**Supplementary material – information on data**

**Scientometrics**

**Overall query**

Date: October 14, 2023

(TITLE-ABS-KEY (

( "blue carbon" OR "ocean\* afforestation" OR "marine afforestation" )

OR ( "ocean\* alkalini\*ation" OR "ocean\* liming" OR "marine alkalini\*tion" OR "marine liming" OR "ocean\* alkalinity enhancement" OR “ocean\* alkalinity addition” )

OR ( ( "ocean\* fertili\*") OR ( ("iron fertili\*" OR "iron enrichment") AND ("ocean\*" OR "marine" OR "sea" OR "coastal") ) )

OR ( ("nitrogen fertili\*ation" OR "nitrogen enrichment" OR "phosphorus fertili\*ation" OR "phosphorus enrichment" OR "biochar" OR "dumping" OR "burial") AND ("ocean\*" OR "marine" OR "sea" OR "coastal") AND ("carbon sequestration" OR "CO2 sequestration" OR "carbon dioxide sequestration" OR "carbon storage" OR "CO2 storage" OR "carbon dioxide storage" OR "carbon capture and storage" OR "CO2 capture and storage" OR "carbon dioxide capture and storage" OR "carbon removal" OR "CO2 removal" OR "carbon dioxide removal" OR "sequestration of carbon " OR " sequestration of CO2" OR "storage of carbon" OR "storage of CO2" OR "capture and storage of carbon" OR "capture and storage of CO2" OR "removal of carbon" OR "removal of CO2" OR "CDR") )

OR ( ("artificial upwelling" OR "artificial downwelling”) AND ("ocean\*" OR "marine" OR "sea" OR "coastal"))

OR ( ("enhanced weathering" OR “electrochemical weathering”) AND ("ocean\*" OR "marine" OR "sea" OR "coastal" OR "beach") )

OR ( ("carbon sequestration" OR "CO2 sequestration" OR "carbon dioxide sequestration" OR "carbon storage" OR "CO2 storage" OR "carbon dioxide storage" OR "carbon capture and storage" OR "CO2 capture and storage" OR "carbon dioxide capture and storage" OR "sequestration of carbon " OR " sequestration of CO2" OR "storage of carbon" OR "storage of CO2" OR "capture and storage of carbon" OR "capture and storage of CO2" OR "BECCS") AND ("ocean\*" OR "marine" OR "sea" OR "coastal" OR "seagrass" OR "mangroves" OR "macroalgae" OR "salt marshes") )

OR ( "ocean\* storage" OR "ocean\* sequestration" )

OR ( ("carbon removal" OR "CO2 removal" OR "carbon dioxide removal" OR "removal of carbon" OR "removal of CO2" OR "CDR") AND ("ocean\*" OR "marine" OR "sea" OR "coastal" OR "seagrass" OR "mangroves" OR "macroalgae" OR "salt marshes") )

OR ( ("extraction of carbon" OR "extraction of CO2" OR "carbon extraction" OR " CO2 extraction " OR " carbon dioxide extraction") AND ("seawater") )

OR ( ("climate change mitigation" OR "climate mitigation" or "climate intervention\*") AND ("ocean\*" OR "marine" OR "sea" OR "coastal" OR "seagrass" OR "mangroves" OR "macroalgae" OR "salt marshes") )

OR ( "ocean\* geoengineer\*" OR "ocean\* geo-engineer\*" OR "ocean\* climate engineer\*" OR "ocean\* negative emission" OR "ocean\* NETs" OR "marine geoengineer\*" OR "marine geo-engineer\*" OR "marine climate engineer\*" OR "marine negative emission" OR "marine climate change solutions")

))

AND PUBYEAR > 1959 AND PUBYEAR < 2024

**Query for individual methods and umbrella terms**

**Blue Carbon**

TITLE-ABS-KEY ( "blue carbon" OR "ocean\* afforestation" OR "marine afforestation" )

AND (PUBYEAR > 1959 AND PUBYEAR < 2024)

