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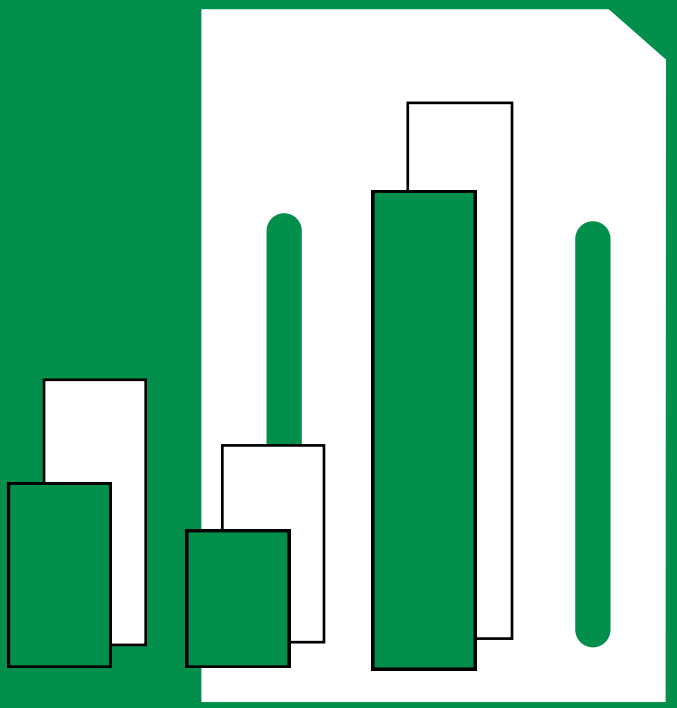
Fast Start to 2024: CDR Market Update, April 2024

The Latest CDR Pricing, Investment and Capacity Trends



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Market Trends

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It's been a busy 6 months since our previous market update, which came out following NY Climate Week. Here are some market themes we're following as 2024 gets underway:

Biochar Bounceback Year

While most CDR activity grew from 2022 to 2023, biochar retirements on Puro registry actually declined year over year, falling from 90,000 tCO2e retired in 2022 to 81,000 tCO2e retired in 2023. Q1 retirements suggest that 2024 is poised to be a strong year, with more credits retired in the first three months of the year than in any quarter in 2023. And with Planboo, Varaha, NetZero, and Novocarbo all raising money to expand biochar activities, expect more credits to come online in the coming months.

Puro.earth Retirements (as of March 27)				
	2021	2022	2023	2024
Q1	1,790	8,084	24,746	35,784
Q2	6,373	20,944	15,445	
Q3	14,590	10,525	17,382	
Q4	21,249	51,164	23,881	

*data excludes Red Trail Energy retirements

Standard Proliferation

With CDR credits increasingly attracting buyer interest, carbon standards are developing methodologies to accommodate the entrants. Verra's biochar methodology has 5 pending projects, and its concrete projects have already begun issuing and retiring credits; **Isometric** has registered its first project, with more on the way; **Riverse** currently hosts several removals projects; **Evident** has received investment to (among other goals) scale up its C-Capsule registry; **Carbon Standards International** has revamped its Global C-Sink Registry; **Covalent** is getting ready to onboard more projects; and **Puro.earth**'s revamped registry has allowed for more transparency around transactions in the market. More entities are likely to join these incumbents, and other registries (like Gold Standard) also have CDR methodologies that are sure to attract project interest.

DAC Deployment Drive

This year will also see the launch of new direct air capture facilities, punctuated by Climeworks's Mammoth facility in Iceland. Combined, the new facilities will bring on more than 50,000 tCO2e in removal capacity in 2024 (assuming all goes according to plan). To date, the DAC market has been defined by constrained supply; with more credits becoming available to buyers, will demand keep up pace? For more on DAC Deployments, see page 4 below, and check out the interactive map we've put together with DAC Coalition.

