu/faculty\\_scholarship/3637/](https://scholarship.law.columbia.edu/faculty_scholarship/3637/); Romany M. Webb et. al., *Removing Carbon Dioxide Through Artificial Upwelling and Downwelling: Legal Challenges and Opportunities* (2022), [https://scholarship.law.columbia.edu/faculty\\_scholarship/3337/](https://scholarship.law.columbia.edu/faculty_scholarship/3337/); Korey Silverman-Roati et al., *Removing Carbon Dioxide Through Seaweed Cultivation: Legal Challenges and Opportunities* (2021), [https://scholarship.law.columbia.edu/faculty\\_scholarship/2980/](https://scholarship.law.columbia.edu/faculty_scholarship/2980/); Romany M. Webb et al. *Removing Carbon Dioxide Through Ocean Alkalinity Enhancement: Legal Challenges and Opportunities* (2021), [https://scholarship.law.columbia.edu/faculty\\_scholarship/2739/](https://scholarship.law.columbia.edu/faculty_scholarship/2739/).

<sup>24</sup> *Id.*

<sup>25</sup> Korey Silverman-Roati and Romany M. Webb, *Conclusion*, in *Ocean Carbon Dioxide Removal for Climate Mitigation: The Legal Framework* 310, 317-318 (Romany M. Webb et al. eds, 2023).

Conversely, other ocean CDR research may not be adequately regulated under existing law, which could create opportunities for projects that are not scientifically sound and/or present unacceptable risks to the environment or communities.<sup>26</sup> Greater clarity from agencies around how they will evaluate potential risks could help mitigate these outcomes.

## **B. Executive Actions to Help Overcome the Challenges**

Legal reforms are needed to create a framework that balances the need for further research to enhance understanding of ocean CDR techniques against the potential risks of such research. Reforms are also needed to put in place appropriate safeguards to prevent or minimize negative environmental or other outcomes. The needed reforms could be implemented in various ways, including through legislative or executive-level action at the federal, tribal, state, and local levels.

In March 2023, the authors published model federal legislation aimed at advancing ocean CDR research in U.S. ocean waters.<sup>27</sup> The model legislation was designed to achieve the dual goals of facilitating needed research, while also ensuring that it occurs in a scientifically sound, safe, and responsible manner.<sup>28</sup> Enacting new federal legislation would have the advantage of restructuring the legal framework in a top-down, comprehensive way. A new law could spur needed changes by clearly defining agency authority and directing federal agencies to issue resources, guidance, and regulations aimed at facilitating safe and responsible research. However, enacting new legislation can be difficult, requiring the balancing of constituents and interests across the country, and can take a number of years to develop.

Absent new legislation, federal agencies could take a variety of actions under existing law to facilitate safe and responsible ocean CDR research. The Biden Administration has already recognized the need for such action. In March 2023, the Biden Administration released its Ocean Climate Action Plan, which outlines a number of actions the administration could take to help achieve the three goals: (1) create a carbon-neutral future, (2) accelerate ocean climate solutions, and (3) enhance community resilience.<sup>29</sup> It recommends, among other things, development of “a robust regulatory framework for research and possible later deployment” of ocean CDR approaches.<sup>30</sup>

In October 2023, the White House Office of Science and Technology Policy announced a Fast-Track Action Committee on marine CDR.<sup>31</sup> The committee is made up of experts from 11 federal

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<sup>26</sup> Romany M. Webb, Introduction, in *Ocean Carbon Dioxide Removal for Climate Mitigation: The Legal Framework* 1, 6-8 (Romany M. Webb et al. eds, 2023).

<sup>27</sup> Romany M. Webb and Korey Silverman-Roati, *Developing Model Federal Legislation to Advance Safe and Responsible Ocean Carbon Dioxide Removal Research in the United States* (2023), [https://scholarship.law.columbia.edu/sabin\\_climate\\_change/199/](https://scholarship.law.columbia.edu/sabin_climate_change/199/).

<sup>28</sup> *Id.*

<sup>29</sup> The White House, *Ocean Climate Action Plan* (2023), [https://www.whitehouse.gov/wp-content/uploads/2023/03/Ocean-Climate-Action-Plan\\_Final.pdf](https://www.whitehouse.gov/wp-content/uploads/2023/03/Ocean-Climate-Action-Plan_Final.pdf).

<sup>30</sup> *Id.* at 41.

<sup>31</sup> Scott Doney and Jane Lubchenco, *Marine Carbon Dioxide Removal: Potential Ways to Harness the Ocean to Mitigate Climate Change*, the White House (2023), <https://www.whitehouse.gov/ostp/news->



agencies and three White House offices, and aims to fulfill the Ocean Climate Action Plan’s goal of “a substantial ramp up in marine CDR research and development.”<sup>32</sup> Among other actions, the committee will draft “[r]ecommendations and guidelines for policy, permitting, and regulatory standards for marine CDR research and implementation”<sup>33</sup> These developments demonstrate that federal officials acknowledge the need for federal agency changes, and that there is a distinct opportunity to implement such changes.

This paper presents several recommended actions that federal agencies could take to ensure safe and responsible permitting and regulation of ocean CDR research in U.S. waters. First, the paper recommends actions designed to enhance interagency coordination, which will be critical to ensure the efficient review and permitting of ocean CDR projects. Second, the paper discusses actions to improve environmental review of, and ensure robust stakeholder engagement about, ocean CDR projects. The actions in both of these first two recommendations apply to a broad range of agencies across the federal government. The third section of the paper then recommends actions that individual agencies should take to improve the regulation of ocean CDR, including actions by the Environmental Protection Agency (EPA), the Department of the Interior’s Bureau of Ocean Energy Management (BOEM), the Army Corps of Engineers (ACE), the National Oceanic and Atmospheric Administration (NOAA), and the Department of Energy (DOE). All of the recommended actions are intended to achieve the dual goals of facilitating needed ocean CDR research, while ensuring that research occurs in a safe and responsible way that minimizes risks to the environment and communities.

This paper discusses actions that the federal executive can take to improve permitting and regulation. It does not address possible changes at the tribal, state, and local levels. Given the shared nature of authority over the oceans, legal reforms at these levels of government may also be needed to facilitate safe and responsible ocean CDR research. Further research is needed to identify and evaluate possible tribal, state, and local reforms.

## II. Recommendations

### A. Recommended Actions to Enhance Interagency Coordination

- 1. Federal agencies involved in reviewing ocean CDR projects should clarify their respective roles and responsibilities and take steps to avoid duplicative processes and otherwise streamline project reviews.** Depending on where an ocean CDR research project takes place and the activities involved, the project may require permits and other approvals from a number of federal agencies, including EPA, BOEM, and ACE. Other agencies, such as NOAA and DOE could also be involved in funding or otherwise supporting ocean research projects. For example, a DOE-funded ocean alkalinity

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updates/2023/10/06/marine-carbon-dioxide-removal-potential-ways-to-harness-the-ocean-to-mitigate-climate-change/.

<sup>32</sup> Executive Office of the President of the United States, Charter of the Marine Carbon Dioxide Removal Fast Track Action Committee of the Subcommittee on Ocean Science and Technology National Science and Technology Council (2023), <https://www.noaa.gov/ocean-science-and-technology-subcommittee/ost-activities-and-products>.

<sup>33</sup> *Id.*

enhancement project sited in federal ocean waters and co-located with renewable energy could require a federal outer continental shelf lease from BOEM, a Rivers and Harbors Act (RHA) permit from ACE, and an ocean dumping permit from EPA.<sup>34</sup>

In stakeholder interviews conducted as part of this project, many identified the lack of coordination across federal agencies as a key barrier to an efficient and effective regulatory regime. Many expressed uncertainty about which federal agencies will be involved in reviewing any particular ocean CDR project and whether and how those agencies will work together, share information, or otherwise coordinate their reviews. Clarifying the respective roles and responsibilities of each federal agency involved in reviewing ocean CDR projects, and better coordinating their review processes, would help to avoid duplication of effort, saving both time and money. It would also increase certainty for project proponents, enabling them to develop more accurate project timelines and budgets, and it could help agencies better anticipate resource needs for project reviews and authorizations.