**Ocean Alkalinization & Weathering**

TITLE-ABS-KEY ( ( "ocean\* alkalini\*ation" OR "ocean\* liming" OR "marine alkalini\*tion" OR "marine liming" OR "ocean\* alkalinity enhancement" OR “ocean\* alkalinity addition” ) OR ( ("enhanced weathering" OR “electrochemical weathering”) AND ("ocean\*" OR "marine" OR "sea" OR "coastal" OR "beach") ) )

AND (PUBYEAR > 1959 AND PUBYEAR < 2024)

**Ocean Fertilization**

TITLE-ABS-KEY ( ( "ocean\* fertili\*") OR ( ("iron fertili\*" OR "iron enrichment") AND ("ocean\*" OR "marine" OR "sea" OR "coastal") )

OR ( ("nitrogen fertili\*ation" OR "nitrogen enrichment" OR "phosphorus fertili\*ation" OR "phosphorus enrichment") AND ("ocean\*" OR "marine" OR "sea" OR "coastal") AND ("carbon sequestration" OR "CO2 sequestration" OR "carbon dioxide sequestration" OR "carbon storage" OR "CO2 storage" OR "carbon dioxide storage" OR "carbon capture and storage" OR "CO2 capture and storage" OR "carbon dioxide capture and storage" OR "carbon removal" OR "CO2 removal" OR "carbon dioxide removal" OR "sequestration of carbon " OR " sequestration of CO2" OR "storage of carbon" OR "storage of CO2" OR "capture and storage of carbon" OR "capture and storage of CO2" OR "removal of carbon" OR "removal of CO2" OR "CDR") ) )

AND (PUBYEAR > 1959 AND PUBYEAR < 2024)

**Upwelling & Downwelling**

TITLE-ABS-KEY ( ("artificial upwelling" OR "artificial downwelling”) AND ("ocean\*" OR "marine" OR "sea" OR "coastal") )

AND (PUBYEAR > 1959 AND PUBYEAR < 2024)

**Ocean CCS**

TITLE-ABS-KEY ( ( "carbon capture and storage" OR "CO2 capture and storage" OR "carbon dioxide capture and storage" OR "capture and storage of carbon" OR "capture and storage of CO2" OR "BECCS") AND ("ocean\*" OR "marine" OR "sea" OR "coastal" OR "seagrass" OR "mangroves" OR "macroalgae" OR "salt marshes") )

AND (PUBYEAR > 1959 AND PUBYEAR < 2024)

**Ocean NETs, CDR & Geoengineering**

TITLE-ABS-KEY ( "ocean\* negative emission" OR "ocean\* NETs" OR "marine negative emission"

OR ( ("carbon removal" OR "CO2 removal" OR "carbon dioxide removal" OR "removal of carbon" OR "removal of CO2" OR "CDR") AND ("ocean\*" OR "marine" OR "sea" OR "coastal" OR "seagrass" OR "mangroves" OR "macroalgae" OR "salt marshes") ) )

OR ("ocean\* geoengineer\*" OR "ocean\* geo-engineer\*" OR "ocean\* climate engineer\*" OR "marine geoengineer\*" OR "marine geo-engineer\*" OR "marine climate engineer\*" )

AND (PUBYEAR > 1959 AND PUBYEAR < 2024)

**CDR & NETs**

TITLE-ABS-KEY ( "negative emission" OR "net emission\* tech\*" OR "negative emission\*" OR "CO2 removal" OR "carbon dioxide removal" OR "removal of CO2" )

AND (PUBYEAR > 1959 AND PUBYEAR < 2024)

**Geoengineering**

TITLE-ABS-KEY ( "geoengin\*" OR "geo-engin\*")

AND (PUBYEAR > 1959 AND PUBYEAR < 2024)

**Semi-structured interviews**

To gather the perspectives and experience of actors themselves, we conducted 18 interviews with researchers, scientific managers and public servants between November 2021 and February 2022. Interviewees were selected based on their expertise and ability to reflect on past and current scientific and policy debates on ocean-based climate intervention.

