



April 25, 2025

Response to Request for Information (RFI) 24062-25-361

Via shawn.corbett@tbs-sct.gc.ca

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 CO₂ removal (CDR) at scale. We are guided by a set of core principles that emphasize transparency, an outcome-agnostic approach, 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 CDR sector, should that be appropriate. In 2023, **we awarded more than [\\$27 million to scientists and engineering teams](#)** to ask and answer open questions associated with: measurability; efficacy and permanence; environmental safety; economics; utility of byproducts; monitoring; alkalinity delivery; alkalinity generation; and measurement, reporting, and verification (MRV).

In Canada, CTS has provided significant support for research, development, and demonstration of abiotic aquatic CDR. Specific Canadian investments have included:

- (1) An engineering-focused grant to Planetary Technologies;
- (2) Research grants to the Canadian contingent of the Ocean Alk-align consortium including independent researchers at Dalhousie University; and
- (3) A partnership with COVE to advance the world's first Joint Learning Opportunity focused on ocean alkalinity enhancement.

The extensive engagement between researchers and emerging start-ups provides our organization with unique insight into the status and future directions of ocean-based carbon removal technologies.

CTS applauds the efforts of the Treasury Board of Canada Secretariat (TBS) to facilitate and advance and expand the availability of high-quality carbon dioxide removal (CDR) offsets to help Canada achieve its domestic and international climate goals, including through its plans for the government to achieve net-zero emissions by 2050. We offer the following observations, comments, and responses to questions in the hope that it will assist you in these efforts.

Annex C – Technical and Procurement Questions

1. Respondent (Organization) Identification

1. Respondent's Legal Name, as well as "Doing Business as Name", if applicable:

Carbon to Sea Initiative

2. Respondent's Primary Office Address: 1828 L Street, NW, Suite 300-C Washington, DC 20036

3. Respondent's Telephone Number, if applicable

4. Respondent's Website Address, if applicable: carbontosea.org

5. Authorized Representative's Name: Diane Hoskins

6. Authorized Representative's Title: Global Policy Director

7. Authorized Representative's Email Address: diane@carbontosea.org

8. Authorized Representative's Phone Number:

9. Please identify the category that best describes you/ your organization: j. Other: nonprofit climate science funder

2. Proposed mandatory requirements

10. Scope of Carbon Removal: TBS is interested in technology-enabled CDR solutions that result in long-term (1,000+ year) storage. Section 1.4 identifies supply streams of CDR technologies that meet these requirements, and Annex B lists CDR protocols that are currently available.

a. Do you have any comments on the proposed technology categories (supply streams)?

CTS supports a broad portfolio of CDR technologies in the proposed procurement. At this stage of research and development, there is a wide range of technological readiness, along with uncertainty in future costs and scalability of different CDR approaches. As a result, government procurements such as this can provide vital support for advancing promising technologies, as well as providing much-needed information and experience to the government in the design and management of procurement strategies, potentially paving the way for large-scale CDR procurements in the future to achieve climate goals while helping to ensure program design also considers relevant local benefits and minimizes any risks.

Aquatic CDR shows great promise for scale at relatively low cost. Challenges include assessing environmental impacts and co-benefits, as well as monitoring, reporting, and verification (MRV) for open-system technologies. However, rapid progress is being made in these areas as illustrated by the pending certification of a protocol for ocean alkalinity enhancement from coastal outfalls by respected voluntary registry Isometric. We're encouraged that the "foundational science" behind what this RFI defines as abiotic aquatic CDR is quite strong. Continued work is needed to advance and refine MRV, including environmental MRV, by applying protocols such as those being developed by Isometric to reduce uncertainties related to quantification and verification of carbon removal and environmental impacts.

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.

