National Oceanography Centre

‘ADDITIONAL GLOBAL PERSPECTIVES ON MCDR’ NASEM MCDR STANDING COMMITTEE MEETING #2

PROF. CHRISTOPHER PEARCE

NATIONAL OCEANOGRAPHY CENTRE, UK

18TH SEPTEMBER 2025

There is an urgent need for mCDR research and guidance within the UK

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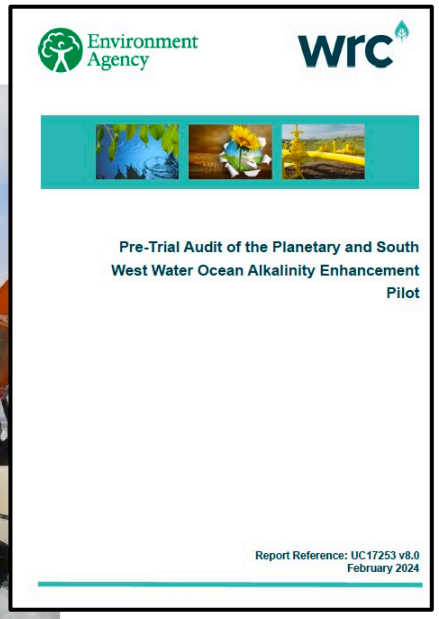
News › Cornwall News › Environment

Canadian company wants to dump tonnes of 'laxative' in St Ives Bay to fight climate change

Magnesium hydroxide is seen as a way to change the alkalinity of the ocean and help capture more CO2

Campaigners worry about scheme's impact on marine ecosystem but Planetary Technologies says concerns misplaced

Hundreds of people gather to voice their concerns over a proposed carbon dioxide removal scheme in the bay of St Ives. Photograph: Jonny Weeks/The Guardian


Environment Agency wrc

Pre-Trial Audit of the Planetary and South West Water Ocean Alkalinity Enhancement Pilot

Report Reference: UC17253 v8.0
February 2024

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Climate

Project to suck carbon out of sea begins in UK

Jonah Fisher
BBC environment correspondent, Weymouth

18 April 2025

A ground-breaking project to suck carbon out of the sea has started operating on England's south coast.

SeaCURE

Accelerating the ocean's natural removal of atmospheric carbon

SeaCURE has developed and demonstrated the components of a marine-based Negative Emissions Technology (NET), with the potential to be applied at very large scales. The system makes use of the natural behaviour of the carbon cycle, i.e. the 'sucking' of CO_2 out of the atmosphere in response to the atmosphere-ocean difference in CO_2 concentration generated by rising atmospheric CO_2 concentrations. We are now designing and building a demonstration plant in the UK which will operate at a rate of 100 tonnes of CO_2 removal from the atmosphere per year, developing and testing state of-the-art approaches to verify that CO_2 removal, and carefully building the evidence based required for larger-scale plant deployment.

SeaCURE is a collaboration between world leading academic experts (in ocean carbon and climate monitoring and modelling, green infrastructure, life cycle analysis and marine law) and engineering and technology-focused SMEs with expertise in carbon removal, water processing and plant design and build.

The NOC is providing the scientific knowledge needed to facilitate informed decision making on the potential to use marine environments to help tackle climate change

