QUARTERLY REVIEW I (PART 3): MARINE GEOENGINEERING – ONGOING AND PLANNED OPEN-OCEAN TRIALS AND RECENT DEVELOPMENTS IN RESEARCH

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By Anja Chalmin

The third and final part of this quarterly review provides an overview of planned greenhouse gas removal (GGR) projects and outdoor trials affecting the marine environment. The new year has seen an increase in the number of planned marine geoengineering open-air trials, research projects and funding programmes. Many of the approaches to marine geoengineering involve technologies to remove greenhouse gases, particularly CO_2, from the atmosphere, including ocean fertilisation, enhanced weathering, artificial upwelling or the proposal to dump biomass on the seabed. But there are other approaches as well: The Artic Ice Project is aiming to cover large areas of sea ice with reflective substance. In addition, the seabed is being considered as a storage site for captured CO_2 at many locations. There are various proposed explanations for the increase in marine GGR projects, including growing technical and political challenges for GGR projects on land, commercial interests – where marine GGR projects have been set up by

entrepreneurs or are intended to appeal to entrepreneurs, and also the higher concentration of CO_2 in water compared to ambient air. But one commonality among the various approaches to marine geoengineering is that they do not address the root cause of climate change. Additionally, marine geoengineering is associated with numerous and sometimes unpredictable risks to the marine environment, e.g., threats to the marine food web, oxygen depletion, increased release of methane, potential effects on marine biochemical processes, harmful toxin-producing algal blooms as well as potential transboundary effects on fisheries, coastal communities and weather patterns. None of the proposed marine geoengineering technologies have proven successful so far – although some of them have been researched for decades. The potential risks alone speak against their use as well as further research.

MARINE GEOENGINEERING – ONGOING AND PLANNED FIELD TRIALS

Fig 1: ongoing and planned marine field trials. Source: world map on geoengineering map, prepared by ETC Group and the Heinrich Boell Foundation

Table 1: Planned and ongoing marine field trials

Project	Type of GE	Location(s)	Period of time	Scale
Arctic Ice Project (former Ice911)	reflective substance for covering Arctic or land ice	Svalbard, Norway	not available	not available
-“-	-“-	North Meadow Lake, USA	since winter 2015/2016	17,500 m² (not available since 2019)
-“-	-“-	Lake Elmo, USA	since ~2012	pond, 27m diameter
-“-	-“-	Lake Serene, USA	since ~2014	not available
-“-	-“-	and further sites, e.g., Canadian SERF, Fram Strait, Beaufort Gyre		
Bright Ice Initiative	Please see Arctic Ice Project	Himalaya, Greenland, further locations	Since March 2022	not yet available
WhaleX: University of Sydney & partners	OF	off Port Botany in New South Wales, Australia	December 2021	300 l of nutrient solution
-“-	-“-	-“-	January 2022 (?)	2,000 l of solution
-“-	-“-	-“-	not available	trial area: 225 km²
Centre of Climate Repair (CCRC) & local partner	OF	Arabian Sea, India	~April 2022	not available
-“-	-“-	Hawaii, USA	not available	not available
-“-	-“-	South Korea	not available	not available
OPR Alaska Inc. (former Planktos Inc.)	OF	Gulf of Alaska, south of Kodiak	not available, three-year project	100 t of iron fertilizer, over ~26,000 km²

Oceaneos	OF	Coast off Peru	not available	Departments of Ica, Arequipa y Moquegua
-“-	-“-	Coast off Chile	not available	10 t of iron fertilizer
Climos Inc.	OF	not available	not available	not available
Nualgi America Inc	OF	not available	not available	not available
Project Vesta	EW	Northern Caribbean	announced for 2022	two beaches
-“-	-“-	Project Vesta is looking for further trial sites, e.g., in the US, France, in the Caribbean, and India	not available	not available
OceanNETs project	EW	off Bergen, Norway	May 2022	offshore trials in mesocosms
RETAKE project	EW	Baltic Sea	not available	offshore trials in mesocosms
Planetary Technology Inc.	EW	not available	not available	demonstration plant
ONCE project	AU, EW	off China	since 2020	test platform in the open sea
Ocean-Based Climate Solutions	AU	Canary Island waters, Spain	July 2022	demonstration-scale trial
Blue Fields project	AU	off West Hawaii, USA	not available	40 m² swimming platform, 300 m pipes
Trophic	AU	Gulf of Maine, USA	since ~2020	small-scale trial
Seafields Solutions Ltd.	AU	off Cape Verde	spring 2023	technology test
-“-	Algae, AU	off Ascension, UK	2023	pilot plant
Running Tide	Algae	Gulf of Maine, USA	since 2018	small-scale pilot trial