Federal agencies have a number of options to formalize their coordination on ocean CDR. One option would be to enter into an Interagency Memorandum of Understanding (MOU). Interagency MOUs are used across the federal government to establish the ground rules for agency collaboration and cooperation. In recent years, a number of interagency MOUs have been adopted with the goal of streamlining the review of projects, particularly climate-related infrastructure projects that require approvals from multiple federal agencies. For example, in 2021, the Departments of Agriculture, Defense, Energy, and the Interior and EPA entered into an interagency MOU to “improve public land renewable energy project permitting coordination.”<sup>35</sup> In addition, in 2022, the Departments of Energy, Housing and Urban Development, and Transportation and EPA entered into an interagency MOU to establish a blueprint for decarbonizing transportation.<sup>36</sup> The agencies agreed, among other actions, to establish a joint executive-level team to implement the MOU, ensure cross-agency coordination on research, and establish points of contact from each agency for administration of the MOU.<sup>37</sup>

An interagency MOU on ocean CDR could serve a number of purposes. The MOU could help to clarify the legal framework for ocean CDR, and the role different federal agencies

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<sup>34</sup> Romany M. Webb et al., *Removing Carbon Dioxide Through Ocean Alkalinity Enhancement: Legal Challenges and Opportunities Enhancement: Legal Challenges and Opportunities* (2021), [https://scholarship.law.columbia.edu/faculty\\_scholarship/2981/](https://scholarship.law.columbia.edu/faculty_scholarship/2981/).

<sup>35</sup> Memorandum of Understanding between the U.S. Department of the Interior, the U.S. Department of Agriculture, the U.S. Department of Defense, the U.S. Department Of Energy, and the U.S. Environmental Protection Agency to Improve Public Land Renewable Energy Project Permit Coordination, <https://www.doi.gov/sites/doi.gov/files/mou-esb46-04208-pub-land-renewable-energy-proj-permit-coord-doi-usda-dod-epa-doe-2022-01-06.pdf>.

<sup>36</sup> Memorandum of Understanding between the U.S. Department Of Energy, the U.S. Department of Transportation, the U.S. Environmental Protection Agency, and the U.S. Department Of Housing And Urban Development, <https://www.energy.gov/articles/biden-harris-administration-announces-interagency-commitment-lower-transportation>.

<sup>37</sup> *Id.*

play in implementing that framework. It is common for MOUs to describe the statutory authorities and responsibilities of the participating agencies. For example, prior MOUs dealing with interagency coordination on renewable energy development have listed the statutes pursuant to which each agency reviews renewable energy projects, and described the scope of the agencies' review authority. An MOU on ocean CDR could similarly clarify the roles different federal agencies' play in overseeing projects.

An interagency MOU on ocean CDR should also outline steps that will be taken to improve coordination between federal agencies and reduce duplication and other inefficiencies in project reviews. In this regard, we offer three specific recommendations.

First, as part of the MOU, federal agencies should agree to implement a combined interagency pre-application process. The agencies should publish guidelines on the pre-application process that list the approvals an ocean CDR project proponent may need (based on the activities involved, where they would take place, and their potential impacts) and the agencies responsible for issuing those approvals. The pre-application process should include a system for formalized pre-application meetings, where the applicant can describe the project and agencies can describe authorization informational needs. The agencies should also consider identifying a single person who can serve as the primary point of contact for applicants navigating the pre-application process. This contact could field informal questions and connect applicants with relevant contacts at the agencies to set up meetings.

The agencies could draw lessons from other permitting regimes that incorporate pre-application processes. For instance, the Bureau of Land Management (BLM) sets procedures for pre-application meetings and screenings for solar and wind energy project applications.<sup>38</sup> These meetings are intended to identify potential environmental and siting constraints for the projects.<sup>39</sup> Another example comes from state aquaculture projects, which often require complex permitting approvals from multiple state agencies. To address this complexity, Alaska,<sup>40</sup> California,<sup>41</sup> and Maine<sup>42</sup> encourage aquaculture project applicants to engage in a pre-application process, which includes pre-application meetings with representatives of the state permitting agencies. These meetings help applicants get a sense for informational requirements and timelines, and notify agencies of potential incoming applications.<sup>43</sup>

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<sup>38</sup> Bureau of Land Management, Initial Screening and Prioritization for Solar and Wind Energy Applications and Nominations/Expressions of Interests, IM 2022-027, <https://www.blm.gov/policy/im-2022-027>.

<sup>39</sup> *Id.*

<sup>40</sup> Alaska Aquatic Farm Program, *Joint Agency Application – Part I*, <https://perma.cc/9PXW-XWRX>.

<sup>41</sup> California Department of Fish & Wildlife Office of Aquaculture, *Permit Guide to Aquaculture in California*, <https://perma.cc/H5BP-P5JW>.

<sup>42</sup> Maine Department of Marine Resources, *Standard Aquaculture Lease Process*, <https://perma.cc/H273-DDYL>.

<sup>43</sup> Corey Silverman-Roati, Romany M. Webb & Michael B. Gerrard, *Permitting Seaweed Cultivation for Carbon Sequestration in California: Barriers and Recommendations* (2022), [https://scholarship.law.columbia.edu/faculty\\_scholarship/3523](https://scholarship.law.columbia.edu/faculty_scholarship/3523)

Second, the federal agencies entering into an interagency MOU should develop a standard schedule for project reviews and authorizations. The schedule should identify the steps generally needed to complete decisions on all federal reviews and authorizations with recommended timing for each. The schedule should provide for parallel (rather than sequential) action by multiple federal agencies wherever possible.

Standard schedules would provide more temporal certainty to both applicants and fellow agencies. They would also advance goals similar to those outlined in the Biden-Harris Permitting Action Plan, which aims to “strengthen and accelerate Federal permitting and environmental reviews” for infrastructure and clean energy projects.<sup>44</sup> That plan directs agencies to “create permitting schedules with clear timeline goals” and to make that information available to the public.<sup>45</sup> Providing standard schedules for ocean CDR project reviews and authorizations would advance these same priorities in the context of developing climate solutions, another administration priority, as explained above. Setting standard timelines for review would not impede agency flexibility because agencies could deviate from the timelines where necessary to fulfil their statutory obligations.

Third, each federal agency should identify a primary point of contact for other agencies and for project proponents. The designated contacts at each agency should have regular meetings to (among other things) assess the status of projects under review and jointly develop plans to address any issues, delays, or obstacles to completing the review process in accordance with the agreed schedule (see above). Both while projects are under review and subsequently, agencies should share information and data to the maximum extent possible. This would address a concern among stakeholders that federal agencies in the ocean CDR space often operate in silos and do not coordinate their project reviews and other functions. Designating a point of contact and establishing a regular schedule of meetings would help to formalize coordination. It should be noted that agency resources are limited and proposals like this may require additional funding from Congress. Absent such funding, clear directives from the White House through executive actions could be helpful to ensure that agencies prioritize coordination work, and allocate existing resources to it.

- 2. Funding agencies should consult with permitting agencies on ocean CDR funding decisions. Permitting agencies should provide guidance to funding agencies on whether projects they propose to fund are likely to meet permitting requirements.** During 2022 and 2023, federal agencies announced significant funding for ocean CDR research. In November 2022, NOAA’s National Oceanographic Partnership Program (NOPP) announced a call for proposals focused on understanding ocean CDR, co-benefits

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<sup>44</sup> The White House, The Biden-Harris Permitting Action Plan to Rebuild America’s Infrastructure, Accelerate the Clean Energy Transition, Revitalize Communities, and Create Jobs, <https://www.whitehouse.gov/briefing-room/statements-releases/2022/05/11/fact-sheet-biden-harris-administration-releases-permitting-action-plan-to-accelerate-and-deliver-infrastructure-projects-on-time-on-task-and-on-budget/>.

