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# Demystifying Carbon Dioxide Removal

## June roundup

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Dear all,

Late last month, my colleagues and I spent four days filling our heads with information on carbon removal at the [negative emissions conference](#) in Oxford. Later in this newsletter, we share our key takeaways from the event. But first, we dive into recent stories on ocean CDR and public backlash to CDR projects. We also discuss the announced closure of ocean CDR company Running Tide, and shed some light on Microsoft's huge new deal to plant trees in the Amazon, highlighting why preserving and restoring the forests we already have should be our main priority.

As always, please feel free to share this newsletter with anyone who may be interested. You can [sign up here](#), or [click here](#) to see previous editions. Don't hesitate to get in touch if you have any questions, suggestions or feedback.

Till next time,

Victoria

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Stat of the month

**146 billion tonnes:**

the amount of [emissions that could be released from vegetation if plant diversity worldwide is lost](#), equivalent to all CO2 emissions from fossil fuels and industry released globally over the past 4 years.



## Ocean removal highs and lows

In the media, ocean carbon removal techniques are receiving a lot of airtime. Equatic - which featured in [previous newsletters](#) - [announced it will start building a commercial scale facility in Canada](#). The USD 100 million plant, which should be in operation by 2026, will ultimately be [scaled to remove over 100,000 tonnes of carbon each year](#). “The plant will allow us to [get to below \\$100 per ton \(of CO2 removal\) by 2030](#),” Equatic COO Edward Sanders told Forbes. Sanders claims this would be possible due to the revenue from hydrogen that is created as a byproduct, and Equatic has already sold both credits and hydrogen to Boeing.

This price represents [a significant drop in the cost of carbon removal, even compared to Swiss company Climeworks’ projections](#) of its direct air capture costs. Climeworks aims to [drop its costs to between USD 400 and 600 per net tonne of carbon removed by 2030](#), anticipating a [50% reduction in costs from today](#) due to the use of new sorbent materials that consume half the amount of energy.

To build CDR projects to any meaningful scale, Equatic and other ocean CDR companies will have to build thousands of new facilities, costing billions of dollars and - more importantly - requiring massive levels of carbon-free energy. “[Removing already-emitted carbon is laughably small, incredibly expensive, and full of engineering obstacles](#),” Jonathan Foley, executive director of Project Drawdown, a nonprofit organisation focused on climate solutions, told National Geographic. “[Limited research on this should continue, but our time and resources should focus on cutting emissions as quickly as possible](#),” he added.

The US National Oceanic and Atmospheric Administration and the US Department of Energy recently signed an [agreement to collaborate on future marine CDR research and development](#). At the same time, NGOs like CIEL [warned against the inclusion of ocean geoengineering, including carbon removal approaches, in UN climate text](#).

Attention on ocean CDR has also come from the public - not always focusing on the positives. In a deep dive, Hakai Magazine explored [community backlash against initial trials of mineral sinking by Planetary Technologies in St Ives](#). Lack of early community engagement was “hard to dislodge” and resulted in [sceptics having “built up their brick walls”](#). While Planetary understands there will always be risks, it says the scale of these risks is most important. “[We get statements from people saying this trial could kill all things in the bay. There is no way that it could do that](#),” said Planetary CEO Mike Kelland. To answer questions about the technologies efficacy, trials will need to be done in the

open ocean. [“It’s the unknown unknowns that get you sometimes in nature,”](#) Professor David Ho told Hakai, “Things we didn’t think of.”

Another ocean CDR company, Vesta, is [moving ahead with trials of a similar approach in North Carolina](#), although the carbon removing mineral is applied to the sand instead of directly into the ocean.



**“Removing already-emitted carbon is laughably small, incredibly expensive, and full of engineering obstacles.”**

*Project Drawdown Executive Director  
Jonathan Foley*

## Ocean CDR closure

[Ocean CDR pack leader Running Tide announced earlier this month that it is shutting up shop.](#) In a [LinkedIn post](#), the company - which was exploring carbon removal via ocean alkalisation, macroalgae growing and biomass dumping - cited lack of demand as a key reason for the closure. The company [was listed in the top 10 CDR companies globally in terms of total removal to date](#), and had received over USD 54 million in funding.