SeaCURE project	Marine CDR	not available	not available	pilot plant
AIMS3 project (example project, many marine	CO_2 storage	“Mid-Atlantic Ridge”	not available	drilling and CO_2 injection

ARCTIC ICE PROJECT: MANY TONS OF COVER SUBSTANCE ARE TO BE DEPLOYED IN SENSITIVE ARCTIC AREAS

The Arctic Ice Project suggests covering land and sea ice in the arctic with a layer of floating reflective substance to slow down the melting of the ice and/or to restore the ice. The proposed cover substance is a reflective silica glass, consists mostly of silicon dioxide and has the form of tiny hollow glass spheres. Since 2018, the project looks for funding and governmental permissions to carry out large-scale testing and deployment, proposing to cover up to 100,000 km^2 with silica glass, e.g., in selected arctic regions or in glacier areas. At a large scale, the project would involve spreading tonnes of cover material, which may severely impact animals and plants as well as change global weather patterns in unpredictable ways. Since 2010, the Arctic Ice Project has conducted outdoor trials at six field sites and is currently conducting field trials on frozen lakes at three sites during the winter months. The project’s largest test site is the Arctic North Meadow Lake near Utqiagvik in Alaska. Further tests have been conducted at Lake Elmo, Minnesota and Serene Lake, California. At the end of December 2021, the Arctic Ice Project reported a multi-year, multi-million-dollar collaboration with the Norwegian research organisation SINTEF. In addition to financial support, SINTEF will also provide field support for the experiments. The Arctic Ice Project has been planning to test its cover substance on sea ice for some time – and this is now planned to happen in cooperation with SINTEF: „*SINTEF scientists have already identified field test locations in Svalbard, north of the Arctic Circle […]. We still need to secure permits and additional funding*“

The **Bright Ice Initiative** has the same founder, Leslie Field, as the Arctic Ice Project (AIP). The Initiative was registered in California in March 2022 and is seeking funding to conduct outdoor tests using the AIP technology described above in the Himalayas and Greenland. According to the Initiative’s website, other possible test sites with sea and glacier ice are in the company’s focus, including Iceland, Canada and Alaska. At this stage, it is not yet clear how the Artic Ice Project and

the Bright Ice Initiative will collaborate. In mid-March 2022, Leslie Field and Tom Light, AIP's executive director, jointly campaigned for funding and permits for outdoor testing.

SEVERAL COMPANIES AND RESEARCH PROJECTS ARE ENDANGERING THE MARINE ENVIRONMENT WITH THEIR PLANS TO DUMP FERTILIZER IN OCEAN AREAS

The companies and research institutions currently conducting or planning ocean fertilization experiments are located in North America, the UK and Australia. However, many of the experiments are planned for the coasts of other countries.

The WhaleX project aims to conduct a larger-scale ocean fertilization experiment off the Australian coast. This would follow their first experiment in December 2021, dumping 300 litres of fertilizer into the ocean off Sydney. The trials are led by Edwina Tanner, University of Sydney. The Australian Ocean Nourishment Corporation (ONC) is another participant in the project. ONC is a commercial company, which has been advertising its self-developed ocean fertilization technology since 2004. In 2007, ONC tried to add 500 tonnes of urea to the Sulu Sea, between Malaysia and Philippines. A campaign organised by a coalition of civil society groups and Philippine government forced ONC to cancel the trial. In Morocco, ONC also attempted unsuccessfully to conduct an experiment on ocean fertilization. As the term ocean fertilization is – rightly – associated with negative impacts, for example on marine food chains, ONC has since avoided the term ocean fertilization. In the last decade, ONC has tried to market its ocean fertilization technology under terms such as 'ocean nourishment' or 'ocean restoration'. Since last year, ocean fertilization has increasingly been marketed as 'simulated whale poo'. No matter what the dumping of fertilizers into the ocean is called, the multiple risks to the marine environment stay the same. For January 2022, WhaleX had announced 2000 litres of nutrients to be dumped into the ocean – there is no publicly available information on whether this follow-up trial has taken place. Later, WhaleX plans to conduct trials on 225 km² of ocean off the Australian coast.