<sup>45</sup> *Id.*

and risks, and the science needed to build regulatory frameworks.<sup>46</sup> Then, in September 2023, NOAA’s NOPP announced \$24.3 million in funding to advance these research goals in 17 individual projects.<sup>47</sup> The Department of Energy (DOE) has similarly invested millions in ocean CDR research.<sup>48</sup> In October 2023, DOE announced it would provide \$36 million for 11 projects aimed at improving measurement, reporting, and validation of ocean CDR approaches.<sup>49</sup>

This sort of federal funding is important to enable research to advance scientific understanding of ocean CDR approaches. However, where that research is to occur in the field, the project will still need to comply with all applicable permitting and other requirements. It is critical, therefore, that permitting agencies are engaged in funding agency processes early on and throughout funding agency decisions and oversight. This can ensure that the projects are able to secure necessary permits within the time-limited parameters of the funding, and that funding agencies do not support projects that are unlikely to receive permits. Developing stronger ties between permitting and funding agencies can also help build coordination infrastructure for future funding agency decisions, in that agencies will develop better communication, identify helpful contacts, and develop better expectations around how other agencies work on ocean CDR project decisions. The more the agencies are coordinating early on, the more likely the funding agencies will avoid unnecessary delays in their sponsored projects.

## **B. Recommended Actions to Improve Environmental Review and Stakeholder Engagement**

- 1. Federal agencies should explore options for streamlining environmental review of ocean CDR projects, including through the use of categorical exclusions for projects that pose minimal environmental risks.** Under the National Environmental Policy Act (NEPA), federal agencies must prepare an environmental impact statement (EIS) for any “major federal action[] significantly affecting the quality of the human environment.”<sup>50</sup> Preparation of an EIS is important to inform agency decision-makers and the broader public about the environmental risks posed by a proposed action and possible options for preventing, mitigating, and managing those risks. However, the process of preparing an EIS is often highly complex, can take several years and cost millions of dollars, and lead to litigation that can add further complexity, time, and cost. Given the urgency of

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<sup>46</sup> NOAA Ocean Acidification Program, Announcing Funding Opportunity in Marine Carbon Dioxide Removal (Mcdr)- Opportunity Closed, (2022), <https://oceanacidification.noaa.gov/announcing-funding-opportunity-in-marine-carbon-dioxide-removal-mcdr/>.

<sup>47</sup> NOAA Ocean Acidification Program, Announcing \$24.3M Investment Advancing Marine Carbon Dioxide Removal Research, (2023), <https://oceanacidification.noaa.gov/fy23-nopp-mcdr-awards/>.

<sup>48</sup> ARPA-E, U.S. Department of Energy Announces \$45 Million to Validate Marine Carbon Dioxide Removal Techniques, (2023), <https://arpa-e.energy.gov/news-and-media/press-releases/us-department-energy-announces-45-million-validate-marine-carbon>.

<sup>49</sup> Department of Energy, DOE Announces \$36 Million To Advance Marine Carbon Dioxide Removal Techniques and Slash Harmful Greenhouse Gas Pollution, (2023), <https://www.energy.gov/articles/doe-announces-36-million-advance-marine-carbon-dioxide-removal-techniques-and-slash>.

<sup>50</sup> 42 U.S.C. § 4332(2)(C).

addressing the climate crisis, it is important that agencies look at ways to simplify and streamline environmental review of climate-beneficial projects, while still fully complying with their obligations under NEPA. They have several options to do just that.

As noted above, NEPA only applies to “federal actions,” which “projects and programs entirely or partly financed, assisted, conducted, regulated, or approved by Federal agencies” (subject to limited exceptions).<sup>51</sup> This would encompass ocean CDR projects that are undertaken directly by federal agencies or by private parties with funding from, or the approval of, a federal agency. Thus, for example, an ocean CDR project that requires a federal permit may be considered a “federal action” under NEPA.<sup>52</sup> Notably however, as a result of amendments made to NEPA in the 2023 Fiscal Responsibility Act, actions “with effects located entirely outside the jurisdiction of the United States” do not qualify as “federal actions” for the purposes of NEPA.<sup>53</sup> As such, in determining whether NEPA applies to a particular ocean CDR project, it is necessary to consider where the project’s effects will be felt. Projects that take place in, and only affect, areas outside U.S. jurisdiction (e.g., the high seas) will not be subject to NEPA.

Where NEPA does apply, the agency undertaking, funding, or authorizing an ocean CDR project will need to prepare an EIS if it determines that the project will “significantly affect[] the quality of the human environment.” This must be assessed on a case-by-case basis, taking into account “the potentially affected environment and degree of the effects of the” project.<sup>54</sup> If project effects are unknown or uncertain, the agency may need to complete an environmental assessment (EA) to determine whether an EIS is required.<sup>55</sup> EAs must include a brief discussion of the proposed project, possible alternatives, and their respective environmental impacts. If the agency concludes, based on the EA, that no EIS is required, it may issue a finding of no significant impact (FONSI). However, if the EA shows that a project may have significant impacts, a full EIS must be prepared. This can be a highly complex, time consuming, and costly process.

Many ocean CDR projects will require an EA and, in some cases, that EA may show that a full EIS is required. However, for certain small-scale research and other projects, it may be clear from the outset that there will be no or only very minor environmental impacts. Where that is the case, agencies should consider issuing categorical exclusions (CEs) for the projects.

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<sup>51</sup> 40 CFR § 1508.1(q).

<sup>52</sup> It should be noted that some federally-permitted ocean CDR projects may not be subject to NEPA. For example, NEPA will generally not apply to ocean CDR projects that only require a permit from EPA under the MPRSA, and do not have any other federal connection (e.g., do not receive federal funding or other support). The courts have held that EPA is not required to prepare an EIS when permitting projects under the MPRSA because that Act includes requirements for assessment of the environmental impacts of the permitted activity that are equivalent to the requirements imposed by NEPA. *See Maryland v. Train*, 415 F.Supp. 116.

<sup>53</sup> 42 U.S.C. § 4336e(10)(B).

<sup>54</sup> 40 CFR § 1501.3(b).

<sup>55</sup> 42 U.S.C. § 4336; 40 CFR § 1501.5.

CEs may be issued for categories of actions that agencies determine, in advance, do not normally have significant environmental effects.<sup>56</sup> Agencies typically do not need to prepare an EA or EIS for actions covered by a CE and can, instead, make a determination that further environmental review is unnecessary. However, if extraordinary circumstances exist that suggest an action normally covered by a CE could have significant impacts, the agency must undertake further review to determine if an EIS is required.<sup>57</sup> In this way, CEs can help to streamline the environmental review process for low-risk activities while still maintaining flexibility for agencies to undertake a full review where necessary to comply with NEPA.

The use of CEs has been endorsed by the Council on Environmental Quality (CEQ)—the federal entity charged with overseeing implementation of NEPA—which recently described CEs as “an important mechanism to promote efficiency in the NEPA process.”<sup>58</sup> CEQ has suggested that, where a class of activity is typically overseen by multiple federal agencies, those agencies “may find value in establishing a CE jointly.”<sup>59</sup> According to CEQ, joint development of CEs “may save administrative time,” and increase “efficiency in project implementation.”<sup>60</sup> The various agencies involved in overseeing ocean CDR activities should, thus, jointly consider whether and when CEs may be appropriate therefor. Agencies should, in particular, consider whether there are categories of ocean CDR research that pose minimal environmental risks and thus may be eligible for a CE.