While Running Tide was [praised as a frontrunner](#), it also received [criticism](#) over the scientific rigour of its practices. Icelandic newspaper Heimildin recently published [a three-month investigation](#) which found that Running Tide was not following the practices it claimed to use to sink biomass and store carbon in the ocean. Wil Burns, professor at Northwestern University, told Latitude Media that there was likely [enough demand in the voluntary market for the “very modest” amounts of CDR the company was able to offer](#), but the real issue was that [“the industry in general was ‘extremely skeptical’ of Running Tide’s approach to monitoring, reporting, and verification.”](#)

Ocean CDR non-profit Ocean Visions, which worked closely with Running Tide, wrote in support of the scientific research conducted by the company that [“it is simply not accurate to suggest that they did not make good faith efforts to do the needed science to support their activities.”](#) The non-profit reiterated that while the closure of Running Tide [“is a setback for mCDR \[marine-based CDR\] and for the nascent mCDR industry, it is not the end of mCDR”](#) and all types of ocean CDR should be explored.

Others believe closures are to be expected at this early stage in the industry. [“We expect more of this to happen in the coming months and years,”](#) Nan Ransohoff, head of Frontier, told Bloomberg. “That’s just a sign of what an early ecosystem looks like,” she added.

Former Running Tide employee Jordan Breighner told Nick van Osdol that [“If I learned anything from Running Tide, it’s that \[carbon removal\] is all politics, and politics is all storytelling. You have to out-storytell others.”](#) He adds that Running Tide “spent too much money on research, development, and science [rather than politics and communications.](#)”

As I discuss in the conference takeaways, for many ocean CDR approaches, perfect monitoring, evaluation and verification is simply not possible. Still, other companies, like Kelp Blue, are trying their hand at similar CDR approaches, such as [growing seaweed in the open ocean](#).

## Protecting forests > planting new ones

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Companies are continuing to make big investments in nature-based carbon credits. Microsoft has bought 8 million carbon credits in Brazil, in [“the largest known carbon dioxide removal credit transaction to date.”](#) The deal [aims to buy, lease or invest in farmland in the beef-producing state of Mato Grosso and convert it back to forest](#). Half of the land will be planted with native species and the other half will be planted with timber for logging - which is what makes the deal financially viable in the long run. The project, which will be undertaken by Brazilian timber company BTG TIG in partnership with nonprofit Conservation International, will take place over 135,000 hectares of farmland, [“an area nearly 23 times the size of Manhattan.”](#)

However, scientists have reiterated that the focus should remain on preserving biodiversity and restoring existing forests. Kate Dooley, from the University of Melbourne, wrote in The Conversation that [“The way we currently count carbon stores risk creating incentives to plant new trees rather than protect existing forests. Yet old-growth forests store vastly more carbon than young saplings.”](#) In Australia, which “is in the [top 10](#) list globally for tree cover loss”, preventing logging could [help conserve biodiversity and help reach net-zero targets](#).

New modelling studies also shed light on carbon uptake by plants. One [study published in Nature Communications](#) highlighted the importance of biodiversity, with researchers estimating that [“losing plant diversity worldwide could release up to 146 billion metric tons of carbon from vegetation”](#). This is equivalent to [all global CO2 emissions from fossil fuels and industry released between 2020 and 2023](#). Another study finds that plants [“store more carbon but for a shorter time frame”](#) than is [currently recognised in climate models](#). Lastly, [a recent paper](#) warned that even if we reduce the amount of carbon in the atmosphere, the reduced levels of rainfall in the Amazon would not be reversed, [leading to drought and weakening the ability of the world's largest tropical rainforest to take up carbon](#).