The Centre of Climate Repair (CCRC) Cambridge University, is coordinated by David King and is part of the University's Cambridge Zero programme. In 2020, David King announced plans to conduct ocean fertilization with iron at three locations across the world's oceans over the next four years. To implement the trials, the CCRC established relationships with the National Institute of Oceanography Goa in India, the US-based University of Hawaii and Incheon University in South Korea. The first

trial will be conducted by April 2022 and plans to dump fertilizer into the Arabian Sea, west of India. Information on the exact location and scale of the trial is not publicly available. The CCRC announced a three-week trial period and plans to mix the fertilizer, which contains nitrates, phosphates and iron, with rice husks. CCRC's Indian research partner, the National Institute of Oceanography Goa, participated in the LOHAFEX experiment, an ocean fertilization trial conducted in 2009. No trial period has yet been announced for the two planned follow-up trials, off the South Korean and Hawaiian coasts.

Russ George, founder of OPR Alaska Inc. (formerly Planktos Inc.) announced plans for a new ocean fertilization project. This time, he aims to dump 100 tonnes of iron fertilizer into the Gulf of Alaska, south of Kodiak. The trial aims to stimulate the growth of phytoplankton and the phytoplankton is supposed to store carbon as it dies and sinks to the ocean floor. There is no scientific evidence that this works – but there are warnings from scientists about the possible negative effects of such experiments, including toxic algal blooms. Toxic algal blooms occur regularly in the Gulf of Alaska, endangering fisheries as well as humans and wildlife. The mere risk that iron fertilization could increase and cause toxic algal blooms is a clear argument against conducting such a trial. Russ George has been trying to conduct ocean fertilization trials since 2002, when his company Planktos conducted a first ocean fertilization trial off Hawaii. In 2007, protests prevented another trial from being carried out in the waters off the Canary Islands. In 2008, the company intended to conduct an ocean fertilization trial near the Galapagos Islands, but this was prevented by the governments of Ecuador and Spain. In 2012, Russ George was involved in an ocean fertilization trial in the Pacific Ocean west of the Haida Gwaii Islands. At a hearing before the Alaska Senate on 8 March 2021, Russ George claimed that he had the full support of the Canadian government for the Haida Gwaii trial. The Haida Gwaii Observer stated in 2018: "*Canada's environment minister called the experiment "rogue science" and launched a legal investigation*". Since around 2020, Russ George has been trying to market ocean fertilization under various company names and websites, including OPR World Inc., OPR Alaska, OPR New England and Pasture Partners.

Since 2016, **the Canadian organization Oceaneos** is seeking permits from the Chilean government to trial ocean fertilization, aiming to release up to ten tonnes of iron. In Peru, Oceaneos has similar plans. Chilean and Peruvian scientists criticised these plans and Oceaneos applications for the trials were not approved. In early 2022, the Oceaneos office in Chile announced a research mission to survey plankton and seawater chemistry in the Humboldt Current off the north coast of Chile. The

research project is expected to last up to eight months and includes a ten-day cruise. Oceaneos is currently recruiting several staff to implement the project. As in Peru in 2020, Oceaneos now appears to have received approval for marine research in Chile. The company's website makes it clear that Oceaneos plans for ocean fertilization are still being considered. Some of the people involved in Oceaneos are the same people who formed the Haida Salmon Restoration Corporation, involved in the 2012 Haida Gwaii ocean fertilization event west of Canada.

In 2010, **the US-based company CLIMOS Inc.** proposed an ocean fertilization trial, aiming to cover four million hectares of ocean surface. CLIMOS raised US$ 3.5 million, including funds from Tesla founder Elon Musk. Shortly thereafter, the company stopped its plans on the grounds that they had not raised enough funds to carry out the planned experiment. Since 2020, CLIMOS is active again and wants to pour iron into large ocean areas once more. There is no publicly available information on the financing and the exact plans.

Since 2021, the California-based manufacturer of aquarium fertilizer, **Nualgi America Inc, has promoted** its self-manufactured fertilizers for ocean fertilization under the brand Aquaritin.