- 2. Federal agencies should, where appropriate, conduct programmatic environmental reviews for ocean CDR activities.** CEQ has encouraged federal agencies to take a programmatic approach to environmental review where possible.<sup>61</sup> According to CEQ, the programmatic approach reflects “best practice” for assessing the environmental impacts of “broad actions, such as programs, policies, rulemakings, series of projects, and larger or multi-phase projects.”<sup>62</sup> Federal agencies are encouraged to issue programmatic EAs and EISs, which assess the environmental impacts of a class of activities or multiple, related projects in a single document. Once a programmatic EA / EIS has been developed, subsequent project-specific reviews can tier to, or incorporate analysis from, the programmatic document.<sup>63</sup> As CEQ has noted, this “avoids repetitive . . . analyses in

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<sup>56</sup> 40 CFR § 1501.4(a).

<sup>57</sup> *Id.* § 1501.4(b).

<sup>58</sup> National Environmental Policy Act Implementing Regulations Revisions Phase 2, 88 Fed. Reg. 49924, 49937 (July 31, 2023).

<sup>59</sup> *Id.*

<sup>60</sup> *Id.*

<sup>61</sup> 40 CFR § 1502.4(b); Memorandum for Heads for Federal Departments and Agencies from Michael Boots, Council on Environmental Quality, on Effective Use of Programmatic NEPA Reviews (Dec. 18, 2014) [hereinafter “Boots Memo”].

<sup>62</sup> National Environmental Policy Act Implementing Regulations Revisions Phase 2, 88 Fed. Reg. 49924, 49943 (July 31, 2023).

<sup>63</sup> 40 CFR § 1501.11. The Fiscal Responsibility Act of 2023 inserted a new section 108 into NEPA, declaring that agencies may use the analysis in a programmatic EA / EIS in subsequent environmental documents “[w]ithin 5 years and without additional review of the analysis in the programmatic environmental document, unless there are substantial new circumstances or information about the significance of adverse effects that bear on the analysis.” The new section 108 further provides that the

subsequent tiered NEPA reviews,” and allows agencies to “narrow the consideration of alternatives and impact[s].”<sup>64</sup> The programmatic approach can, therefore, “provide a better defined and more expeditious path toward decisions on proposed action.”<sup>65</sup>

Federal agencies should consider using programmatic approaches to streamline the environmental review process for ocean CDR activities. In doing so, agencies can learn from prior experience with the use of programmatic reviews for other climate-beneficial activities, such as renewable energy development. During the Obama Administration, the Department of the Interior’s Bureau of Land Management (BLM) sought to expedite renewable energy development on federal lands by, among other things, streamlining the environmental review process. BLM prepared a programmatic EIS that examined the impacts of solar energy development on federal lands in six southwestern states.<sup>66</sup> BLM relied on that programmatic EIS when deciding whether to approve individual solar projects on land in the covered states. As a result, individual projects did not require their own EISs, and could be approved more quickly than would have otherwise been possible.<sup>67</sup>

- 3. Federal agencies should require those seeking federal funding for, or federal approval of, ocean CDR projects to develop and implement robust public engagement programs.** Ocean CDR activities could have impacts—both positive and negative—on a wide range of stakeholders. For example, where ocean CDR activities require the construction of new coastal facilities, local communities in the vicinity of those facilities might experience both benefits (e.g., job creation) and harms (e.g., environmental disturbance) as a result. Ocean CDR activities could also affect communities’ access to coastal and marine resources and interact with other ocean uses (e.g., fishing, shipping, energy development, recreation, etc.) in various positive and negative ways. The impacts may be felt especially keenly by Native American Tribes and other indigenous communities, which have spiritual and cultural connections to the ocean and have long relied on it for substance.

The 2022 NASEM report on ocean CDR concluded:

[I]t is critical that research and development activities incorporate equity, diversity, and inclusion with a particular focus on coastal communities, especially Indigenous communities . . .

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analysis in the programmatic EA / EIS may be relied upon “[a]fter 5 years, so long as the agency reevaluates the analysis in the programmatic environmental document and any underlying assumptions to ensure reliance on the analysis remains valid.” *See* 42 U.S.C. § 4336b.

<sup>64</sup> Boots Memo, *supra* note 61, at 10-11.

<sup>65</sup> *Id.* at 7.

<sup>66</sup> Bureau of Land Management, Final Programmatic Environmental Impact Statement (PEIS) for Solar Energy Development in Six Southwestern States, FES 12-24 (2012), <https://solareis.anl.gov/documents/fpeis/>.

<sup>67</sup> For a more detailed discussion of BLM’s approach, *see* Michael B. Gerrard, Legal Pathways for a Massive Increase in Utility-Scale Renewable Generation Capacity, 47 Environmental Law Reporter 10591, 10594-10597 (2017).



Having communities participate from the outset and guide research can increase the likelihood of ocean CDR implementations that are compatible with environmental justice, and avoid ocean CDR implementations that would exacerbate environmental injustice. Engagement with stakeholders from local government, business, NGOs, and other stakeholders as identified through stakeholder assessment will also be important.<sup>68</sup>

Robust engagement can improve projects by, among other things, ensuring they are designed with local environmental conditions and local community needs in mind. Community concerns and other problems can be addressed early on, thus lessening or avoiding local opposition, which has proved to be a major barrier to advancing other climate-beneficial projects (e.g., renewable energy development).<sup>69</sup> Despite these benefits, however, some ocean CDR researchers and developers may be hesitant to undertake community engagement due to concerns about the time and cost it might add to the project design process.

Federal agencies can and should take steps to ensure robust engagement on all ocean CDR projects. To this end, agencies could require applicants for federal funding or authorization of a project to submit an engagement plan with their application, and make implementation of that plan a condition of the funding or authorization. There are precedents for this. For example, DOE now requires all applicants for funding under programs established by the 2021 Infrastructure Investment and Jobs Act and the 2022 Inflation Reduction Act to submit a community benefits plan, including details of any community engagement that has been undertaken or is planned (among other things).<sup>70</sup> If DOE approves funding, compliance with the community benefits plan becomes “part of the contractual obligation of the funding recipient.”<sup>71</sup>

- 4. Federal agencies should coordinate with, and provide assistance and resources to, other government bodies involved in reviewing ocean CDR projects.** In addition to federal approvals, some ocean CDR projects may also require permits or other approvals from state, territory, and/or local governments. Coastal states and territories generally have primary jurisdiction over ocean waters and the underlying submerged land within three nautical miles of the coast.<sup>72</sup> Some offshore land, underlying state ocean waters, is

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<sup>68</sup> Doney et al., *supra* note 4, at 65 & 244.

<sup>69</sup> See generally, Matthew Eisenson, *Opposition to Renewable Energy Facilities in the United States*, Sabin Center for Climate Change Law 2-3 (May 2023 ed.), [https://scholarship.law.columbia.edu/sabin\\_climate\\_change/200/](https://scholarship.law.columbia.edu/sabin_climate_change/200/); Matthew Eisenson & Romany M. Webb, *Expert Insights on Best Practices for Community Benefits Agreements 2-4* (2023), [https://scholarship.law.columbia.edu/sabin\\_climate\\_change/206/](https://scholarship.law.columbia.edu/sabin_climate_change/206/).

<sup>70</sup> Department of Energy, *About Community Benefits Plans*, Clean Energy Infrastructure, <https://www.energy.gov/infrastructure/about-community-benefits-plans>.