Limiting the scope of the proposed procurement to shore-based aquatic CDR approaches should substantially reduce regulatory uncertainty as such activities appear to be comprehensively regulated under Canada's laws for water quality and environmental protection. Existing riparian and coastal demonstration projects are subject to rigorous environmental monitoring and reporting requirements and have provided new data on how OAE can be safely researched. If Canada is to develop the quantity and quality of CDR it will need to meet its climate targets, activities like the proposed procurement are needed to facilitate sector growth for a diverse array of these technologies, subject to rigorous MRV.

b. Are there other CDR approaches that you think should be included in this procurement pilot for carbon removal? If yes, please describe and identify associated protocols.

11. Carbon credit quality and integrity: Section 1.3 presents requirements eligible offset systems, registries and protocols, and Annex B lists CDR protocols that are currently available or in development.

a. Do you have any comments on the proposed approach to eligibility?

In general, CTS supports the proposed approach to eligibility for the procurement. Ultimately, registry in government compliance-based offset systems drives production of high-quality offsets and contributes directly and most rigorously to meeting climate goals. But as Canadian and other compliance markets currently offer limited scope for CDR, it is appropriate and necessary at this time to make offsets meeting the requirements of high-quality voluntary registries eligible for this procurement.

This serves multiple purposes, including:

- Providing needed financial support for CDR providers while protocols for additional technological pathways are developed for compliance markets;
- Advancing development of protocols for the voluntary market for the broad portfolio of technologies that will be needed to match growing demand for CDR;
- Allowing regulators to gain experience with different technologies and certification protocols, which in turn can inform government regulation of these technologies and the development of federal and provincial protocols to guide CDR's entry into the Canadian compliance markets.

Given that Isometric's ocean alkalinity enhancement protocol is pending certification at this time, it is appropriate for TBS to receive bids for services proposed to be certified under this protocol. It seems very likely that the protocol will either be finalized at the time of bid, or completed and approved prior to the issuance of any contract under the procurement, as proposed under section 1.3.2 of the RFI. The experience gained with project types through voluntary government procurement can help ensure regulators gain the experience needed to establish the rigor and integrity that will be required for compliance markets.

b. Do you have any comments on the protocols listed in Annex B? Are you aware of any reputable protocols that should be added to this list? If so, please identify and describe why you think they should be eligible protocols to support projects in this procurement.
c. Please share your views on allowing projects to bid that plan to use a draft protocol that is currently undergoing approvals or certification at the time of bid.

Protocols under development by Isometric for electrolytic seawater mineralization and ocean alkalinity enhancement from coastal outfalls will likely be operational in time for providers to begin the certification process within the timeframe of the proposed procurement. The development of protocols for these technologies by a respected carbon registry such as Isometric provides confidence that challenges related to MRV for these approaches can be addressed. Because of the urgency to identify and support development of a broad portfolio of high-quality sources to meet the expected demand for CDR, CTS encourages TBS to include abiotic aquatic CDR in the proposed procurement.

The CDR industry is evolving rapidly and a growing number of providers are confronting the scientific, technical, and economic challenges of emerging from the research and development stage into small-scale production. Government support, including procurements such as this, is vital at this stage to reduce uncertainties and drive technological readiness. Allowing eligibility for suppliers who are just beginning the certification process is an important and logical aspect of such support. Although timelines are somewhat uncertain for certification under new protocols, we anticipate that a number of providers will be approved and registered within the timeline of the proposed procurement. This will not only broaden the scope of technologies delivering high-quality offsets, but increase the exposure and experience of producers, certifiers, registries, and buyers with these novel technologies. This, in turn, will inform the registry and entry of such offsets into the growing compliance market, as required to meet long-term climate goals.

12. Additional project requirements: Section 1.5 presents additional project requirements related to location, readiness, community support and Indigenous reconciliation.

a. Do you have any comments on the proposed approach to additional project requirements?