ENHANCED WEATHERING TRIALS PLAN TO SPREAD GROUND ROCK MATERIAL ALONG COASTS AND ON THE SEA SURFACE

The **San Francisco-based Project Vesta** aims to trial enhanced weathering with mined and ground olivine on an experimental site in the Northern Caribbean, probably on beaches in the Dominican Republic. The trial has already been postponed several times and is currently announced for 2022. In late 2021, the project started seeking staff for a site in the northern Caribbean. At the same time, the project is looking for new trial sites, e.g., in the US, France, in the Caribbean, and India.

The **pan-European research project OceanNETs** (Ocean-based Negative Emission Technologies) plans to conduct offshore experiments in so-called mesocosms (large test tubes) to dissolve alkaline minerals and test marine enhanced weathering in sea water. The project is coordinated by the GEOMAR Helmholtz Centre for Ocean Research Kiel and conducted in cooperation with 13 partner organisations from Norway, Germany, UK, Finland, Spain and Australia. The offshore trial is scheduled for May 2022, off Bergen, Norway. An offshore trial off Gran Canaria, Spain, was already completed in 2021. In December 2021, the GEOMAR team made the following statements on the large-scale use of enhanced weathering:

- *"Mining, milling, and transporting minerals would require an industry equivalent to coal mining, since sequestering one ton of CO2 would require between one and five tons of mineral"*
- *"We need years to reach a point where we understand the risks to some extent. We will never fully understand those risks"*

GEOMAR is also leading the **German research project RETAKE** (Carbon Dioxide Removal by Alkalinity Enhancement: Potential, Benefits and Risks), a project funded by the German Federal Ministry of Education and Research. RETAKE aims to research the potential to increase the alkalinity of seawater by adding finely ground rock, with the intention of binding more CO_2 in seawater. Offshore experiments in mesocosms in the Baltic Sea will be conducted to test ocean alkalinity enhancement in a marine environment. For this purpose, olivine from Norway is ground into fine rock powder.

CURRENT PLANS TO TEST ARTIFICIAL UPWELLING

The **New Mexico-based company Ocean-Based Climate Solutions** developed the Oxygenator, an artificial upwelling device with a pipe 2.4 metres in diameter and 400 metres long. In December 2021, the company announced a demonstration-scale trial in Canary Island waters for July 2022. There are no exact details yet on the exact location, duration and scale of the trial.

Since 2020, **researchers at Xiamen University**, in Fujian, China conduct the research project Ocean Negative Carbon Emissions (ONCE). The project aims to look into ocean alkalinity enhancement and artificial upwelling. The researchers have set up a test platform to conduct trials in the open ocean, e.g., on artificial upwelling. The upwelling is caused by air bubbles.

The **US-DOE financed Blue Fields Demonstration Project** plans to pilot an artificial upwelling project, aiming to supply a macroalgae farm with nutrients by upwelling Deep Ocean Water. The proposed trial site is about three kilometres offshore of Kailua-Kona, West Hawaii, near Pawai Bay. The upwelling devices include a 40 m^2 swimming platform and wave-powered pumps with pipes reaching a depth of up to 300 metres. The project applied for the necessary State and Federal permits for deployment and is designed for a period of three years. Desired start time was October 2019. As of March 2022, there is no sign that the project has started, it still seems to be awaiting approval for the open sea trial.

The **companies Trophic and Seafields Solutions Ltd.** aim to combine

artificial upwelling with plans to harvest seaweed in the open ocean and sink the harvested biomass to the seabed as a carbon dioxide removal (CDR) measure. (please see below)

PLANS TO DUMP BIOMASS IN THE OCEAN AS A CDR MEASURE

Running Tide Technologies Inc., a company based in Portland, Maine, founded by Marty Odlin, plans to grow kelp in the open ocean and sink it to the seabed at a depth of 1,000 metres for carbon storage. Since 2018, the company is conducting a pilot trial off the coast of the Gulf of Maine. The trial site is used to grow kelp plants attached to biodegradable buoys. After seven months, the kelp plants are supposed to become too heavy and sink. In January 2022, Running Tide applied for another trial site, about 120 kilometres off the coast of Massachusetts, aiming to conduct a demonstration-scale trial. While awaiting the permission, the company is conducting further research in cooperation with Ocean Visions Inc., an organisation that supports the development and testing of approaches to removing carbon dioxide from the ocean.

The **Californian company Trophic** aims to combine the cultivation of seaweed in the open ocean with a wave-powered artificial upwelling system. The algae biomass is to be sunk in the deep sea for carbon storage, but also used for protein extraction. The company is currently demonstrating a small-scale model project ten kilometres off the coast of New Hampshire, in the Gulf of Maine. However, Trophic intends to build a larger offshore algae farm for biomass production using wave-driven artificial upwelling.