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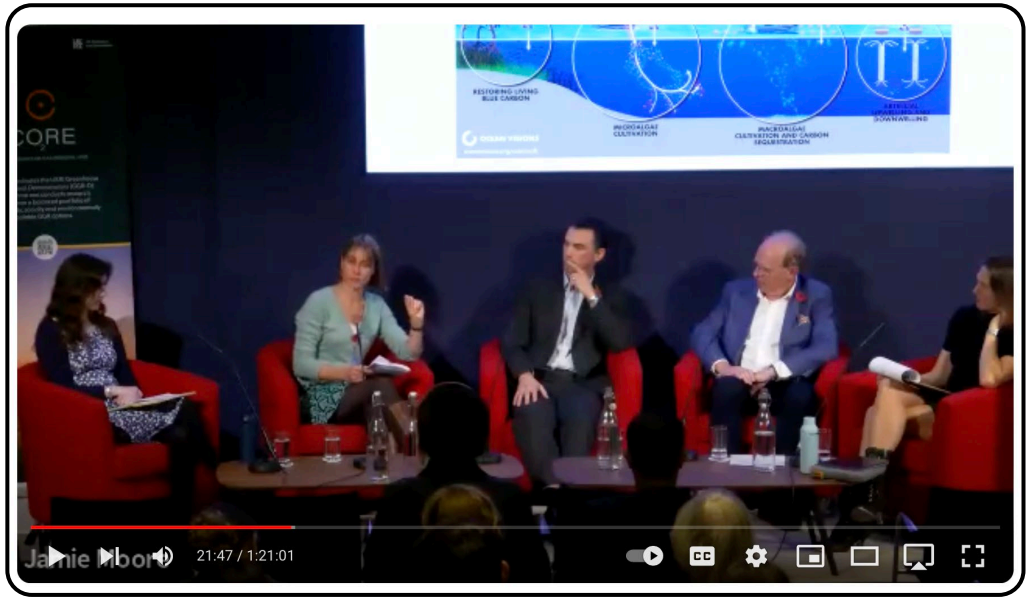
SOCIO-OCEANOGRAPHY

Costs, impacts, unintended consequences and social acceptability of the ocean-based large-scale carbon dioxide removal techniques

The transition towards climate neutral and climate resilient societies requires both a reduction in carbon emissions and the removal of carbon dioxide from the atmosphere. Various ocean-based carbon dioxide removal schemes are currently being explored. However, these schemes raise social concerns due to ecological impacts, including potential harm to marine ecosystems and biodiversity. Uncertainty