Carbon to Sea Initiative

February 11, 2025

Input to Call for Evidence on the proposed European Commission Oceans Pact

The **Carbon to Sea Initiative** (CTS) is a nonprofit effort whose mission is to systematically assess whether and how ocean alkalinity enhancement (OAE) can deliver safe, cost-effective, and permanent CO_2 removal at scale. We are guided by a set of core principles that emphasize transparent outcomes, strong and clear governance standards, and meaningful stakeholder engagement. 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 carbon dioxide removal (oCDR) sector, should that be appropriate.

CTS applauds the efforts of the European Commission to seek consensus on and provide guidance for a comprehensive European ocean policy via an Oceans Pact. Because of the many, and increasing, human activities affecting the ocean, there is often insufficient coordination and collaboration among policies and institutions governing inputs to and outputs from the ocean to ensure the overall ecological health of the ocean and the sustainability of ocean uses. We strongly agree that maintaining a healthy and productive ocean is vital to the European economy and the social well-being of its citizens.

A comprehensive and well-coordinated ocean policy is especially important given the growing effect of climate change on the ocean and coastal communities. As ocean and coastal communities struggle to adapt to climate change, there is growing interest among stakeholders in the ocean's potential not just to adapt, but also to mitigate climate change.

It is now clear that to achieve the European Union's commitment to achieve net-zero emissions by 2050 a two-pronged approach will be required that rapidly reduces emissions economy-wide, while rapidly scaling up technologies to offset hard-to-abate emissions from sectors such as heavy industry, transportation, and agriculture. For example, reaching the 2040 target proposed by the **Commission** (COM(2024) 63 final) is estimated to require carbon removal from all sources of about 400 million tonnes of CO2 equivalent per year. oCDR is a promising suite of technologies that, if proven safe and effective, could contribute cost-effective, durable, and highly scalable carbon removals toward meeting Europe's climate goals while also helping to reverse ocean acidification. The **European Parliament** has recognized this potential by directing the Commission to consider ocean-based carbon removals in developing its Carbon Removal and Carbon Farming regulations.

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.

If oCDR is to be available to supplement emission reductions to limit global warming consistent with the Paris Agreement, it is critical to conduct research now to assess the viability and efficacy of these technologies which will require substantial additional investment in research, development, and demonstration. In its 2022 **Research Strategy for Ocean-based Carbon Dioxide Removal and Sequestration**, the National Academies of Sciences, Engineering and Medicine recommended demonstration-scale in situ experimentation as essential to assess the benefits, risks, and potential scalability of a broad spectrum of oCDR approaches.

At present, oCDR has received orders of magnitude less research funding than has gone toward other forms of CDR. Policies and programs to attract investment, and boost innovation and technical potential for the blue economy, as called for in the framing document for the Call for Evidence, are exactly what is needed to advance the technological readiness of oCDR towards deployment at the scale that will be required for Europe to provide global environmental leadership, meet its climate goals and ensure its competitiveness in what multiple analyses have predicted to be a trillion-euro CDR market by 2050.

We urge the European Commission Oceans Pact to acknowledge and signal the importance of advancing funding and governance frameworks for ocean-based CDR research in support of ocean and climate policy goals. The European Commission has an important role toward ensuring that appropriate safeguards develop alongside the burgeoning oCDR field and advance the public interest alongside ocean and climate protection efforts.

Additional resources to supplement the record:

- Dupont, S. and Metian, M.: General considerations for experimental research on ocean alkalinity enhancement, in: Guide to Best Practices in Ocean Alkalinity Enhancement Research, edited by: Oschlies, A., Stevenson, A., Bach, L. T., Fennel, K., Rickaby, R. E. M., Satterfield, T., Webb, R., and Gattuso, J.-P., Copernicus Publications, State Planet, 2-oae2023, 4, https://doi.org/10.5194/sp-2-oae2023-4-2023, 2023.
- Cyronak, T., Albright, R., and Bach, L. T.: Field experiments in ocean alkalinity enhancement research, in: Guide to Best Practices in Ocean Alkalinity Enhancement Research, edited by: Oschlies, A., Stevenson, A., Bach, L. T., Fennel, K., Rickaby, R. E. M., Satterfield, T., Webb, R., and Gattuso, J.-P., Copernicus Publications, State Planet, 2-oae2023, 7, https://doi.org/10.5194/sp-2-oae2023-7-2023, 2023.

- Marín-Samper, L., Arístegui, J., Hernández-Hernández, N., Ortiz, J., Archer, S. D., Ludwig, A., and Riebesell, U.: Assessing the impact of CO2-equilibrated ocean alkalinity enhancement on microbial metabolic rates in an oligotrophic system, Biogeosciences, 21, 2859–2876, https://doi.org/10.5194/bg-21-2859-2024, 2024.
- Ferderer, A., Chase, Z., Kennedy, F., Schulz, K. G., and Bach, L. T.: Assessing the influence of ocean alkalinity enhancement on a coastal phytoplankton community, Biogeosciences, 19, 5375–5399, https://doi.org/10.5194/bg-19-5375-2022, 2022.
- Moras, C. A., Bach, L. T., Cyronak, T., Joannes-Boyau, R., and Schulz, K. G.: Ocean alkalinity enhancement – avoiding runaway CaCO3 precipitation during quick and hydrated lime dissolution, Biogeosciences, 19, 3537–3557, https://doi.org/10.5194/bg-19-3537-2022, 2022.

Sincerely,

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