<sup>71</sup> *Id.*

<sup>72</sup> State / territorial jurisdiction extends more than 3 nautical miles from the coast in some areas. For example, in parts of the Gulf of Mexico, the jurisdiction of Texas and Florida extends 9 nautical miles from the coast. Puerto Rico’s jurisdiction also extends 9 nautical miles from the coast. *See* 43 U.S.C. §§

under municipal ownership. As a result, states, territories, and sometimes municipalities may need to approve near-shore ocean CDR projects. Additionally, where those projects require onshore activities (e.g., the construction of new infrastructure), those activities may also fall under state, territory, and/or municipal control. Some states, territories, and municipalities have their own environmental review laws similar to NEPA.<sup>73</sup> Where these “little NEPAs” exist, the state, territorial, or municipal government may need to evaluate the environmental impacts of ocean CDR projects and undertake public consultation thereon, before issuing any permits or approvals. Additionally, where ocean CDR projects implicate Native American tribal rights, additional consultation and other requirements might also apply.<sup>74</sup>

Federal agencies reviewing ocean CDR projects should coordinate closely with any reviews occurring at the tribal, state, territory, and/or local levels. This is important to avoid duplication of effort across different levels of government, and would help to streamline the review process, making it easier, quicker, and cheaper for applicants to navigate.

Environmental review is one area where coordination between agencies at different levels of government would be particularly beneficial. As noted above, the environmental review process can be highly complex and time consuming, particularly where multiple government bodies are involved. There are examples, from outside the ocean CDR space, of poorly coordinated reviews that have delayed projects or created other issues. For example, large infrastructure project approvals often proceed in a linear fashion, with one federal agency completing its permitting responsibilities before handing it off to the next agency, leading to long delays and added costs.<sup>75</sup> To avoid this outcome, where an ocean CDR project is subject to environmental review requirements at multiple levels of government, the reviews should be conducted jointly or otherwise coordinated to the maximum extent possible. This is consistent with the direction in the NEPA implementing regulations that federal agencies “shall cooperate with State, Tribal, and local agencies to reduce duplication between NEPA and State, Tribal, or local requirements,” including by conducting “[j]oint planning processes,” “[j]oint environmental research and studies,” and “[j]oint public hearings,” and preparing joint environmental assessments and EISs.<sup>76</sup> The NEPA implementing regulations further provide: “Where State or Tribal laws, or local ordinances have [EIS] or similar requirements in addition to but not in conflict with those in NEPA, federal agencies may cooperate in fulfilling these requirements, as well as those of Federal laws, so that one document will comply with all laws.”<sup>77</sup>

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1301 & 1312; 48 U.S.C. §§ 749 & 1705; U.S. v. Louisiana, 100 S. Ct. 1618 (1980), 420 U.S. 529 (1975), 394 U.S. 11 (1969), 389 U.S. 155 (1967), 363 U.S. 1 (1960), 339 U.S. 699 (1950).

<sup>73</sup> NEPA.gov, *States and Local Jurisdictions with NEPA-like Environmental Planning Requirements*, <https://ceq.doe.gov/laws-regulations/states.html>.

<sup>74</sup> See generally, Romany M. Webb et al., *United States*, in *Ocean Carbon Dioxide Removal for Climate Mitigation: The Legal Framework* 278, 301-203 (Romany M. Webb et al. eds., 2023).

<sup>75</sup> David J. Hayes, *Leaning on NEPA to Improve the Federal Permitting Process*, 45 ENVTL. L. REP. News & Analysis 10018 (2015).

<sup>76</sup> 40 CFR § 1506.2(b)-(c).

<sup>77</sup> *Id.* § 1506.2(c).

Reviewing bodies at all levels of government should also share information and resources to the maximum extent possible. Where appropriate, federal agencies should make use of studies and analysis developed by tribal, state, territorial, and local agencies rather than duplicating the work themselves.<sup>78</sup> Federal agencies should similarly ensure that tribal, state, territorial, and local bodies have access to reports and other information they prepare. Additionally, where those bodies lack relevant expertise or resources, federal agencies should offer to provide technical and/or other assistance as appropriate.

### C. Agency Specific Recommendations

#### *Environmental Protection Agency*

- 1. EPA should clarify when the Marine Protection, Research, and Sanctuaries Act (MPRSA) will apply to ocean CDR activities.** The MPRSA authorizes EPA to "regulate the dumping of all types of materials into ocean waters."<sup>79</sup> There is currently significant uncertainty as to whether and when different ocean CDR activities will qualify as "dumping" for the purposes of the MPRSA. The term "dumping" is defined in the MPRSA to mean "a disposition of material."<sup>80</sup> In ordinary parlance, "disposition" means "the act or power of disposing" of something,<sup>81</sup> which suggests that the MPRSA is intended to apply when materials are added to the ocean for the purpose of getting rid of them. Further supporting this interpretation is the fact that the MPRSA is intended to implement the U.S.'s obligations under the 1972 Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (London Convention) which defines "dumping" to mean "the *disposal* at sea of wastes or other matter" (emphasis added).<sup>82</sup> It could be argued that, in ocean CDR projects, any introduction of materials into the ocean is not done for the purpose of disposing of the materials but rather to stimulate carbon removal.

Further adding to the complexity, the statutory definition of "dumping" in the MPRSA expressly excludes the "construction of any fixed structure or artificial island [ ]or the intentional placement of any device in ocean waters or on or in the submerged land beneath such waters, for a purpose other than disposal, when such construction or such placement is otherwise regulated by Federal or State law or occurs pursuant to an authorized Federal or State program."<sup>83</sup> Whether and when ocean CDR activities might fall within this exclusion is, again, uncertain. For example, the exclusion might capture the installation of pipes in the ocean in connection with artificial upwelling / downwelling if those pipes qualify as a "device," but that is uncertain as the MPRSA does not define

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<sup>78</sup> This is, again, encouraged by the NEPA implementing regulations which state that federal agencies should "use... studies, analysis, and decisions developed by State, Tribal, or local agencies" to the fullest extent practicable. See *id.* § 1506.2(c).

<sup>79</sup> 33 U.S.C. § 1401(b).

<sup>80</sup> *Id.* § 1402(f).

<sup>81</sup> Merriam-Webster Dictionary, *Disposition*, <https://www.merriam-webster.com/dictionary/disposition>.

<sup>82</sup> Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, Art. III(1)(a).

<sup>83</sup> 33 U.S.C. § 1402(f).

that term.

EPA has, to date, provided little guidance on the application of the MPRSA to ocean CDR activities. EPA did recently update the “ocean dumping” section of its website to include the following statement: “An MPRSA permit may be needed for field research, large-scale field trials, and field deployment of CDR . . . activities if the activities involve the disposition of material into the ocean environment.”<sup>84</sup> The website does not, however, provide any further detail on when EPA will consider an ocean CDR activity to involve a “disposition of material” or address the issues raised above. EPA has not issued any formal guidance or other documents addressing the application of the MPRSA to ocean CDR. EPA regulations, adopted to implement the MPRSA, are similarly silent on the matter.

The most detailed information regarding application of the MPRSA to ocean CDR is found in a report published by the International Maritime Organization (IMO), summarizing discussions at a meeting of the scientific group established under the London Convention in March 2023.<sup>85</sup> According to the report, at the meeting, “the delegation of the United States informed” attendees that “[t]he United States considered the disposition of material in the ocean to be “dumping” subject to [the MPRSA] if the project sponsor did not intend, anticipate, or prepare to recover the material from the ocean as part of the project.”<sup>86</sup> The IMO report does not specify who made this statement or provide any other detail. As such, it is unclear whether the statement reflects official EPA policy and, if it does, how that policy will be implemented in practice. For example, what will ocean CDR project developers need to show to satisfy EPA that they intend to remove materials from the ocean? Within what timeframe must the materials be removed? What, if any, recourse will EPA have if a project developer says it intends to remove materials but in fact does not? How will EPA deal with situations in which materials are accidentally lost before they can be removed?

In order to provide more certainty for project developers, EPA should clarify when and how it will regulate ocean CDR activities under the MRPSA. To this end, EPA should issue an official guidance document on the regulation of ocean CDR activities and update the MPRSA implementing regulations, where necessary and appropriate.