and the need for equitable distribution of risks and benefits pose ethical and social justice challenges while economic concerns revolve around high costs, energy requirements, and limited scalability. At the same time, these schemes may divert resources from other mitigation strategies. Addressing these concerns is vital to ensure the ethical, equitable, and sustainable deployment of these technologies.



CO2RE panel: The Role of Marine Carbon Dioxide Removal (CDR) in UK Net Zero

CO_2RE - The Greenhouse Gas Remova
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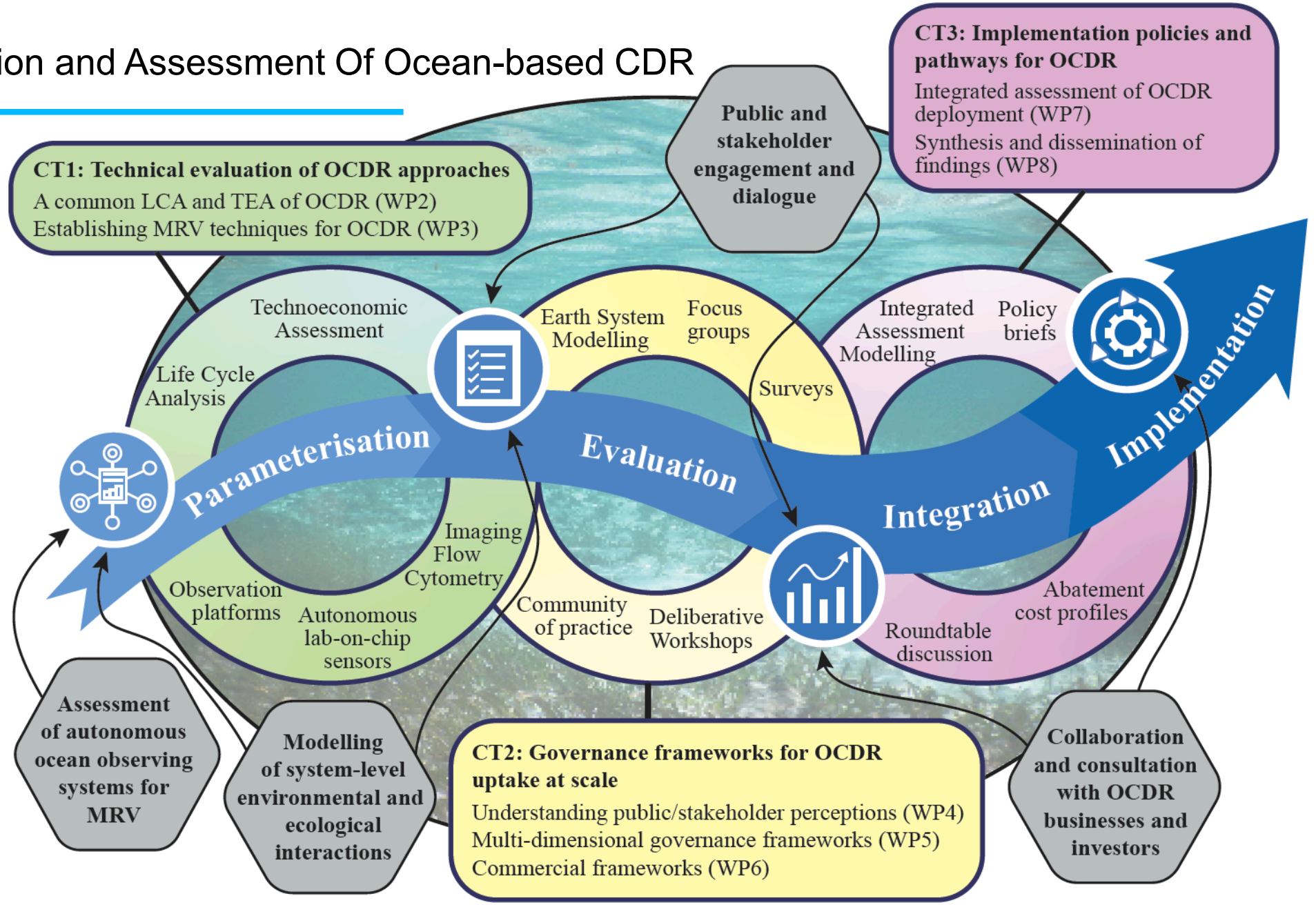
SEAO2-CDR

