

## OceanNETs Principles of Responsible Research and Innovation (RRI) for ocean-based Negative Emissions Technologies (NETs)

Version 4 [22/06/2022]

This document lays out a set of principles that guide the OceanNETs (2020–2025) project as it researches the feasibility, risks and co-benefits of ocean-based negative emissions technologies (NETs) to achieve carbon dioxide removal (CDR).

These principles articulate a collective process of reflection within the OceanNETs consortium about the values guiding our project. They are also meant to help external stakeholders and interlocutors gain a better understanding of the normative assumptions that structure our research and policy engagement activities.

The text below is not meant as a definitive statement of principles. It reflects a live discussion within the project, and will be revised, expanded and refined as the project develops. We will regularly update this page with the latest iteration of this text.

In formulating these principles, we have drawn upon broader [scholarship in responsible research](#) on emerging technologies, previous work on the [governance of geoengineering](#), as well as specific guidance on governance of marine CDR (such as from the [National Academies of Science](#) and the [Aspen Institute](#)).

OceanNETs studies a range of different NETs approaches, with a particular focus on ocean alkalinity enhancement (OAE). The reason for this focus is that OAE combines the potential for large-scale CDR with high levels of uncertainty regarding its environmental impacts, economic cost, and means of measurement, reporting, and verification (MRV).

The project applies multiple scientific disciplines and methods, such as earth system models, economic analyses, contained experimental work in mesocosms, social scientific work on public perceptions, legal investigations into governance frameworks, and the development of hypothetical deployment scenarios for different technological configurations of OAE. It also engages regularly with stakeholders, to inform both specific research activities and the project as a whole. This text includes overarching principles that guide the project as whole, as well as further propositions that are specific to different strands of work.

## General principles

1. OceanNETs understands NETs as a complement, not a substitute, for significant reductions in greenhouse gas (GHG) emissions.<sup>1</sup>
2. OceanNETs seeks to produce evidence that will help society make reasoned and accountable decisions about the development and potential deployment of ocean-based NETs.
3. OceanNETs does not favour any specific ocean-based NET, nor does it advocate for a particular scale or timeline of deployment. Our goal is to inform public decisions on NETs, providing high-quality scientific data that can illuminate the multiple dimensions (technical, political, economic, environmental, social, legal) that must inform these decisions.
4. OceanNETs will seek to minimise in its public communications the risk of ‘mitigation deterrence’ – that is, the prospect that being able to remove greenhouse gases in the future might serve as a justification to avoid or defer commitments to reduce emissions in the present. One important way to minimise this risk is to offer a clear presentation of the uncertainties that characterise different forms of ocean-based NETs at the present time.
5. OceanNETs seeks to produce knowledge that is readily usable by a broad range of stakeholders, and not just by other academic researchers. We will make efforts to share this knowledge beyond the geographical area where our work is conducted (EU, Norway and the UK).
6. OceanNETs will make its findings, and non-personal data on which they are based, to the wider public.

## Principles relating to earth system modelling and simulation of ocean-based NETs

7. OceanNETs recognizes that models and simulations provide key inputs for the societal evaluation of NETs, but do not constitute a policy recommendation. They are research tools, and their results need to be combined and contrasted with other types of evidence before they can guide public policy.
8. OceanNETs considers and specifies the time scale and durability of sequestration in reporting removal potentials. We will also make explicit current limits on our ability to measure, verify and monitor removals.
9. In presenting modelling results, OceanNETs will indicate the assumptions built into the models it uses, and the process by which these assumptions were reached. We will also make explicit current limits on our ability to simulate different NETs.

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<sup>1</sup> This does not prevent the modelling of scenarios in which NETs are assessed in the absence of significant reductions in GHG emissions. This first principle will be subject to further discussions within the project, including at our next consortium-wide meeting in September 2022.

### Principles relating to experiments in ocean alkalinity enhancement (OAE)

10. OceanNETs conducts mesocosm studies to allow the safe evaluation of the potential risks and benefits of ocean alkalinity enhancement. The particular focus of these studies is the impact that additional alkalinity may have on marine biological communities, and which formulations of OAE approaches might minimize these impacts.
11. The data generated by mesocosm studies will help develop criteria for the transition to less contained experiments. These criteria must state the balance of potential risks and benefits attendant to each new phase of experimentation, and should also specify the conditions under which specific kinds of experimental work should be discontinued.
12. OceanNETs is committed to long-term engagement with scientific, economic and conservation stakeholders, and the wider community in the regions where mesocosm studies are conducted. The purpose of this engagement is to help local actors make their own, regionally specific assessment of the potential risks and benefits of OAE and other ocean-based NETs.

### Principles relating to social science and international law research in OceanNETs

13. OceanNETs conducts social-scientific research to produce a more detailed understanding of the assumptions, expectations and concerns that shape public and stakeholder views on ocean-based NETs. It also explores the political and legal context in which ocean-based NETs are being developed, assessed, promoted, and resisted.
14. Social science and international law research is not used to advance any particular NET, and gives equal consideration to arguments for or against any of the technologies under consideration.

### Principles relating to the development of realistic OAE deployment scenarios

15. As part of its mission, OceanNETs is developing realistic deployment scenarios for different forms of OAE. By 'realistic', we mean that these scenarios should 1) consider the full life cycle of activities, including material inputs, energy use, and the broader range of emissions associated with the full value chain of the process; 2) specify the assumed level of readiness of each technology relative to the chosen deployment timeline; and 3) develop its final scenarios through a process of consultation with relevant stakeholders representing a wide variety of view.

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