- 2. EPA should clarify when MPRSA research permits may be issued for ocean CDR activities.** Under the MPRSA, an EPA permit is required to dump materials into ocean waters within 12 nautical miles of the United States coast and outside that area, if the materials are transported from the United States or using a vessel or aircraft registered in the United States.<sup>87</sup> The MPRSA authorizes EPA to “establish and issue various categories

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<sup>84</sup> Environmental Protection Agency, Ocean Dumping Permits, Ocean Dumping, <https://www.epa.gov/ocean-dumping/ocean-dumping-permits>.

<sup>85</sup> Report of the Forty-Sixth Meeting of the Scientific Group Under the London Convention and the Seventeenth Meeting of the Scientific Group Under the London Convention, IMO Doc. LC/SG 46/16 (March 31, 2023).

<sup>86</sup> *Id.* at 12.

<sup>87</sup> 33 U.S.C. § 1411.

of permits.”<sup>88</sup> Regulations issued by EPA under the MPRSA identify four permit categories – (1) general, (2) special, (3) emergency, and (4) research – and outline the criteria for issuance of each category of permit.<sup>89</sup>

EPA has indicated that ocean CDR projects may be permitted under “research, special, or general permits.”<sup>90</sup> It recommends that anyone proposing to undertake an ocean CDR project “contact the . . . Ocean Dumping Program at EPA Headquarters to discuss . . . what type of MPRSA permit . . . would be most appropriate” for the project.<sup>91</sup> This makes sense as EPA will need to consider the specifics of each project to determine the appropriate category of permit. Project proponents would, however, benefit from greater clarity regarding how EPA will make its determination.

Many of the stakeholders interviewed for this project were especially confused about whether and when ocean CDR projects might qualify for research permits. EPA regulations indicate that “[r]esearch permits may be issued for the dumping of materials . . . into the ocean as part of a research project” if certain criteria are met.<sup>92</sup> The term “research project” is not defined in the regulations and EPA has not provided any guidance on the factors it will consider in determining whether a particular activity involves research. This has prompted a range of questions including: What counts as research? Are there restrictions on who can undertake research projects (e.g., only academic or government scientists)? Could an activity undertaken by a commercial entity qualify as a research project? How will a project that has both research and commercial elements be treated? For instance, if a project is designed to answer scientific questions about the impacts of ocean CDR, but is funded through the sale of carbon credits, would it still be treated as a research project?

In addition to the confusion regarding what constitutes a “research project,” there is also significant uncertainty about how EPA will determine whether to issue a research permit for such a project. EPA regulations state that research permits may be issued “when it is determined that the scientific merit of the proposed [research] project outweighs the potential environmental or other damage that may result from the dumping.”<sup>93</sup> This standard may be particularly difficult to apply to ocean CDR research projects that are intended to deliver global benefits but could result in localized harms.

EPA should provide additional guidance on when research permits may be available for ocean CDR activities. In particular, EPA should clarify the factors it will consider in determining whether an ocean CDR activity qualifies as a research project, how it will evaluate the scientific merit of any such project, and how it will weigh the potential for global benefits against possible local harms.

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<sup>88</sup> *Id.* § 1412(b)

<sup>89</sup> 40 CFR § 220.3.

<sup>90</sup> Environmental Protection Agency, Ocean Dumping Permits, Ocean Dumping, <https://www.epa.gov/ocean-dumping/ocean-dumping-permits>.

<sup>91</sup> *Id.*

<sup>92</sup> 40 CFR § 220.3(e).

<sup>93</sup> 40 CFR § 220.3(e).



- 3. EPA should define its timeline for processing MPRSA permit applications and establish an application tracking system.** Some statutory permitting regimes specify a deadline by which the permitting agency must make a decision on applications (e.g., within 90 days of receiving a complete application).<sup>94</sup> No such deadline is specified in the MPRSA and EPA has not provided any indication of its timeline for reviewing permit applications.<sup>95</sup> This can make it difficult for applicants to plan projects. For example, those undertaking early-stage ocean CDR research projects may want to use shared research vessels, which need to be reserved many months or years in advance. Uncertainty regarding EPA timelines for review of permit applications may make it impossible for researchers to make advance reservations. However, waiting until EPA issues a permit may not be feasible either since research permits are only valid for 18 months, and it may take longer than that for a shared research vessel to become available.

EPA should publish an indicative timeline for reviewing MPRSA permit applications for ocean CDR research projects. EPA can do this notwithstanding the lack of a statutory deadline in the MPRSA and while still maintaining the flexibility it needs to ensure a thorough review of all projects. There are examples from other permitting programs it can draw from. For instance, in the context of permitting Class VI (carbon sequestration) wells under the Safe Drinking Water Act, EPA has indicated that it “aims to review complete Class VI applications and issue permits when appropriate within 24 months. This timeframe is dependent on several factors, including the complexity of the project and the quality and completeness of the submitted application.”<sup>96</sup> EPA has also provided a useful breakdown of the different stages of the 24 month review and how long each is expected to take: (1) “Completeness Review (est. 30 days),” (2) “Technical Review (est. 18 months),” (3) “Prepare Draft Permit (est. 60 days),” (4) “Public Comment Period (est. 30-45 days), and (5) “Prepare Final Permit Decision (est. 90 days).” EPA should publish a similar timeline for its review of MPRSA permit applications. Doing so would provide helpful guidance to permit applicants, while still maintaining flexibility for EPA.

EPA should also take steps to enhance the transparency of its review process to enable applicants to better plan for any potential delays in the issuance of their permit. This could be achieved by, for example, establishing a permit tracking system that applicants can use to determine where in the review process their application currently sits and what further steps are needed before a permit can be issued.

- 4. EPA should create a database of MPRSA permits for ocean CDR projects.** To further

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<sup>94</sup> See e.g., 42 U.S.C. § 4370m-7.

<sup>95</sup> We note that EPA’s 2018-2022 Strategic Plan set a goal for the agency to “reach all permitting-related decisions within six months” by September 30, 2022. The 2022-2026 Strategic Plan was, however, silent on permitting timeframes. See Environmental Protection Agency, Working Together: FY 2018-2022 U.S. EPA Strategic Plan 46 (2018), <https://www.epa.gov/sites/production/files/2018-02/documents/fy-2018-2022-epa-strategic-plan.pdf>; Environmental Protection Agency, FY 2022-2026 EPA Strategic Plan (2022), <https://www.epa.gov/system/files/documents/2022-03/fy-2022-2026-epa-strategic-plan.pdf>.

<sup>96</sup> Environmental Protection Agency, *Current Class VI Projects under Review at EPA*, Underground Injection Control (UIC), <https://www.epa.gov/uic/current-class-vi-projects-under-review-epa>.

increase transparency, EPA should establish a publicly-accessible, searchable database of MPRSA permit records for ocean CDR projects. The database should include information about permit applications (e.g., date of application, name of applicant, and ocean CDR activity to be permitted) and issued permits (e.g., date of issuance and details of the permitted activity). Information collected by EPA from permittees (e.g., reports on permitted activities) should also be made publicly available in the database where possible.

There are a number of examples EPA could draw from in developing the database. For instance, EPA already has an online “permit search” tool that allows users to access records relating to certain categories of general permits issued under the National Pollutant Discharge Elimination System established in the Clean Water Act.<sup>97</sup> The tool can, for example, be used to generate a list of all aquaculture operations covered by general permits and access information submitted to EPA by the operators. A similar tool could be created for MPRSA permit records relating to ocean CDR projects. Over time, as the number of records in the database grows, this would help to shed light on how the MPRSA is being used to regulate ocean CDR activities. The information would be useful to individuals and entities looking to develop ocean CDR projects – e.g., to assess whether and how the MPRSA might apply – as well as other stakeholders. It might, for example, be used by coastal communities to identify and track nearby projects. It could also enable community and other groups to evaluate the adequacy of existing regulatory frameworks for ocean CDR and the need for additional controls to mitigate environmental or other risks.