Strategies for the Evaluation and Assessment Of Ocean-based CDR

To evaluate & establish the mechanisms & processes required to facilitate the environmentally safe, socially acceptable & economically viable implementation of appropriate ocean-based CDR approaches to support the realisation of global climate policies

Horizon Europe Grant Agreement No. 101081362

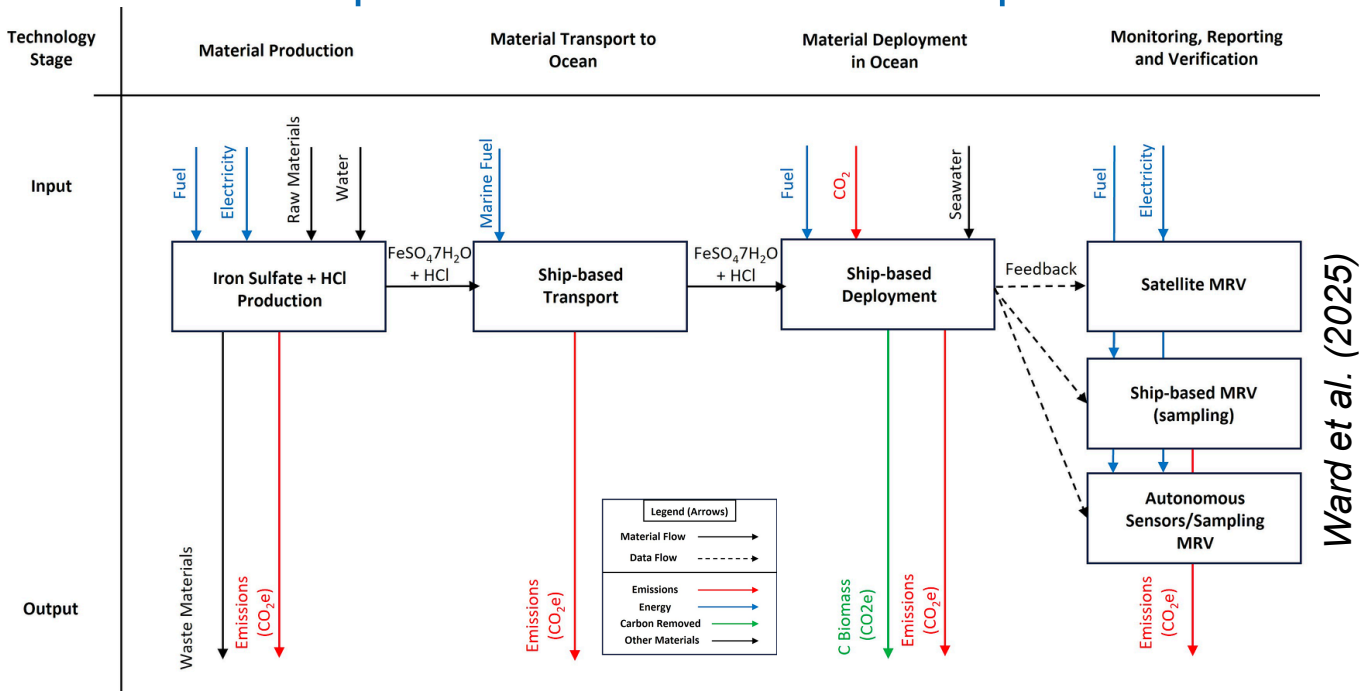


SEAO2-CDR

www.seao2-cdr.eu

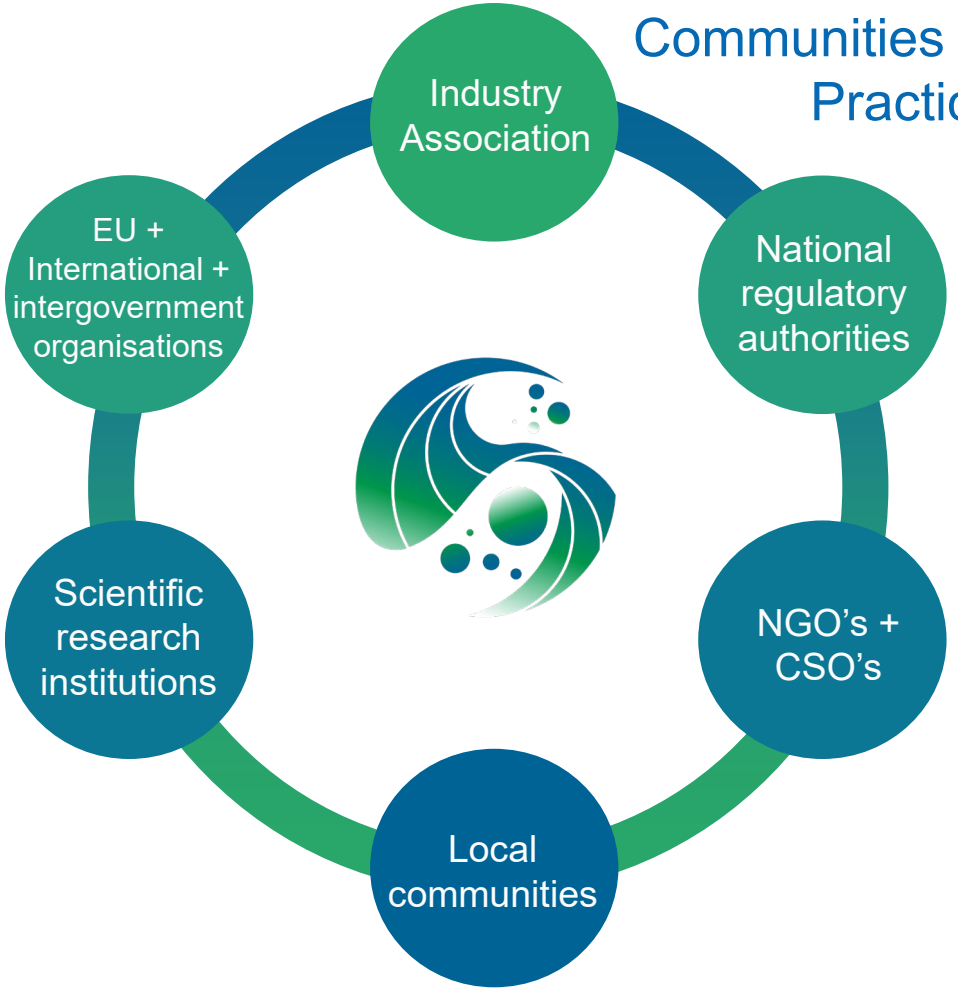
Advancing TEA & LCA capabilities; Developing a multidimensional governance model; Assessing mCDR logistic/implementation requirements via optimisation models