## Negative emissions conference

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In late June, hundreds of participants met in Oxford to discuss negative emissions. The conference spanned all areas of carbon removal, covering science, policy and research. Here are some key takeaways (for a comprehensive overview, see [Carbon Brief's write up](#)):

**There isn't one 'winning' CDR method.** Direct air capture continued to receive significant attention, biochar is being undertaken at the largest scale of all 'novel' CDR options and audience reactions imply ocean biomass sinking could be the least favourable approach. However, while some participants, particularly from the industry side, were keen to promote their approach as a champion, most scientists are still reluctant to put all their eggs in one basket.

**Valid concerns were raised over CDR posing a mitigation deterrence risk.** It is often cheaper for companies to offset their emissions than to reduce them, although offsetting is negligible when it comes to addressing emissions. Setting separate targets for emissions reductions and removals is a step in the right direction that will make it harder for offsets to continue being conflated with removals. However, speakers also suggested there are [not many reasons to think that we would have rapidly cut emissions if CDR was not on the table](#).

**Monitoring, reporting and verification (MRV) will be impossible to do perfectly for some CDR approaches.** There was a lot of discussion around whether we should strive for perfect or "good enough" MRV. Climate scientist Zeke Hausfather said we must be cautious of carbon negativity claims, but we can't let "perfection be the enemy of the good". In his presentation, oceanography Professor David Ho explained that it will not be possible to accurately monitor some ocean CDR approaches, like large-scale ocean alkalinity enhancement. Instead, we will have to rely on modelling.

**CDR will need more than the voluntary carbon market if it is to scale.** Many speakers did not have faith that the voluntary carbon market would enable CDR to scale to the billion tonne levels of carbon removal needed. Some speakers suggested that CDR would require increased demand and support from the government in the long term.

**The general public doesn't care about taking up carbon.** Research on public perceptions of CDR shows that people are much more likely to support CDR approaches if they protect nature or biodiversity, or if the method is perceived as 'natural'. Generally, carbon uptake is less of a priority.

**Misaligned carbon accounting methods for land have serious implications for carbon budgets.** There are significant differences between the scenarios used by the IPCC to model land emissions and the framework used by countries in their Nationally Determined Contributions, where land is divided into 'managed' and 'unmanaged' land. Among other complications, this means that [carbon budgets for achieving 1.5°C are reduced by 15-18%](#) when the two methodologies are compared, according to a study released last year. At the same time, it is difficult to change the way in which countries account for emissions and countries also have varying capacity for carbon accounting.

**There are still no agreed definitions of key terms like durability, residual emissions and hard-to-abate.** In his research, Harry Smith highlighted that out of 71 national climate strategies, [only 26 quantified residual emissions at the time of net-zero emissions](#). In a panel discussion, Holly Buck floated the idea of shifting away from a focus on what is technically or economically hard to abate, to how emissions are valued socially. In terms of durability, some believe there should be a like-for-like swap in credits, meaning balancing out emissions from fossil fuel requires storing carbon in geological formations for similar lengths of time (i.e. thousands of years).

**There is overall a lack of transparency from countries, a lot of missing data and many assumptions.** A major assumption that underpins CDR is that one tonne of CDR is equivalent to taking one tonne of CO<sub>2</sub> out of the atmosphere - but [research suggests these have slightly different effects](#). Additionally, projections on how much land would be required for nature-based methods don't add up. Some countries are [already pledging up to 257% of their land area for CDR](#).

**The net negativity of some CDR methods is less obvious.** For example, transporting biomass to burn it for bioenergy with carbon capture and storage (BECCS) or using natural gas as an energy source for direct air capture (DAC). While these approaches can technically be carbon negative if all stages of the lifecycle are monitored and undertaken efficiently, this may not occur in practice and will depend upon the fossil fuel companies deploying these technologies while perpetuating reliance on fossil infrastructure.

**Ultimately, it feels like views are split** between those who think we need to scale up CDR as fast as we can while taking on some risks, and those who think we need to think more carefully about the use of CDR.