### *Department of the Interior, Bureau of Ocean Energy Management*

- 5. BOEM should clarify when ocean CDR projects on the outer continental shelf require a lease or right-of-way under the Outer Continental Shelf Lands Act (OCSLA).** Under international law, coastal countries (i.e., those bordering the ocean) typically have jurisdiction over ocean areas within 200 nautical miles of their coasts. In the United States, authority over the 200 nautical mile zone is shared among the different levels of government. Coastal states and territories have primarily authority over the water and submerged lands in most near-shore areas, typically within three nautical miles of shore, while the federal government controls areas further offshore. The submerged lands under federal control – typically extending 3 to 200 nautical miles from shore – are known as the outer continental shelf. In the OCSLA, Congress declared that “the subsoil and seabed of the outer continental shelf appertain to the United States and are subject to its jurisdiction, control, and power of disposition.”<sup>98</sup> Consistent with this declaration, the courts have held that the U.S. federal government has “paramount rights” to the outer continental shelf and, as such, use of it by others must be federally authorized.<sup>99</sup>

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<sup>97</sup> Environmental Protection Agency, *Permit Search*, Resources, <https://permitsearch.epa.gov/epermit-search/ui/search>.

<sup>98</sup> 43 U.S.C. § 1332(1).

<sup>99</sup> *U.S. v. California*, 332 U.S. 19 (1947). *See also* Adam Vann, *Wind Energy: Offshore Permitting 3* (2012), <https://perma.cc/36W3-3E66>.

Under the OCSLA, BOEM may issue leases and rights-of-way authorizing specific uses of the outer continental shelf (e.g., for oil and gas exploration and renewable energy development).<sup>100</sup> The Army Corps of Engineers (ACE) can also issue permits authorizing the installation of structures on the outer continental shelf under the RHA (as amended by the OCSLA).<sup>101</sup> There is currently some uncertainty regarding the interaction of these two statutory frameworks and how they might apply to ocean CDR projects.<sup>102</sup> In particular, it is unclear whether an ocean CDR project that makes use of the outer continental shelf (e.g., to moor equipment) would require both a lease / right-of-way from BOEM and a permit from ACE, or only one of the two.

In *Alliance to Protect Nantucket Sound, Inc. v. U.S. Department of the Army*, the First Circuit Court of Appeals held that only an ACE-issued permit (and no BOEM-issued lease / right-of-way) was required to temporarily install a data tower on the outer continental shelf.<sup>103</sup> The data tower was to be installed for five years as part of a research project aimed at assessing offshore wind energy potential. The court held that “erect[ing] a single, temporary scientific device . . . which gives the federal government information it requires” to assess the feasibility of offshore wind energy development would not “be an infringement on any federal property ownership interest” in the outer continental shelf.<sup>104</sup> The court thus held that the tower could be authorized through an ACE-issued permit and did not require additional authorization from BOEM.<sup>105</sup>

Applying the above reasoning to ocean CDR, it could be argued that the installation of facilities on the outer continental shelf in connection with an ocean CDR research project does not require a BOEM-issued lease / right-of-way, provided the facilities are relatively small and will only remain in place temporarily.<sup>106</sup> BOEM has not, however, taken an official position on this. To provide additional certainty to researchers, BOEM should clarify whether and when a lease / right-of-way will be required for ocean CDR research projects. If, consistent with the court’s decision in *Alliance to Protect Nantucket Sound*, BOEM determines that a lease / right-of-way is not required for projects involving only small and temporary installations on the outer continental shelf, it should provide guidance on when it will consider an installation to be “small” and “temporary.”

6. **BOEM should confirm that it has authority to issue leases for ocean CDR projects that are integrated with renewable energy facilities.** BOEM’s authority to issue leases / rights-of-way over the outer continental shelf is somewhat limited. Under the OCSLA, BOEM can only issue leases / rights-of-way for certain activities that involve mineral or energy development, or sub-seabed carbon storage. Activities relating to ocean CDR are not expressly mentioned in the OCSLA. There is, however, a good argument that BOEM has authority to issue leases / rights of way for ocean CDR installations that are integrated

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<sup>100</sup> 43 U.S.C. § 1337.

<sup>101</sup> 33 U.S.C. § 403; 43 U.S.C. 1333.

<sup>102</sup> See generally, Webb et al., *supra* note 74.

<sup>103</sup> *Alliance to Protect Nantucket Sound, Inc. v. US Dept. of the Army* [2005] 398 F.3d 105.

<sup>104</sup> *Id.* at 114.

<sup>105</sup> *Id.*

<sup>106</sup> Webb et al., *supra* note 74, at 297.



with renewable energy facilities. BOEM should confirm this and clarify the limits to its authority.

Under the OCSLA, BOEM has authority to issue leases / rights-of-way over the outer continental shelf for activities that “produce or support production, transportation, or transmission of energy from sources other than oil and gas.”<sup>107</sup> Relying on that authority, BOEM has issued leases for renewable energy facilities (e.g., offshore wind turbines) on the outer continental shelf.<sup>108</sup> BOEM regulations state that facilities installed on the outer continental shelf under renewable energy leases must be used for either (1) “commercial activities . . . associated with the generation, storage, or transmission of electricity or other energy product . . . intended for distribution, sale, or other commercial use,” or (2) other activities “that support, result from, or relate to the production of energy from a renewable energy source.”<sup>109</sup> Category (2) is very broad and would appear to allow for the installation of ocean CDR equipment that is powered by offshore renewable energy facilities. In this regard, one recent study concluded:

[I]n artificial upwelling projects, pipes and pumps may be deployed with, and powered by, [offshore] wind turbines or solar panels. Where this occurs, it could be argued that the pipes and pumps are “relate[d] to the production of energy from a renewable” source (i.e., because they use energy produced by the wind turbines or solar panels).<sup>110</sup>

To provide additional certainty to CDR project proponents, BOEM should issue guidance, clarifying the ocean CDR facilities that may be installed on the outer continental shelf pursuant to a renewable energy lease.

### *Army Corps of Engineers*

- 7. ACE should consider issuing general permits for ocean CDR activities that present minimal environmental risks.** Under the RHA, a permit from ACE is required to install structures in, excavate, fill, or otherwise alter navigable waters of the United States.<sup>111</sup> For the purposes of the RHA, navigable waters of the U.S. include ocean waters, extending up to three nautical miles from shore.<sup>112</sup> While ocean areas further offshore do not qualify as “navigable waters” under the RHA, in the OCSLA, Congress extended ACE’s authority “to prevent obstruction of navigation” to “artificial islands, installations, and other devices” attached to seabed the outer continental shelf.<sup>113</sup> An ACE-issued permit will, therefore, be required for any ocean CDR project involving the installation of fixed

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<sup>107</sup> 43 U.S.C. § 1337(p)(1)(C).

<sup>108</sup> 30 CFR §§ 585.104 & 585.112.

<sup>109</sup> *Id.* § 585.200.

<sup>110</sup> Webb et al., *supra* note 74, at 295.

<sup>111</sup> 33 U.S.C § 403.

<sup>112</sup> 33 CFR §§ 322.2 & 329.12(a).

<sup>113</sup> 43 U.S.C. § 1333. *See also* Army Corps of Engineers, Regulatory Guideline Letter 88-08: Regulation of Artificial Islands, Installations, and Structures on the U.S. Outer Continental Shelf (1998), <https://usace.contentdm.oclc.org/utills/getfile/collection/p16021coll9/id/1345>.

structures in ocean areas under U.S. jurisdiction (typically within 200 nautical miles of shore).

