



# CDRmare Principles of Responsible Research and Innovation

**LIVING DOCUMENT**

**Research Mission of the German Marine Research Alliance  
»MARINE CARBON SINKS IN DECARBONISATION PATHWAYS«**

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## CDRmare Research Consortia

### ASMASYS

#### **Assessing Marine Carbon Removal: Synthesis, Scenarios & Governance**

Nadine Mengis, GEOMAR | Christian Baatz, Kiel University

### GEOSTOR

#### **Submarine Carbon Dioxide Storage in Geological Formations of the German North Sea**

Klaus Wallmann, GEOMAR

### RETAKE

#### **CO<sub>2</sub> Removal through Alkalinity Enhancement: Potential, Benefits and Risks**

Andreas Oschlies, GEOMAR

### sea4soCiety

#### **Innovative Approaches to Enhancing the Carbon Storage Potential of Vegetated Coastal Ecosystems**

Martin Zimmer, ZMT

### AIMS<sup>3</sup>

#### **Alternative Scenarios, Innovative Technologies, and Monitoring Approaches for Carbon Dioxide Storage in Oceanic Crust**

Achim Kopf, University of Bremen

### Test-ArtUp

#### **Ocean artificial upwelling**

Ulf Riebesell, GEOMAR

*(1<sup>st</sup> CDRmare funding phase only)*

# CDRmare Principles of Responsible Research & Innovation

This document lays out a set of principles that guide the first two phases (2021 – 2024 & 2024 – 2027) of the CDRmare research mission that investigates the feasibility, risks and co-benefits of a range of marine-based carbon dioxide removal (mCDR) and carbon storage (mCS) approaches.

These principles articulate a collective process of reflection within the CDRmare research mission about the values guiding our project.

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 and the socio-economic and political conditions develop. We will regularly update this document with the latest iteration of the CDRmare RRI principles.

In formulating these principles, we have drawn upon the »OceanNETs Principles of Responsible Research and Innovation (RRI) for ocean-based Negative Emissions Technologies (NETs)« (*Version 4, June 2022. PI: Javier Lezaun, University of Oxford*), and on specific guidance on governance of marine CDR (such as from the National Academies of Science and the Aspen Institute).

The CDRmare research mission applies multiple scientific disciplines and methods, including Earth system modelling, field studies and experimental work, economic analyses, social scientific work on public perceptions and desirability, political feasibility, legal investigations into governance frameworks, ethical considerations, and the development of hypothetical implementation scenarios for different technological configurations of mCDR and mCS. It also engages regularly with non-academic stakeholders for mutual information exchange and learning, the co-design of scientific and practical approaches, the co-production of knowledge on mCDR and mCS, and the enabling of informed societal decision making.

This text presents overarching principles that guide the project as a whole, as well as further propositions that are specific to different strands of work.

## General principles

1. CDRmare understands mCDR and mCS as a complement, not a substitute, for significant reductions in greenhouse gas (GHG) emissions.
2. CDRmare will seek to minimise in its communications the risk of ›mitigation deterrence‹ – that is, the prospect that removing greenhouse gases might serve as a justification to avoid or defer commitments to reduce emissions.
3. CDRmare seeks to produce unbiased evidence that will help society make informed decisions about the development and potential implementation of mCDR and mCS approaches.
4. CDRmare does not advocate for any specific ocean-based carbon removal or carbon storage approach, nor does it advocate for a particular scale of implementation. Our goal is to inform societal decisions on mCDR and mCS, providing high-quality scientific knowledge that can illuminate the relevant multiple dimensions (technical, political, economic, environmental, social, legal, ethical).
5. CDRmare 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.
6. CDRmare will make all its findings, and non-personal data on which they are based, publicly available, irrespective of whether outcomes are considered ›positive‹ (e.g. affirmative of the scientists' prior assumptions), ›negative‹ or ›neutral‹. Following principles of good scientific practice, CDRmare will make limitations and assumptions for presented results transparent and understandable, recognizing the special importance of such in topics relevant to the science-policy interface.
7. CDRmare scientists will disclose any possible conflicts of interest, including commercial ones, and adhere to good scientific practices, such as published by the German Research Foundation (DFG) at <https://www.dfg.de/en/principles-dfg-funding/basics-and-principles-of-funding/good-scientific-practice>.