Carbon to Sea Initiative

June 13, 2024

RE: Carbon to Sea Statement for the Ocean and Climate Change Dialogue 2024

Dear UNFCCC Ocean and Climate Change Dialogue Co-Facilitators:

We would like to express our gratitude for your leadership in fostering this important ongoing dialogue. We greatly appreciate the opportunity to contribute to this year's discussion of the critical and inextricably related themes of marine biodiversity conservation and technology needs for ocean-based climate action.

The Carbon to Sea Initiative (CTS) is a nonprofit effort whose mission is to systematically assess the conditions under which ocean alkalinity enhancement (OAE) can deliver safe, cost-effective, and permanent carbon dioxide removal (CDR) at scale. We are delivering on our mission by funding research to close knowledge gaps; advancing relevant technology and policy development; and engaging in community-building to support the emergence of a responsible and sustainable ocean-based CDR sector, should that be appropriate.

Clearly, the number one priority in addressing the climate crisis is the decarbonization of the global economy. Reducing emissions of greenhouse gasses is the most cost-effective and sustainable way to address global warming. Nonetheless, as has been recognized by the IPCC, foreseeable efforts to reduce emissions will not be sufficient to achieve Paris Agreement targets. In addition to reducing emissions, removal of carbon dioxide already in the atmosphere and upper hydrosphere will be needed at a gigatonne scale in order to maintain global average temperature rise between 1.5 and 2ºC.

A recent comprehensive analysis by Oxford's Smith School of Enterprise and the Environment predicts that carbon dioxide removal (CDR) in the range of 7-9 gigatonnes per year will be needed by 2050 to achieve sustainable net-zero emissions. This compares with an estimated current level of CDR of 2.1 gigatonnes per year, which is derived almost entirely from nature-based approaches such as ecosystem restoration and improved cropland and forest management. These estimates of the required scale of CDR are, in fact, conservative as the Paris-consistent scenarios examined assume net emission reductions are already underway while latest data show that global greenhouse gas emissions continue to rise.

CDR is currently at a critical juncture. Given the urgency of the climate crisis, rapid progress is needed in three key areas if CDR in general, and for purposes of this forum, ocean-based CDR, are to provide viable climate-mitigation solutions:

- Research, development, and demonstration;
- Measurement, reporting, and verification; and

- Policy and regulation of research and implementation.

To further contribute to discussion at the UNFCCC Ocean and Climate Change Dialogue 2024 and beyond, we describe below the challenges faced by ocean-based CDR in each of these areas along with recent progress.

Research, development and demonstration (RD&D)

Although ocean-based CDR (oCDR) may offer advantages for scalability and cost relative to other technology-based CDR pathways, important questions remain about its environmental impacts, both positive and negative, its effectiveness at stimulating additional CO_2 uptake in marine waters, and the durability of resulting carbon sequestration. A number of CDR technologies, including OAE, have shown promising results in the lab and mesocosms with minimal impact on marine life at moderate alkalinity addition. These approaches are therefore increasingly ready for field trials to see whether in situ results match those of the lab and modeling, and to gain insights about the opportunities for and challenges of scaling. To reduce uncertainty in results, scientists and engineers are also working on improving technologies and models to aid in measuring the effects in situ of the various oCDR technologies on marine geochemistry and ecology.

In 2023, a U.S. federal government interagency research partnership, the National Oceanographic Partnership Program awarded more than $24 million in grants to academic institutions, technology startups, and public/private partnerships for oCDR RD&D. At least 8 of the 17 funded projects involved a field component. Also in 2023, CTS awarded more than $23 million to scientists and engineering teams to ask and answer open questions associated with: efficacy and permanence, environmental safety, economics, utility of byproducts, monitoring, alkalinity delivery, alkalinity generation, and measurement, reporting and verification (MRV).

In June 2024 the U.S. National Oceanic and Atmospheric Administration (NOAA) and the Department of Energy signed a memorandum of agreement to combine the ocean science expertise of NOAA with the carbon dioxide removal and energy science and technology expertise of DOE, strengthen coordination between both agencies, and continue to advance the state of oCDR science.

Despite this progress, investment in CDR remains woefully inadequate if it is to reach the scale needed to assist in meeting Paris targets. Substantial additional public funding will be required to deliver carbon removal capacity at the required scale in addition to philanthropic support. In a December 2023 report, McKinsey and Company estimated that an investment in all forms of CDR five times greater than currently predicted, based on announced projects in development, will be required by 2030 to keep this emerging industry on track to deliver 6-10 gigatonnes per year of carbon removal by 2050.