|  |  |  |  |
| --- | --- | --- | --- |
| **Number** | **Position** | **Date** |  |
| 1 | Civil servant | 16 November 2021 | Online |
| 2 | Researcher | 13 November 2021 | Online |
| 3 | Researcher | 17 November 2021 | Online |
| 4 | Researcher | 19 November 2021 | Online |
| 5 | Researcher | 22 November 2021 | Online |
| 6 | Researcher | 23 November 2021 | Online |
| 7 | Researcher | 23 November 2021 | Online |
| 8 | Civil servant | 25 November 2021 | Online |
| 9 | Researcher | 25 November 2021 | Online |
| 10 | Researcher | 26 November 2021 | Online |
| 11 | Civil servant | 01 December 2021 | Online |
| 12 | Researcher | 02 December 2021 | Online |
| 13 | Researcher | 17 December 2021 | Online |
| 14 | Researcher | 21 December 2021 | Online |
| 15 | Researcher  | 17 January 2022 | Online |
| 16 | Researcher | 18 January 2022 | Online |
| 17 | Researcher  | 28 January 2022 | Online |
| 18 | Researcher | 7 February 2022 | Online |

**Key events considered**

|  |  |  |
| --- | --- | --- |
| **Name** | **Date** | **Type** |
| Workshops on Ocean-based CDR Opportunities and Challenges, by NASEM (4 parts)<https://www.nationalacademies.org/our-work/a-research-strategy-for-ocean-carbon-dioxide-removal-and-sequestration#sectionPastEvents> (accessed January 4, 24) | 19 January 20213 February 202125 February 202125 March 2021 | Online |
| High-Level Launch - First International Ocean Decade Conference <https://www.youtube.com/watch?v=BPBjWEe9IIM> (accessed January 4, 24) | June 2021 | Online |
| 1st Annual Conference for Carbon Removal Law and Policy: Exploring Ocean Based Approaches to CDR, by the Institute for Carbon Removal Law and PolicyN/A | 22 September 2021 | Online |
| The Potential Role of Ocean-Based Carbon Removal Approaches, by Northwestern University | 5 November 2021 | Online |
| A Research Strategy for Ocean Carbon Dioxide Removal and Sequestration: Report Release, by NASEM<https://www.nationalacademies.org/event/12-08-2021/a-research-strategy-for-ocean-carbon-dioxide-removal-and-sequestration-report-release> (accessed January 4, 24) | 8 December 2021 | Online |
| Carbon Dioxide Removal as an Ocean Climate Solution: urgently taking a precautionary approach, by Ocean Conservancy and Woods Hole Oceanographic Institution<https://www.youtube.com/watch?v=53p1OEPm5-4> (accessed January 4, 24) | 15 November 2022, COP27 | Online |
| Ocean-Based Carbon Dioxide Removal, by Sustainable Population Australia (SPA)N/A= | 16 November 2022, COP27 | Online |
| Carbon Dioxide Removal (CDR) in the IPCC WG III Report, by the IPCC<https://www.youtube.com/watch?v=lmOEFC4o_Ic> (accessed January 4, 24) | 17 November 2022, COP27 | Online |
| Ocean-climate progress in the GST and synthesizing environmental and social impacts of related solutions, by Whale and Dolphin Conservation (WDC), Connecticut State University System (SCSU) and Ocean Conservancy (OC)<https://www.youtube.com/watch?v=HmlPSrpyxjA> (accessed January 4, 24) | 12 June 2023, SB58 | Bonn |
| The GST and Ocean-based CDR, by Plymouth Marine Laboratory (PML), American Geophysical Union (AGU), Plateforme Océan et Climat (POC), University of California and Woods Hole Oceanographic Institution (WHOI)<https://www.youtube.com/watch?v=a2MGPt2Q2CI> (accessed January 4, 24) | 12 June 2023, SB58 | Bonn |
| Including Coastal Ecosystems in NDCs for Mitigation and Adaptation<https://www.youtube.com/watch?v=Ttg2ARfNSvU> (accessed January 4, 24) | 13 June 2023, SB58 | Bonn |
| UNFCCC Ocean Dialogue<https://unfccc.int/event/ocean-and-climate-change-dialogue-2023-day-1> (accessed January 4, 24) | 13 June 2023, SB58 | Bonn |