CDR Pricing Overview

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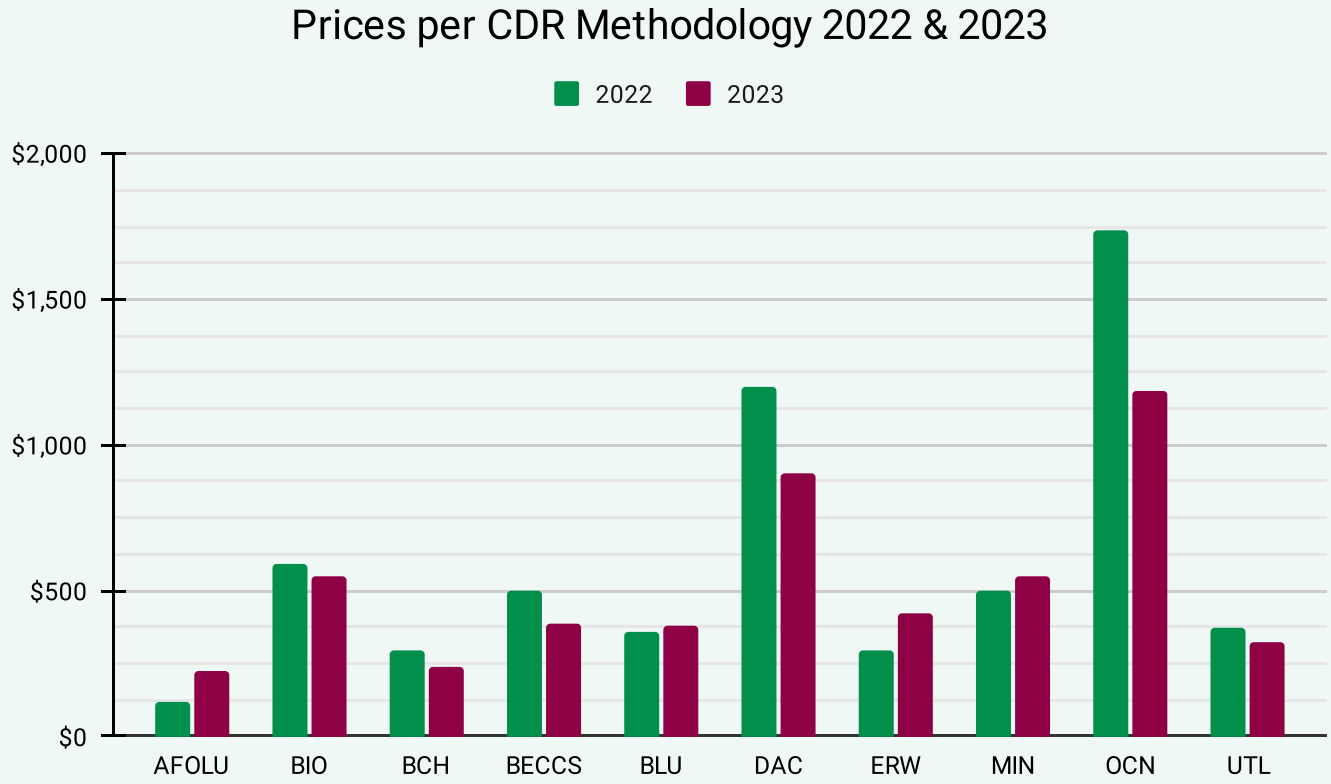
Price Movements