Conceptual structure for TEA comparison

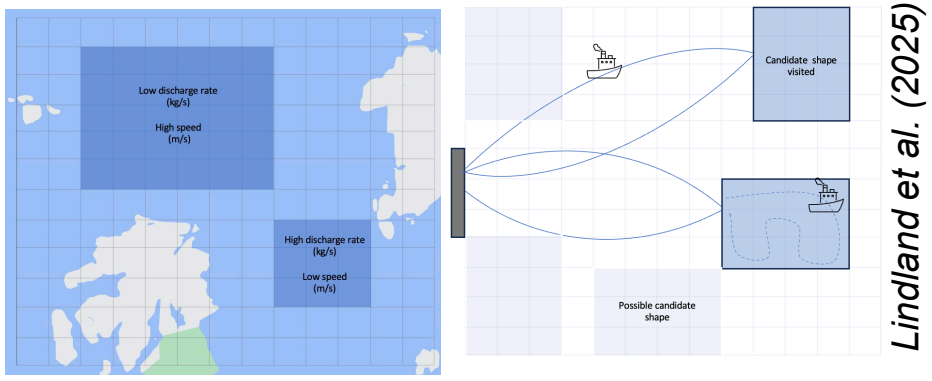


Ward et al. (2025)

Communities of Practice



Maritime logistics for at-sea OAE implementation



Lindland et al. (2025)

SEAO2-CDR is developing the mechanisms, tools & guidelines required to help responsibly & transparently evaluate the viability of mCDR approaches.

Scientific & technological potential	**Scientific principles** Efficacy Durability Scalability	**Technological capability** Material, energy & costs LCA & TEA assessments	**Environmental impacts** Co-benefits & Risks EIA frameworks	**MRV readiness** Monitoring platforms Modelling capabilities Data handling systems
Governance mechanisms	**Legal frameworks** National Policies European Law International Law	**Ethical requirements** Public admissibility Community engagement	**Geopolitical considerations** Cross-boundary effects 'Flashpoint' potential	**Market demand**
Implementation pathways	**Operational logistics** Maritime operational effects on cost/efficiency	**Site suitability** Supply chain considerations Environmental conditions	**Multi-pathway solutions** Integrated Assessment Modelling	Funding mechanisms (Voluntary market; Compliance market; Private investment…) Price of carbon credits Equitable access for countries/companies

Open communication & collaboration is essential for ensuring compatible advances in mCDR assessment, monitoring & regulatory requirements.

AtlantiS (Research Theme III)

The implications and feedbacks associated with ocean-based climate mitigation strategies

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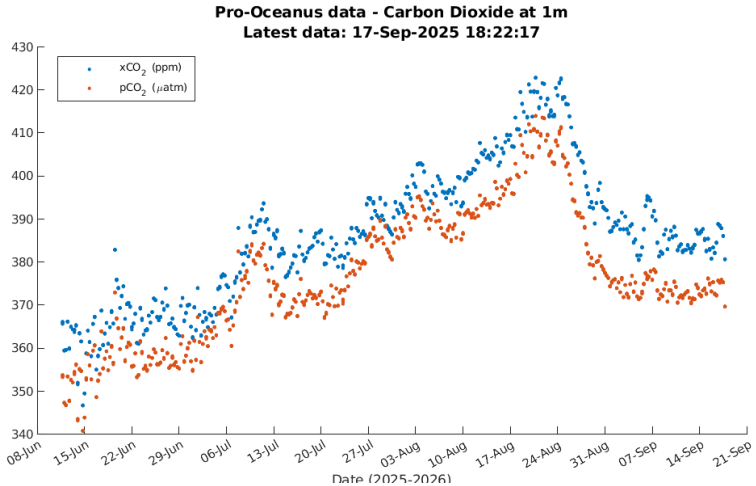
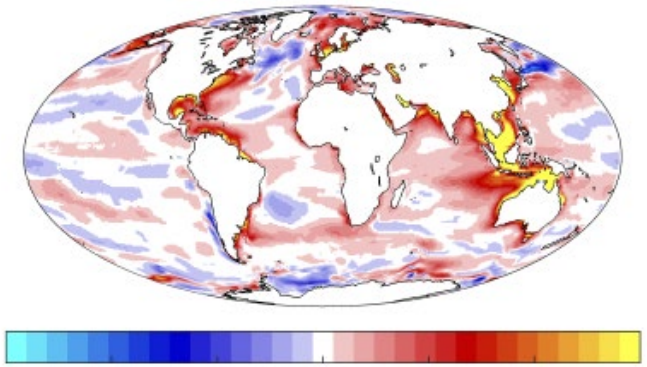
Can natural and/or engineered approaches be used to enhance the ocean's role as a carbon sink, and what are the environmental and ecosystem impacts of doing so?