The RFI imposes a special requirement for abiotic aquatic CDR proponents to demonstrate that they have engaged with the Department of Fisheries and Oceans and Environment and Climate Change Canada. CTS has no objection to AA CDR bidders doing so, and both CTS and its grantees are actively doing so. But we wonder why this technological pathway, alone among those under consideration for the procurement, must meet special consultation conditions? Perhaps a more appropriate approach would be to require **all projects**, as a condition of their eligibility, demonstrate they have received regulatory approval and conducted required consultation with relevant government authorities. We believe consultations are an incredibly important part of the regulatory process and should be equally required by all project proponents, not simply some and not others. At a minimum, it would be helpful for TBS to clarify the nature of and need for any consultations over and above those conducted as part of the regulatory process for these projects.

13. Proposed Procurement approach: Section 1.6 presents the proposed procurement approach for Phase 1 (Pilot), including timelines, volumes, evaluation and Indigenous business considerations. Do you have any comments on the proposed procurement approach?

In general, CTS supports the proposed approach to establish contracts with a broad range of qualified suppliers and to compete each supply stream separately. Done right, this will provide support for a broad range of technologies, which is appropriate at this stage of development given widely varying costs, carbon accounting methods, and scale challenges. Awarding competitively within each category will facilitate comparison of “best-in-class” technologies across the categories.

However, we note that there are some challenges in making “apples-to-apples” comparisons in the very diverse AA CDR technology category. For example, while river and coastal ocean alkalinity enhancement achieve CDR within “open” aquatic systems, direct ocean capture technologies range from fully closed systems to hybrids involving closed- and open-system elements. We encourage exploration among these different technologies, but note that ranking quality based purely on the final (current) cost of delivering tonnes of CDR may miss important long-term considerations regarding sustainability and co-benefits at scale.

We urge the program to additionally encourage a “race to the top” in terms of best practices by directly incentivizing project developers to pursue the highest levels of monitoring, environmental stewardship, accountability, community engagement, and maximization of societal benefits.

3. For CDR Project Developers

N/A for CTS.

Additional Comments on Annex A

Section 1.1

- CTS strongly supports Canada's prioritization of emission reduction and its view of the appropriate role for CDR in offsetting critical air and marine fleet operations, and other hard-to-abate emissions.
- While we are pleased to see an initial investment of \$10 million from the TBS for CDR procurement, the current cost to support the R&D required to produce these credits is greater than what we understand the government is currently willing to pay for those credits - incumbents may be able to, eventually, cover costs and potentially make sustaining margins only if being able to demonstrate that they have a contract with the Canadian government will enable them to sell to governments or customers abroad for a return on investment.
- Notably, the Canadian government's commitment to defense spending is roughly [\\$30 billion](#). This alongside an increasing interest in [advancing dual-use technologies](#) and knowing [Canada's R&D intensity remains below G7 average](#) – with increased investment, Canada is in a position to lead the level of scale-up required to offset the government's targeted emissions while meeting multiple objectives.

Section 1.2

- A considerable body of [research](#) indicates that the storage time in the ocean of carbon as bicarbonate and carbonate is in the range of 10,000 years. Thus, CO₂ converted to these species via OAE more than satisfies the proposed standard for permanence of storage.
- To the extent there are concerns about the potential environmental impacts of abiotic aquatic CDR, as defined in section 1.4, the [Aspen Institute's Code of Conduct for Marine CDR Research](#) provides strong general principles. To provide more detailed guidance specific to environmental monitoring needs and considerations for the conduct of OAE field trials, CTS has a partnership with NOAA to establish guidelines to ensure consistency and comparability across marine carbon dioxide removal projects, enhancing the impact of research findings in this critical field. We engaged PML Applications, the commercial arm of the respected Plymouth Marine Laboratory to support this effort. This framework is under development and an early draft will be available for community input in late spring 2025.

The TBS procurement effort is well positioned to increase the quality and integrity of carbon removal efforts and ultimately help Canada in meeting its climate goals and enhance its competitiveness in what McKinsey and Company have predicted to be a \$1.2 trillion CDR market by 2050. The efforts of Canada and other countries who remain committed to the goals of the Paris Climate Agreement are needed now more than ever to minimize the impacts of global climate change on people and the planet.

Thank you for your consideration of our views on this important topic.