Measuring, reporting, and verification (MRV)

Current CDR pathways span a wide range of biological and geochemical capture processes (including hybrid approaches) and carbon storage pools. There is a correspondingly wide variability in the methods for assessing the efficacy and durability of carbon removal. The vast majority of carbon offsets produced through CDR are traded on the voluntary market, in which no universal standards exist for MRV. As a result, there is a need for better, more consistent, and inter-comparable protocols and methodologies for measuring/monitoring, reporting, and verification (MRV). These are needed to assess the environmental safety; environmental co-benefits, if any; efficacy at carbon removal; and durability of carbon sequestration of the various CDR approaches. Credible scientific information in these areas will, in turn, enhance confidence of governments, markets, and the general public in the validity of CDR as a climate mitigation tool.

The U.S. government has begun making investments to address these issues. In 2023, the U.S. Department of Energy's ARPA-E program awarded $36 million in grants to support development of sensors and modeling needed to improve MRV for oCDR. DOE's Office of Fossil Energy and Carbon Management recently announced 24 semi-finalists for its Carbon Dioxide Removal Purchase Pilot Prize, among which are four companies whose technologies enhance alkalinity to sequester CO_2 in aquatic systems. From this group, ten finalists will be selected based on the durability of their carbon removal, the quality of their MRV processes, and their commitment to providing community benefits from their operations. This competition will thus provide modest but important income as these startup companies move from demonstration to larger scale, while helping to identify those technologies that are the most safe, effective, and sustainable.

Policy and regulation

Both national and international policy and law must respond and evolve to facilitate the additional RD&D needed to determine which oCDR technologies are safe and effective, and whether and how they can be deployed to meaningfully contribute to gigatonne-scale carbon removal. National and international law governing disposition of material in the ocean has, understandably, been crafted to prevent harm from disposal of noxious substances at sea, not to cautiously facilitate activities, like oCDR, that are intended to provide an environmental benefit even though they may have side-effects that need to be understood,managed, and mitigated. Although there are encouraging signs that regulatory frameworks are rising to the challenge of permitting field research on oCDR, more may be required both to permit the level of research needed to determine the efficacy and safety of the various methods and, ultimately, to safely regulate those technologies if and when they are deployed at large scale.

In the United States, regulatory agencies have recently proposed the first permits for field testing of two different OAE approaches, one that would add alkaline minerals to a beach renourishment project off North Carolina and another, funded in part by CTS, that would utilize controlled release of a sodium hydroxide solution into ocean waters off Cape Cod, Massachusetts. These are important milestones because, depending on the agencies' final decisions, they would allow field testing of promising technologies to proceed so that geochemical and biological effects can be assessed in situ and so that monitoring and evaluation methods can also be tested and improved. The project off Cape Cod, in particular, represents a milestone for the U.S. regulatory process as it would be the first oCDR field trial regulated under the Marine Protection, Research, and Sanctuaries Act

(MPRSA), which is the primary U.S. law implementing the United States' responsibilities under the London Convention.

At the international level, the Parties to the London Convention and London Protocol have been working since 2007 to establish an effective regulatory mechanism for marine geoengineering activities, including oCDR, that fall within the scope of the London Convention and London Protocol. At the 2023 Meeting of the Contracting Parties to the London Convention and London Protocol, the Parties issued a statement on marine geoengineering that reiterated concern about the potentially deleterious effects marine geoengineering; noted the need to carefully assess potential marine geoengineering activities; and urged that, given the risks and uncertainties, marine geoengineering activities other than legitimate scientific research, should be deferred.

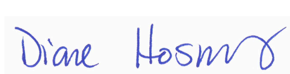
CTS agrees that commercial-scale projects should not be permitted unless/until the technologies used have been demonstrated to be both safe and effective. However, we are concerned that the Parties' statement on geoengineering may be interpreted to preclude legitimate scientific research undertaken by commercial entities or public-private partnerships. To date, most of the technological advancement of oCDR has been driven by private entities using private capital. Given the urgency of the climate crisis and the need to rapidly develop CDR to mitigate hard-to-abate emissions, it would be counterproductive for authorities at the national or international levels to throw up roadblocks to the kind of public-private partnerships that have been so instrumental in driving technological advancement across a wide variety of fields.

Conclusion

Ocean-based CDR, and particularly ocean alkalinity enhancement, offer the possibility of safe, durable, and scalable carbon dioxide removal to supplement aggressive efforts to reduce greenhouse gas emissions. As the final report is developed we urge participants to build on their progress during the recent dialogue to advance ocean-climate solutions and ensure that a full suite of technologies are considered.

Recognition by the Dialogue of the important role ocean-based CDR could play in achieving Paris targets, and the identification of additional steps the UNFCCC and its various forums could take to ensure that these technologies receive due consideration as potential tools for ocean-based climate action, would help to ensure that we are using all the tools at our disposal to confront the existential threat of global climate change.

Sincerely,



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