

Exploring potential marine options for climate intervention

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With the Paris Agreement, 197 countries have agreed to limit global warming to well below 2°C and preferably to no more than a maximum of 1.5°C. In October 2018, the Intergovernmental Panel on Climate Change presented a special report stating that the 1.5°C target is still achievable, but only if anthropogenic CO₂ emissions start falling sharply now and reach net zero by 2050. The report also made clear that net zero emissions will not be achievable without employing some form of active CO₂ removal, referred to as carbon dioxide removal strategies (CDR). The focus with CDR approaches presently lies on possible solutions on land, such as afforestation and bioenergy with carbon capture and storage (BECCS). These and other land-based options are often in conflict with other societal interests, such as food security, urbanisation and ecosystems conservation.

What role can the ocean play in achieving the 1.5°C target? By absorbing 90% of the extra heat generated by global warming and more than 25% of the CO₂ released from human activities, the ocean already serves as a powerful buffer in the Earth's climate system. What are the options for ocean-based CDR approaches, what do we know about their CO₂ removal and long-term storage potential? What are the associated environmental risks and possible co-benefits? What do we know about public perceptions, potential economic impacts, and the need for social licence and? What instruments are needed for effective governance of ocean-based CDR research and implementation?

Objective:

The workshop will bring together scientists and stakeholders from a variety of disciplines, ranging from oceanography, climate research, marine ecosystem management and protection to environmental economics, law of the sea and public perception. The workshop will aim to address objectives in four focal areas using aspects of the 2019 GESAMP WG41 report as a point of departure:

(1) Natural sciences:

- pinpoint key knowledge gaps of eight different categories of marine CDR approaches regarding CO₂ mitigation potential, environmental impacts, risks and co-benefits
- identify pathways to overcome major barriers for CDR research
- agree on research areas most needed to inform economics, socio-political and governance issues

(2) Environmental economics:

- explore ecological-economic benefits and trade-offs
- develop an integrated assessment framework for CDR valuing
- consider accordance of ocean-based CDR with UN Sustainable Development Goals, in particular SDG 2 (Zero Hunger), SDG 13 (Climate Action), SDG 14 (Life Below Water)

(3) Political and societal acceptance:

- detect major barriers for CDR research
- identify potential conflicts of interest
- explore reasons for the divide of researchers over investigating CDR strategies
- identify mechanisms to ensure transparency

(4) Ocean governance:

- evaluate existing legislation relevant to ocean-based CDR
- identify governance instruments needed to regulate CDR implementation
- pinpoint forms of adaptive ocean governance (what can we learn from social control of technologies?)

Progress in this field of research critically depends on (a) initial provision of the fundamental scientific precepts on which different climate intervention approaches are based (b) the co-design of research with relevant societal groups and stakeholders, and (c) full transparency, pro-active communication and a broad societal involvement.

Outcomes and expected impact:

Work towards developing a Marine Carbon Roadmap or a Perspective Paper

Using and going beyond existing publications including:

- High level report: GESAMP WG41 report (2019) “High level report of a wide range of proposed marine geoengineering techniques” <http://www.gesamp.org/work/groups/41>
- Schäfer S, Lawrence M, Stelzer H, Born W, Low S, Aaheim A, Adriaola P, Betz G, Boucher, O
- Carius A, Devine-Right P, Gullberg A, Haszeldine RS, Haywood J, Houghton K, Ibarrola R,
- Irvine P, Kristjánsson J, Lenton T, Watson, IM (2015) The European Transdisciplinary Assessment of Climate Engineering (EuTRACE): Removing Greenhouse Gases from the Atmosphere and Reflecting Sunlight away from Earth. DO-10.2312/iass.2015.018

Special issue: Frontiers Research Topic “The Role of Ocean-based Negative Emission Technologies for Climate Mitigation. Editors: David Peter Keller, Lennart Thomas Bach, Kerry Brent, Wilfried Rickels
<https://www.frontiersin.org/research-topics/12507/the-role-of-ocean-based-negative-emission-technologies-for-climate-mitigation>

Special issue: Frontiers Research Topic: “Scaling-Up Negative Emissions: The Power of Leveraging Policy, Philanthropy, Purchasing and Investment. Editors: Noa Deich, Gregory M Dipple, Keith Paustian, Phil Renforth, Jennifer Wilcox
<https://www.frontiersin.org/research-topics/15960/scaling-up-negative-emissions-the-power-of-leveraging-policy-philanthropy-purchasing-and-investment>

Perspective paper: Boyd P & Vivian C (2019) Should we fertilize the oceans or seed clouds? No one knows. Nature 570, 155