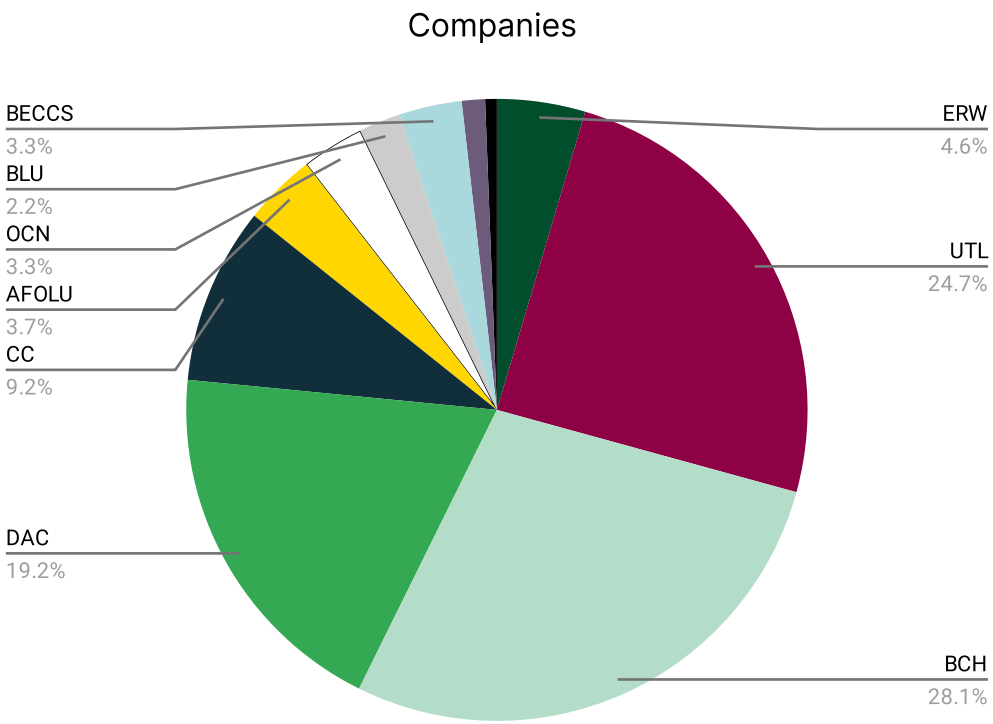
At AlliedOffsets, we track prices from a range of sources: buyer commitments, marketplace listings, self-reported, etc. Some technologies, like DAC, are showing a continued decrease in prices, while others have seen prices fluctuate.

Across all methodologies, however, the average reported price to remove 1 tCO2e has dropped from from $914 in 2020 to to $418 in 2024. This may be driven by a number of factors, including: lowered technology costs as companies scale, and an increase of credits from companies with lower barrier to entry (like biochar).



Sector Breakdown

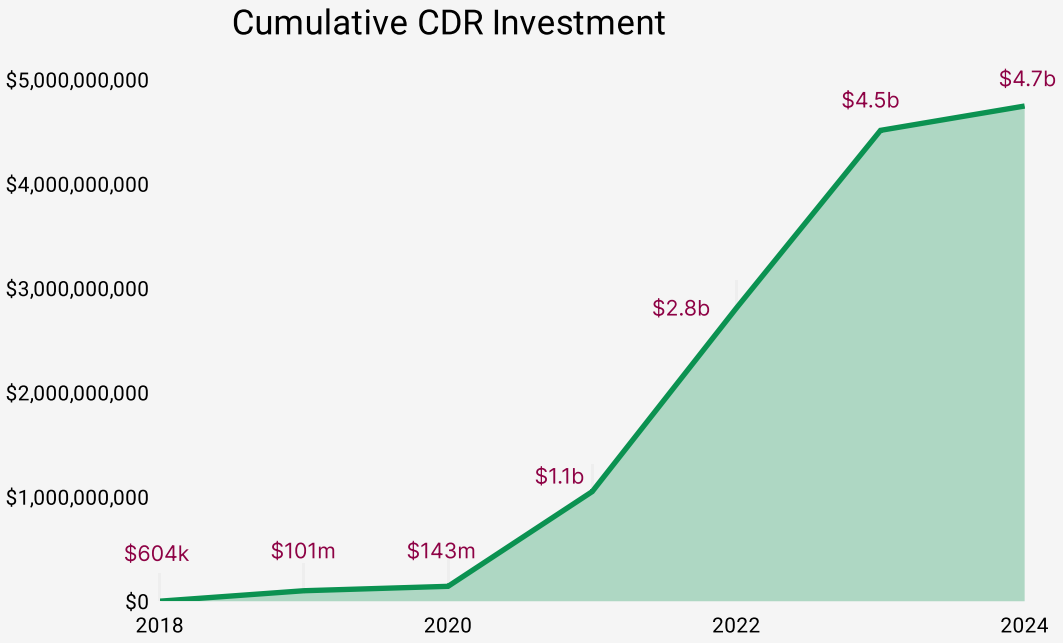
As of 2024, there are over 750 project developers within CDR (not including carbon capture companies). One third of these companies are biochar companies and another third is utilization. This is to be expected, as biochar accounts for 95% of all delivered credits due to its low technological barriers to entry. UTL is another large proportion of the CDR developers and has its own sub taxonomy such as concrete, carbon products, fuels, and chemicals.