ACE issues two classes of permits: (1) general, and (2) individual. General permits are issued for categories of activities that “are substantially similar in nature and only cause minimal individual and cumulative environmental impacts.”<sup>114</sup> Activities covered by general permits do not need to be specifically authorized by ACE. In some cases, the person undertaking the activity may need to notify ACE in advance, but that is not always required.<sup>115</sup> Even where advance notice is required, operating under a general permit is far easier than securing an individual permit from ACE, which involves submission of a detailed permit application, a public notice and comment process, and thorough review by ACE.<sup>116</sup> Indeed, ACE has described general permits as being “designed to regulate with little, if any delay or paperwork certain activities having minimal impacts.”<sup>117</sup>

Certain research activities are already covered by general permits issued by ACE. Specifically, Nationwide General Permit 5 (Scientific Measurement Devices) covers the installation of “devices whose purpose is to measure and record scientific data, such as staff gages, tide and current gages, meteorological stations, water recording and biological observation devices, water quality testing and improvement devices, and similar structures.”<sup>118</sup> This would encompass equipment installed to collect baseline data needed to inform decisions about when and where to pursue ocean CDR. It is, however, unlikely to cover the installation of other equipment used in ocean CDR research. For example, according to one recent study, the installation of pipes and pumps to test the efficacy of artificial upwelling and downwelling is unlikely to be covered by General Permit 5.<sup>119</sup> ACE should consider issuing a new general permit(s) dealing with the installation of this and other equipment in connection with ocean CDR research projects. This would help to simplify and streamline the approvals process for ocean CDR research.

Before issuing a general permit for ocean CDR research, ACE would need to assess the risks posed by different research activities since, as noted above, only activities that have “minimal impacts” can be authorized via a general permit. To inform its assessment, ACE may need to consult with other agencies with greater experience and expertise with respect to ocean CDR, such as NOAA, DOE, and the National Labs. ACE would also need to provide an opportunity for public comment and consider any comments received before adopting any new general permit.<sup>120</sup> A NEPA review and other environmental

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<sup>114</sup> 33 CFR § 322.2(f)(1).

<sup>115</sup> 33 CFR §§ 330.1(e) & 330.6.

<sup>116</sup> *See generally, id.* Pt. 325.

<sup>117</sup> *Id.* § 330.1(b).

<sup>118</sup> Army Corps of Engineers, 2021 Nationwide Permit 6 (2021), <https://usace.contentdm.oclc.org/utis/getfile/collection/p16021coll7/id/20099>.

<sup>119</sup> Romany M. Webb et al., Removing Carbon Dioxide Through Artificial Upwelling and Downwelling: Legal Challenges and Opportunities 36 (2022), [https://scholarship.law.columbia.edu/faculty\\_scholarship/3337/](https://scholarship.law.columbia.edu/faculty_scholarship/3337/).

<sup>120</sup> 33 CFR § 330.5

assessments may also be required.<sup>121</sup>

### *National Oceanic and Atmospheric Administration*

- 8. NOAA should share relevant data with permitting agencies to enable them to evaluate project impacts.** NOAA has a valuable role to play in providing data to permitting agencies, like those described above, to use in evaluating whether to accept or reject permit applications for ocean CDR projects. NOAA is widely considered an authority on data both about climate change and about ocean environments. NOAA hosts a large suite of data products on its website, called U.S. climate normals, that provide information about typical climate conditions for locations around the U.S.<sup>122</sup> Similarly NOAA studies ocean ecosystems to improve understanding and help manage living marine resources.<sup>123</sup>

Although the data NOAA collects is often publicly available, NOAA guidance on how to use the data could help permitting agencies in their decisions. In order to determine whether individual projects will be effective at storing carbon dioxide, permitting agencies will need a good understanding of baseline ocean biology and chemistry in a given marine environment. Similarly, in order to understand ecosystem impacts of ocean CDR projects, permitting agencies will need to understand baseline ecosystem conditions, and how those conditions might be expected to change due to climate change. NOAA should devote resources towards sharing data relevant to these questions with permitting agencies and provide advice to the agencies on how to locate and use the data.

- 9. NOAA should provide technical assistance to permitting agencies for the evaluation of project impacts.** Similar to the recommendation above, NOAA's expertise on ocean and atmospheric dynamics can aid permitting agencies in making their permitting decisions. In addition to sharing data, NOAA could also provide technical assistance, and even directly share employees, to help agencies like EPA and ACE evaluate project impacts. NOAA's expertise in using environmental data towards management of fisheries might be especially instructive. Under the Magnuson-Stevens Fishery Conservation and Management Act, NOAA assesses and predicts the status of fish stocks, sets catch limits, and ensures compliance with fisheries regulations.<sup>124</sup> The expertise required to do this well, by evaluating ecosystem impacts of fishery and other ocean uses, could aid permitting agencies in making decisions about projects with potential impacts on marine ecosystems.

One way to formalize the provision of technical assistance is through a secondment program. Federal employees can work on a temporary basis at other federal agencies

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<sup>121</sup> *Id.*

<sup>122</sup> NOAA National Centers for Environmental Information, U.S. Climate Normals, <https://www.ncei.noaa.gov/products/land-based-station/us-climate-normals>.

<sup>123</sup> NOAA, Ecosystems & Fisheries-Oceanography Coordinated Investigations, <https://www.ecofoci.noaa.gov/>.

<sup>124</sup> NOAA Fisheries, Our Mission, <https://www.fisheries.noaa.gov/about-us>

through an “external detail.”<sup>125</sup> These details may require compliance with existing or new interagency agreements, approval from the sending and receiving agencies, and approval by the General Services Administration.<sup>126</sup> By formalizing a secondment program, NOAA could facilitate smooth processing of external details. This could lead to, for example, NOAA experts working for a number of months at EPA, ACE, or BOEM to train their staff and offer other assistance to the agencies to help with their review and regulation of ocean CDR projects

### *Department of Energy*

**10. DOE should share relevant data and provide technical assistance to permitting agencies on ocean CDR projects.** This recommendation should be read in conjunction with the two recommendations directed at NOAA above, as the general thrust of the recommendation is the same. Similar to NOAA, DOE should be proactive in sharing relevant data and should consider providing technical assistance to permitting agencies, including, for example, through a secondment program. DOE has specific expertise on ocean CDR that would be relevant to permitting agencies, and they should share that expertise with them. Since 2017, DOE’s Advance Programs Research-Energy (ARPA-E) office has been funding research into seaweed cultivation as part of its Macroalgae Research Inspiring Novel Energy Resources (MARINER) program.<sup>127</sup> Data and lessons learned from this project could aid in permitting decisions around seaweed cultivation for ocean CDR. In addition, as mentioned above, DOE has committed \$36 million in funding for 11 projects focused on monitoring, reporting, and verification of ocean CDR.<sup>128</sup> The lessons learned from those projects might answer critical questions permitting agencies have about the viability of ocean CDR approaches and environmental impacts. Further, DOE’s national labs, like the Pacific Northwest National Laboratory, appear likely to conduct early in-ocean experiments.<sup>129</sup> DOE should proactively share information and learnings from those experiments.

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<sup>125</sup> Government Services Administration, TTS Handbook, Details with Other Agencies, <https://handbook.tts.gsa.gov/hiring-staying-or-changing-jobs/external-details/>.

<sup>126</sup> *Id.*

<sup>127</sup> ARPA-E, Macroalgae Research Inspiring Novel Energy Resources, <https://arpa-e.energy.gov/technologies/programs/mariner>.

<sup>128</sup> Department of Energy, DOE Announces \$36 Million to Advance Marine Carbon Dioxide Removal Techniques and Slash Harmful Greenhouse Gas Pollution, (2023), <https://www.energy.gov/articles/doe-announces-36-million-advance-marine-carbon-dioxide-removal-techniques-and-slash>.

<sup>129</sup> *Id.*