What technologies and techniques are needed to conduct in-situ monitoring, reporting and verification (MRV) of the effectiveness and impacts of ocean-based climate mitigation solutions?

What information is needed by the UK Government and other international bodies to inform/guide the use of ocean-based climate mitigation strategies?





Palmiéri and Yool (2024)

UK National Climate Science Partnership

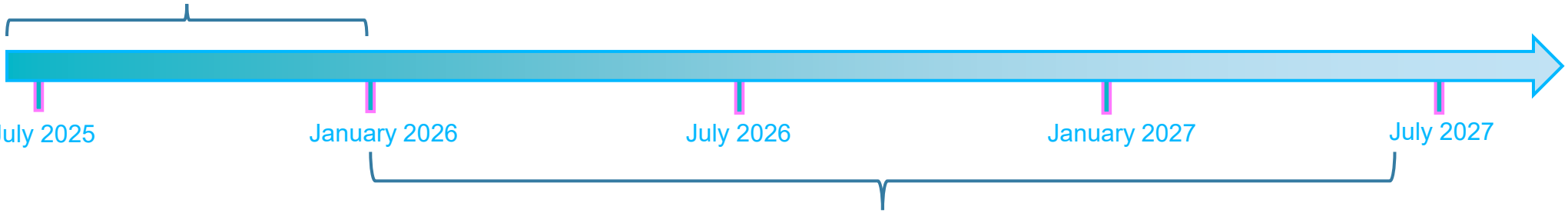
European MARINE BOARD Advancing Seas & Ocean Science

Environmental Impact Assessment Framework

A standardized resource for assessing both the risks and benefits of various mCDR approaches

Stage 1 *(June-December 2025)*

Synthesis of best available knowledge of mCDR



Open and Comprehensive Framework for Assessing Environmental Impacts of mCDR

Stage 2 *(January 2026 – May 2027)*

Input, feedback and testing of the EIAF from across the mCDR community via transparent and participatory processes

OCEAN SCIENCES MEETING | GLASGOW SCOTLAND 22-27 FEBRUARY 2026

Ocean Sciences 2026 Townhall: An Environmental Impact Assessment Framework for mCDR

Scan to sign up to a mailing list to receive updates and engagement opportunities

SeaSINC

Evaluating the effects of seaweed sinking in the Caribbean

Seafields

THE UNIVERSITY OF THE WEST INDIES
CAVE HILL CAMPUS, BARBADOS, WEST INDIES

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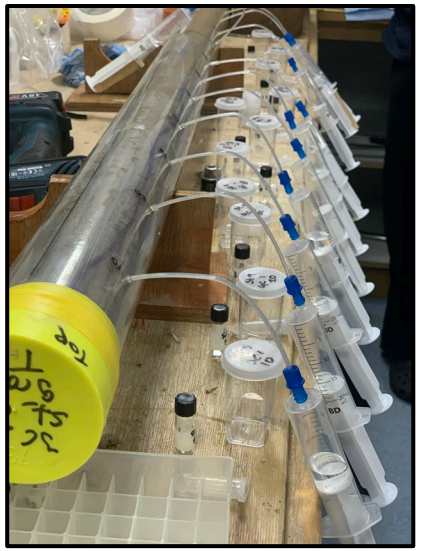