Investment Growth Continues

Overall, there has been a total of $4.7b invested into CDR across 95 investments (not including funding by governments). Moving into the first quarter of 2024, $233m has already been invested in CDR. However, 2023 was a big year for CDR with $1.7b invested, following an increasing year on year funding into the sector as can be seen in the figure below.

CDR also bucked the trend in the climate tech space in 2023 as it shows a 6% increase in investment as opposed to an overall 30% decrease in climate tech investments according to Sightline (formerly Climate Tech VC). While a positive development, it is important to note that CDR still has a long way to go, only consisting of 5.3% of all climate tech investments in 2023.

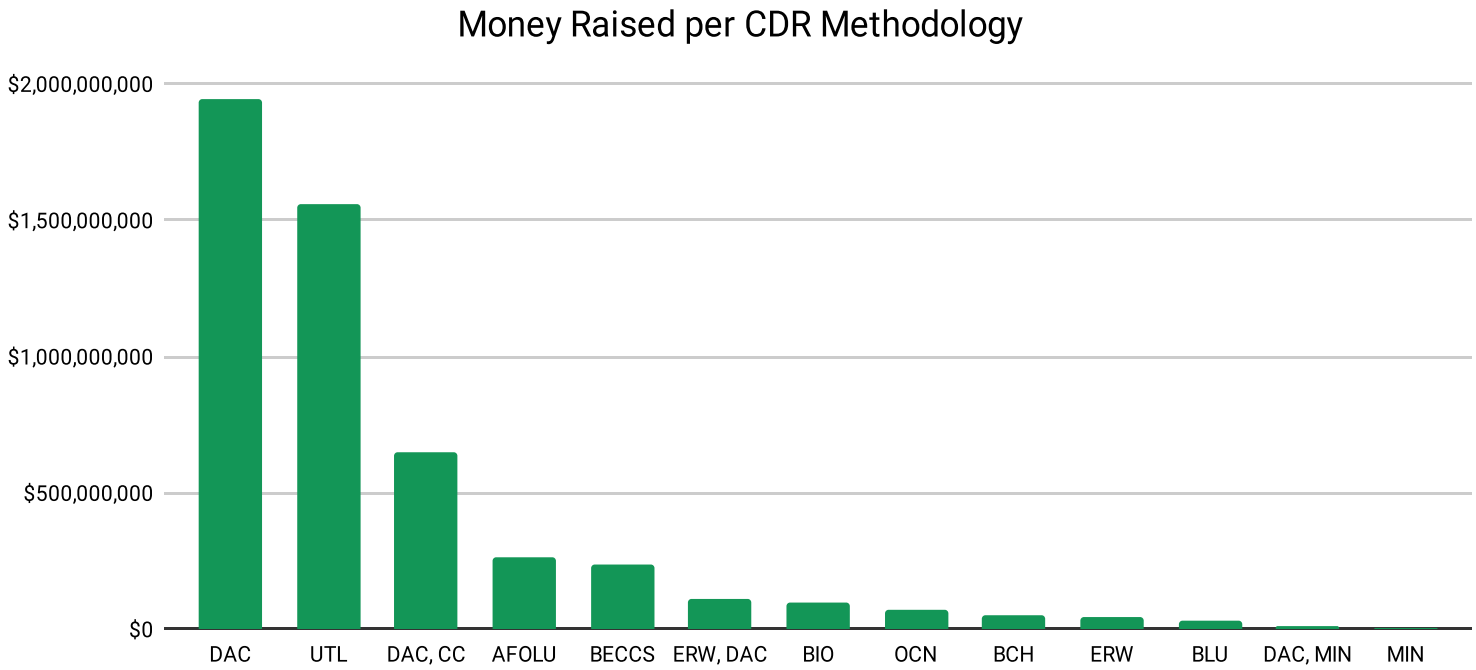


Top Methodologies for Investment

When it comes to the various types of CDR investment, DAC and UTL are the winners, with $1.9b and $1.6b invested in each methodology, making up two thirds of all investment.

DAC as expected with all the press last year emerges on top but composition of the investment is dominated by a select few large investments into the leading companies such as Carbon Removal Partners $649m investment into Climeworks and $550m project finance by BlackRock into 1PointFive.