The **UK-based Seafields Solutions Ltd.**, founded in April 2021, aims to cultivate the fast-growing and invasive seaweed *Sargassum spp.* in the open sea, press the harvested seaweed into bales and sink it into the deep sea. The company intends to combine seaweed cultivation with artificial upwelling, aiming to enhance the nutrient supply. Seafields plans to collaborate with Carbonwave (former C-Combinator) to explore ways of using sargassum as a raw material, such as a plastic substitute, construction material or filler. The upwelling technology for the trial is to be tested off the coast of Cape Verde in spring 2023. Around 2023, the first pilot project is expected to take place near Ascension Island.

It is unclear what happens to the biomass once it reaches the seabed and whether any sensitive underwater ecosystems may be damaged. In addition, some algae species are invasive, such as the *Sargassum spp.* proposed by Seafields Solution, which is already causing problems on beaches.

FURTHER MARINE GEOENGINEERING PROPOSALS

The project **Sea Carbon Unlocking and Removal (SeaCURE)** is led by the University of Exeter (UK) and aims to make seawater temporarily more acidic so that the CO_2 contained in the water "bubbles out". This CO_2 is captured, concentrated, compressed and then "stored". The water will be returned to the ocean, where it is supposed to be able to absorb new CO_2 from the air. The project aims to optimise this approach and test it in a pilot plant. In the long term, SeaCURE hopes to remove CO_2 on a megaton scale.

The **Canadian company Planetary Technology, Inc.** (former Planetary Hydrogen), founded by Greg Rau, Mike Kelland and Brock Battochio, is developing and commercialising a technology described as ocean alkalinity enhancement (OAE). The technology is called SeaOH2 and aims to mimic natural weathering. The SeaOH2 process uses electrolysis to extract hydrogen (H_2) and oxygen (O_2) from water – meaning that electricity is used to split water into H_2 and O_2. By adding a mineral salt derived from alkaline rock tailings, the electrolysis cell also produces a by-product called mineral hydroxide. Planetary states that this alkaline hydroxide, when discharged into the ocean, combines with CO_2 to forms a bicarbonate. This process will now be further researched and developed. The company aims to establish a demonstration plant in Halifax in early 2022 and is conducting research in collaboration with both Dalhousie and Miami University. In March 2022, Planetary raised CAD 7.8 million in funding. The SeaOH2 process has been developed at the U.S. Naval Research Laboratory (NRL) since 2016. Greg Rau joined the studies at the NRL in 2018 and has been working to commercialize the SeaOH2 process since 2019.

The **German research project AIMS^3** (Alternate scenarios, Innovative technologies, and Monitoring approaches for Sub-Seabed Storage of CO_2), funded by the German Federal Ministry of Education and Research and led by the Centre for Marine Environmental Sciences at Bremen University, aims to investigate the storage of CO_2 in the upper ocean crust. The project is conducted in cooperation with the GEOMAR Helmholtz Centre for Ocean Research, Frauenhofer Institute, and Sea & Sun Technology. AIMS^3 seeks to investigate the storage of CO_2 in the form of carbonates. Laboratory studies are planned for this purpose, but also investigations in the open sea, in the Mid-Atlantic. The exact location and scope of the field tests have not yet been announced.

MARINE GEOENGINEERING – RECENT DEVELOPMENTS IN RESEARCH

The UK greenhouse gas removal programme was launched in in 2017. Since 2021, the programme has been part of the UK's £ 1 billion Net Zero Innovation Portfolio. Within this framework, a number of new calls for proposals have been published since 2021, e.g., on DAC, BECCS and CCUS. In 2022, the first 24 projects were approved, including projects to research CO_2 removal from seawater (SeaCURE) and ocean alkalinity enhancement (Planetary Hydrogen Inc.).

In March 2022, a kick-off meeting was held with **the research projects of CDRmare – Marine carbon sinks in decarbonisation pathways** – a research mission of the German Marine Research Alliance (DAM). In six research projects, CDRmare aims to investigate the CO_2 uptake capacity of the oceans. The research programme was launched in August 2021 and is funded by the German Federal Ministry of Education and Research (BMBF) with € 26 million. Five of the six projects deal with geoengineering technologies such as underground storage of CO_2 in geological formations (GEOSTOR, AIMS3), artificial upwelling (Test-ArtUp) or increasing the alkalinity of seawater (RETAKE). The ASMASYS project addresses legal, social and ethical aspects of marine greenhouse gas removal (GGR) as well as the political framework for marine GGR and current hurdles for field studies. GEOMAR leads three of six research projects (Test-ArtUp, GEOSTOR, RETAKE).