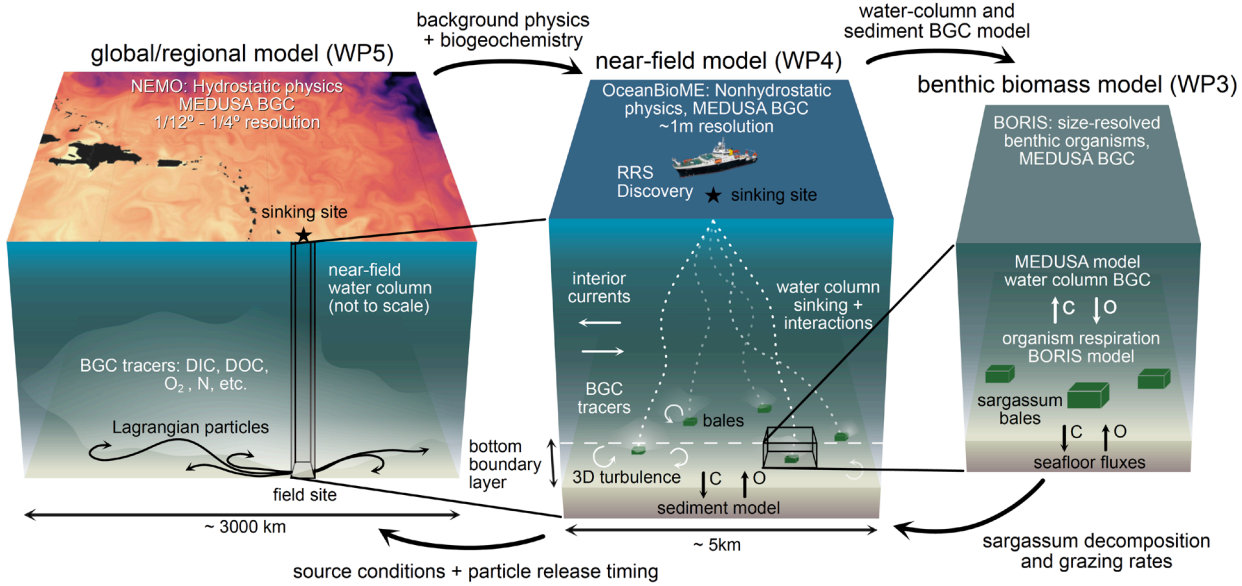

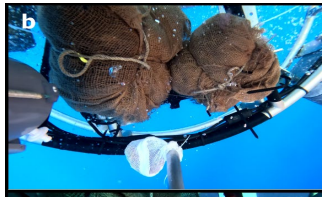

Other European mCDR projects

and forthcoming activities…

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uptake
www.cdr-uptake.eu

RESCUE
www.rescue-climate.eu

OCEAN NETs
www.oceannets.eu

CDRmare
www.cdrmare.de

Coming Soon…

HORIZON-CL6-2025-02-CLIMATE-01: The ocean-climate-biodiversity nexus and marine carbon dioxide removal (mCDR)

Option A: Ocean Alkalinity Enhancement (OAE): biogeochemical and physiological responses and impacts on marine ecosystems

Option B: Monitoring the global ocean for safe, verifiable and sustainable potential marine carbon dioxide removal (mCDR)

Future perspectives

Opportunities, concerns and critical next steps

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The ocean plays a dominant role in the global carbon cycle thus whether actively or passively it will contribute to CDR efforts. Scientific & socio-economic uncertainties are currently prohibitive for large-scale (climatically significant) commercial application; near-term small-scale, controlled in-situ trials and assessments will be critical for evaluating implementation/upscaling potential

Open communication and collaboration between all parties is essential for ensuring mutually compatible advances in scientific understanding and regulatory requirements.

The UK marine scientific community is well positioned to lead and contribute to the assessment of mCDR strategies, but greater investment is needed to facilitate independent evaluations.

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THANK YOU

c.r.pearce@noc.ac.uk

NOC.AC.UK

Further information & additional resources

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SEAO2 CDR STRATEGIES FOR THE EVALUATION & ASSESSMENT OF OCEAN BASED CARBON DIOXIDE REMOVAL

www.seao2-cdr.eu

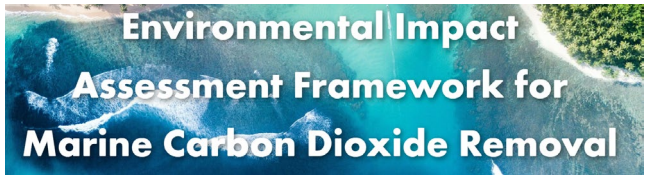
c.r.pearce@noc.ac.uk

@c-r-pearce.bsky.social

@c_r_pearce

AtlantiS ATLANTIC CLIMATE AND ENVIRONMENT IMPACTS

www.atlantis.ac.uk



www.oceanvision.org/mcdr-eiaf

mailing list for updates and engagement opportunities