Overall there have been 20 investments into DAC with those two accounting for approximately 26% of all investment into CDR. UTL has its largest of investment into the company Soulgen within multiple rounds which accounts for 41% of all UTL investments.



Breaking Ground on CDR Facilities

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AlliedOffsets has been working on finding all the facilities and therefore the capacity in the world and so far we have comprehensive maps for BECCS, biochar, and DAC.

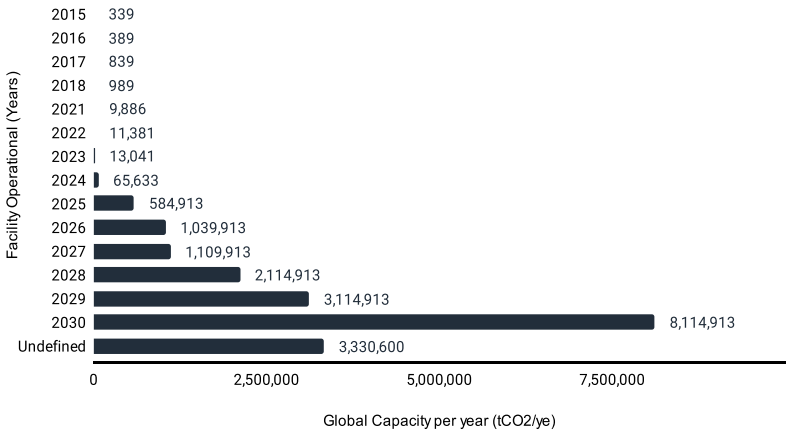
There is an anticipated 5.0x increase in global CDR capacity from 2023 (13,000 tCO2 per year) to 2024 (65,600 tCO2 per year)

Direct Air Capture (DAC)

59 DAC plants (combined pilots and commercial facilities) are expected to be operational by the end of 2024, with a combined capacity of 65,600 tCO2/year. By 2030 – assuming no new deployment announcements – companies anticipate 95 facilities to be operational, with a combined capacity of 6.4m-11.4m tCO2/ye. We expect there to be more announcements in the coming months and years.