## Emissions from BECCS

BECCS is often labelled as carbon removal or a negative emissions technology - but not everyone agrees. There are two ways you can look at emissions in the life cycle of a BECCS project, [explains Emily Pontecorvo in Heatmap](#). You can simply look at the movement of the carbon which was taken up from the atmosphere from a plant via photosynthesis and then ended up stored in the ground. Or you can look at the broader picture, taking into consideration the energy that goes into growing, harvesting and transporting the biomass and the emissions associated with building the infrastructure. With this second perspective, some agree that BECCS can actually end up emitting more carbon than it takes up. Sifan Chen from nonprofit Carbon180 told Heatmap that [“When it comes to ethanol with CCS, we want to see the actual net negativity.”](#)

For BECCS, the source of the biomass is also important. The Frontier Fund, a group for buying carbon removal services, recently announced it will pay Swedish Utility Exergi USD 48.6 million to finance its BECCS plant. The fund “[insists it has set stringent conditions](#), including the use of waste rather than purpose-grown biomass, and requirements to buy the material from highly regulated jurisdictions, like Sweden,” according to Bloomberg.

## Pick of the news

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[How Much Energy Would It Take to Pull Carbon Dioxide out of the Air?](#) (Wired)

Calculations from a physicist suggest that just to remove the amount of CO<sub>2</sub> we released in 2023, it would require 764 gigawatts of power - or more than 1,000 nuclear power plants. In short: “This tech won’t save us from climate catastrophe.”

[Why a tool to tackle climate change is struggling for cash](#) (BBC)

Peatlands want to be acknowledged as a carbon removal approach by the Science Based Targets Initiative (SBTI).

[The world's on the verge of a carbon storage boom](#) (MIT Technology Review)

A deep dive on the development of new permits for wells to store carbon dioxide in California and the associated benefits and risks.

[Why Big Tech Is Pumping Big Money Into Companies Pulling CO<sub>2</sub> From the Air](#) (Newsweek)

Tech companies are investing in CDR for a number of reasons - including pressure to decarbonise, supporting innovation and availability of financial resources to do so.

[Do We Really Need Carbon Removal? 5 Insights From World's Top Experts](#) (Forbes)

While some experts believe CDR is necessary in addition to mitigation, some warn that “CDR serves as a convenient cover to continue expanding fossil fuel extraction and usage.”

[Carbon-capture projects launch in Los Angeles County as CO<sub>2</sub> levels reach global records](#) (LA Times)

A partnership between Palmdale Water District in Los Angeles County and climate tech company Capture6 claims it will “not only provide residents with new water supplies, but will also help California achieve its goals of 100% renewable energy and carbon neutrality by 2045.”



## Useful resources:

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[Report](#): Boston Consulting Group released a new report which showed that “governments have five primary direct and indirect ways to boost demand for durable CDR, which vary significantly in terms of the amount of demand created.”

[Paper](#): Scientists think the role of phytoplankton has been overlooked in ocean CDR: “if CO2 removal techniques change the appetite of tiny animals at the base of the food chain, that could dramatically change how much carbon is actually stored.”

[Research](#): A new study finds that the frequency and magnitude of extreme wildfires have doubled in the last 20 years, with significant implications for the reversibility of carbon stored in forests.

[Celebrity watch](#): Taylor Swift was a common feature in discussions at the negative emissions conference, and has been brought up again as a potential “vocal advocate and ... investor in new and innovative technology such as sustainable aviation fuels or direct air capture.”

[Interview](#): Jennifer Wilcox talks to Heatmap about building the first US carbon removal office.

[Law](#): The EU has adopted a Nature Restoration Law. NGO Carbon Gap explains what this has to do with CDR.

[Book excerpt](#): In her new book, Genevieve Guenther writes “...when oil and gas executives promise that, despite its technological challenges and massive costs, carbon dioxide removal can decarbonize wide-scale fossil fuel use, and advocates and entrepreneurs, overpromising about the potential of these technologies in order to drive investment, unwittingly legitimize industry P.R ... It is through such reverberations, filtered through the news media, that fossil fuel propaganda becomes something like the commonsense position.”

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Each month the demystifying carbon dioxide removal newsletter digs into the world of CDR to bring you the latest stories on everything from carbon credits and net-zero plans to nature-based solutions (NbS) and new technologies. Feel free to forward this email to your colleagues!

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