Ocean Visions was founded in 2019 by various universities and educational institutions in the United States to accelerate the development and testing of ocean-based CDR approaches. In 2021, Ocean Visions launched the Ocean Visions Launchpad – an initiative that provides technical and financial support to selected participants in Elon Musk's XPRIZE for carbon removal competition. The selected teams, announced in February 2022, include Captura, Ebb Carbon, Running Tide, Seafields, TROFX.

Ebb Carbon wants to commercialize an approach to bind CO_2 and remove acid from the ocean. The approach seeks to electrochemically convert CO_2 into bicarbonate and sink the bicarbonate in the deep sea. In this electrochemical process an acid (hydrochloric acid) and a base (sodium hydroxide, NaOH) are produced from seawater. The NaOH solution is returned to the ocean and is intended to increase the ocean's ability to store atmospheric CO_2 in the form of bicarbonate. The acid will be sold as an industrial product, e.g., for use in mines. The Californian company Ebb Carbon emerged from the SEA MATE (Safe Elevation of

Alkalinity for the Mitigation of Acidification Through Electrochemistry) research project in 2021. SEA MATE was conducted by Stony Brook University, the University of Washington and the National Oceanic and Atmospheric Administration (NOAA).

Captura, launched by the California Institute of Technology (Caltech) in ~2021, aims to develop a CO_2 capture and sequestration technology to capture CO_2 from seawater. The electrochemical approach splits seawater molecules into acids and bases. By shifting the pH in seawater, CO_2 is supposed to release from carbonates and bicarbonates. Captura plans to capture the dissolved CO_2 and store it "in depleted offshore oil wells and other locations".

The **Swiss-based company Atmospheric Methane Removal (AMR AG)**, founded by Oswald Petersen and around 15 shareholders, proposes to eliminate methane from the atmosphere by introducing iron-salt aerosols (ISA) into the lower atmosphere. ISA is supposed to initiate oxidation processes that convert the greenhouse gas methane into CO_2 and water molecules. Franz Oeste (gM-Engineering) is a member of the AMR AG's scientific advisory board and the AMR approach is based on the ISA method patented by Franz Oeste. The AMR AG markets the ISA method in several ways – in addition to the AMR AG website, the Cool Planet Earth website has been set up. A large part of the AMR board is also involved in the UK-based organisation Restore Our Climate, which advocates the use of the ISA method. ISA is to be released into the atmosphere from drilling platforms to spread over a large area of the ocean. For this purpose, 400-metre-high towers are to be installed on decommissioned drilling platforms. The AMR AG aims to remove half of the world's methane from the atmosphere each year by installing 40 towers and dispersing 1.8 million tonnes of ISA annually. The company has suggested the Pacific Ocean near Chile or the Atlantic Ocean near Namibia as possible locations for the dispersion towers. Marine GGR projects are increasingly moving into the focus of geoengineers, partly because geoengineering projects on land must deal with growing technical and political challenges. Despite the many risks associated with marine geoengineering, the number of companies, research projects and outdoor experiments active in this field is currently increasing. The outdoor experiments stretch from the coasts to the open ocean and are often associated with the input of large quantities of substances, for example chemical fertilisers. The idea of dumping carbon-rich biomass in the ocean is also attracting greater attention. Although many of the research activities and experiments are funded by taxpayers, it is increasingly difficult to obtain information on the planning, progress and results of the projects and experiments. The data situation is often very opaque, one example being the publicly funded MCB trials in

Australia. Another visible trend is that projects are often developed in the Global North, but the implementation of experiments in the marine environment is then planned in the Global South, for example the planned experiments of the British CCRC and the Canadian Oceaneos. Other visible trends include projects that aim to capture CO_2 from ocean water – considering that CO_2 is an inert, i.e., non-reactive, substance, this approach is unlikely to be more successful than capturing CO_2 directly from the atmosphere, e.g., in terms of high energy consumption. The capture of methane from the atmosphere is also attracting increasing interest.