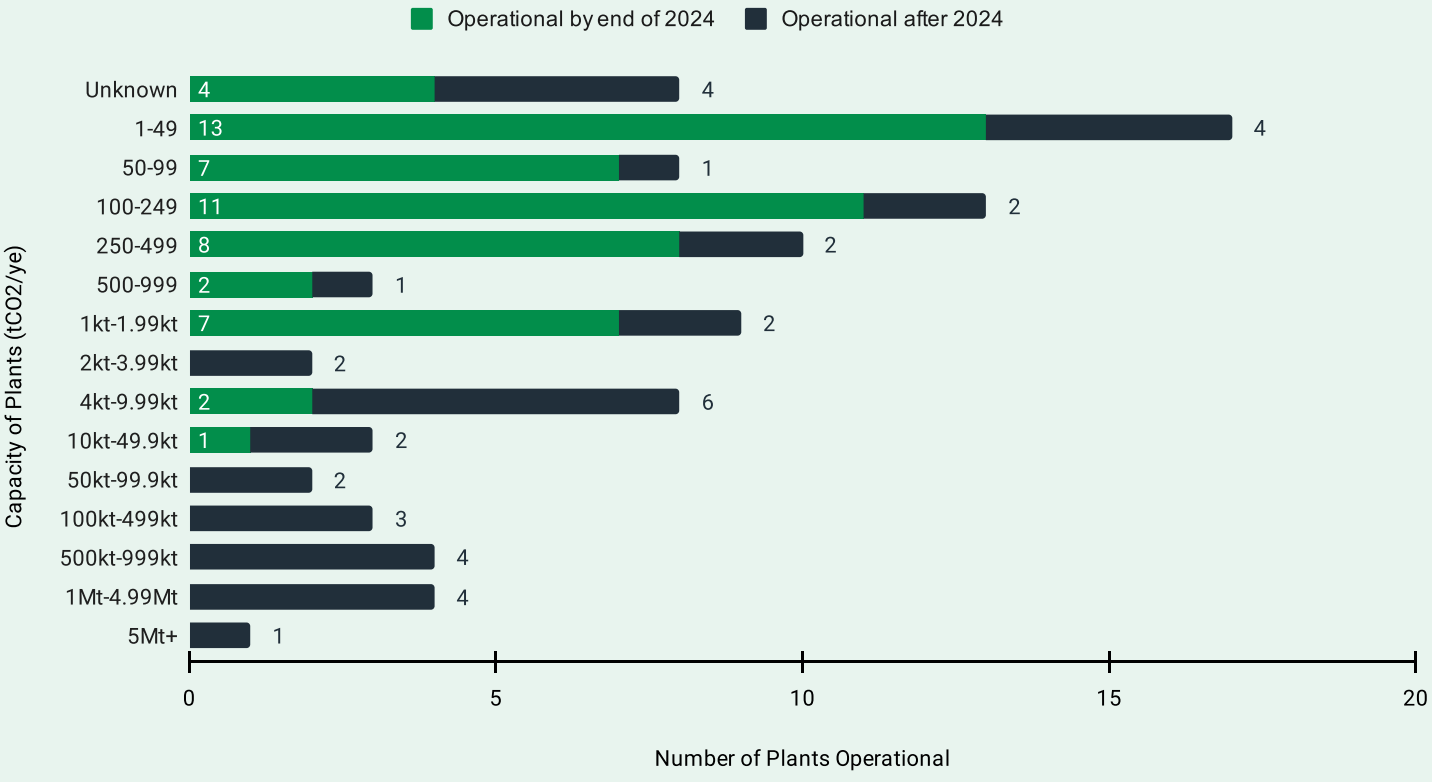
2024 and 2025 are likely to be big years for DAC. There is an anticipated 5.0x increase in global capacity from 2023 (13,000 tCO2/ye) to 2024 (65,600 tCO2/ye) due to the operationalisation of some of the world's first kiloton plants: Heimedal's Project Bantam (7,000 tCO2/ye), Airhive's Alpha Test Site project (1,000 ktCO2/ye), and Climeworks's aptly named Project Mammoth (36,000 tCO2/ye).

Global Capacity per year vs. Facility Operational



2025 will see the operationalisation of Stratos, a 500,000 tCO2/ye plant in Texas by Carbon Engineering and 1PointFive, which, if delivered on time, will increase the industry capacity by 10x from 2024. Figure 2 showcases the capacity breakdown of each of the DAC dataset.

Operational DAC Plants by capacity, during and after 2024



Breaking Ground on CDR Facilities

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Biochar

With biochar credits responsible for up to 95% of all delivered carbon removal credits, the technology leads the way in engineered CDR.

In order to help the industry better benchmark its progress to date, AlliedOffsets has identified nearly 770,000 tCO2e in annual operational facility capacity.

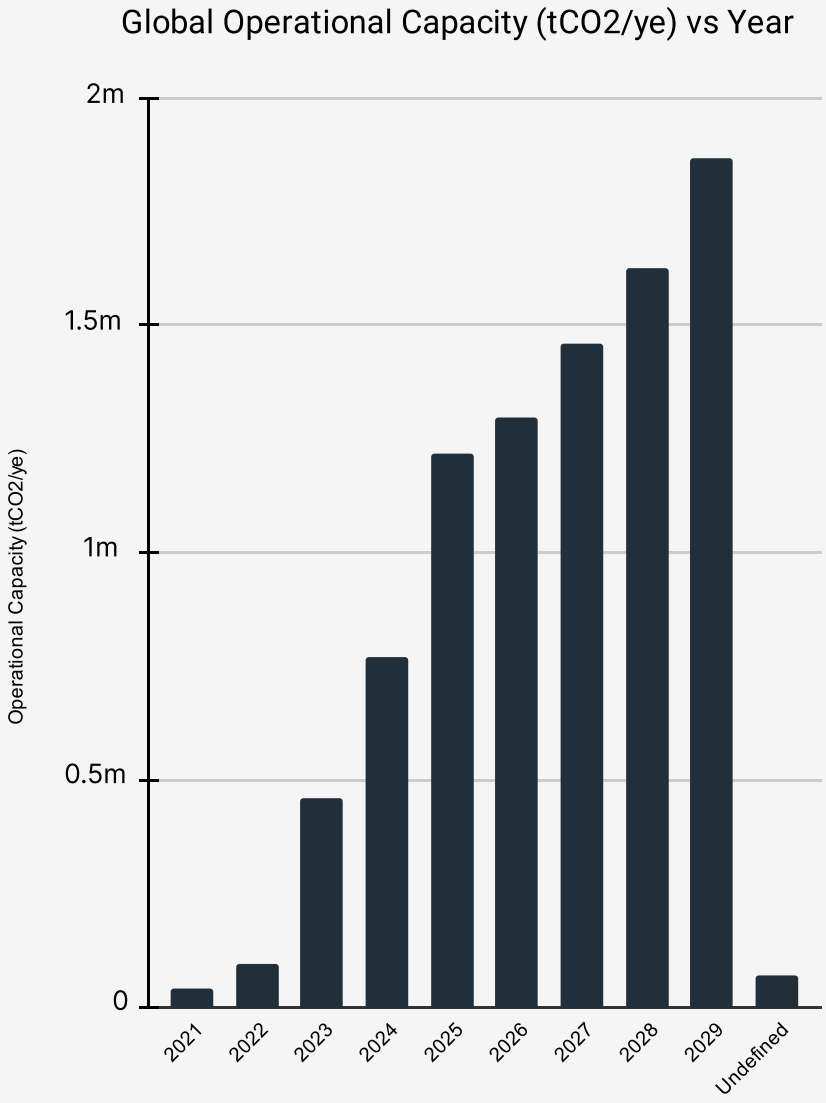
Overall, data from operational and announced facilities suggests supply will double in the next five years – even if no new facilities are announced in the coming years.

The data comes from 230 biochar companies worldwide with 93 operational biochar plants found worldwide in 2024. The most common feedstock was woodchips. The global distribution of known operational plants is mainly concentrated in Europe. In terms of global capacity, however, Europe is similar to the capacities of biochar facilities based in the Americas and Oceania.

The largest 5 plants, owned by Pacific Biofuel Holdings, Exomad Green, Carbon C2, Dutch Carboneers, and Avenger Energy account for 55% of total credit capacity, with an average capacity of 85,000 tCO2/ye.

It is important to note that the median for other continents is statistically limited and reflects a representative value for median production across continents. However, it can also be seen as a reflection of biochar production heading in two directions, artisanal and industrial production.

Biochar credits are responsible for up to 95% of all delivered carbon removal credits



Appendix: CDR by the Numbers

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Prices by Company Methodology

Company Methodology	2022	2023
Agriculture, Forestry, and Other Land Use	$123	$226
Bio-other	$593	$553
Biochar	$294	$239
Bioenergy with Carbon Capture and Storage	$500	$388
Blue Carbon	$358	$382
Direct Air Capture	$1,197	$902
Enhanced Rock Weathering	$296	$425
Mineralization	$499	$551
Ocean Alkalinization	$1,737	$1,188
Utilization	$374	$323

Suppliers - Known Facilities

Methodology	Suppliers	Sites Known
OCN	27	14
BLU	18	23
BIO	5	7
BECCS	27	14
ERW	38	61
MIN	10	22
BCH	232	158
DAC	159	108

Company	Retirements
Ekovilla	66,369
Red Trail Energy	44,276
Wakefield BioChar	42,290
Freres Biochar	26,966
Exomad Green	19,132
Aperam BioEnergia	18,906
Moelven	18,149
ARE Treindustrier	16,314
Douglas County Forest Products	12,390
Soilfood	11,776

Buyer	Tons Purchased
Microsoft	3,185,426
Airbus	400,000
Frontier	355,837
Amazon	250,000
BCG	120,184
JP Morgan Chase	73,175
Boeing	62,000
Trafigura	50,000
Shopify	49,310
Nasdaq	46,723

Data Updated as of 25/03/2024

AlliedOffsets

AlliedOffsets is the world's largest data source for the voluntary carbon market. We have aggregated data from the world's leading carbon offsetting registries and our AI and advanced analytics layer allows us to identify unique insights into project pricing, quality, and much more. Our data is used by leading sustainability and carbon consultants, financial institutions, offsetting corporations, project developers, buyers, and academics.

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