PitchBook

EMERGING TECH RESEARCH

Carbon & Emissions Tech Launch Report

VC trends and emerging opportunities

Q2 2022

REPORT PREVIEW

The full report is available through the PitchBook Platform.

Contents

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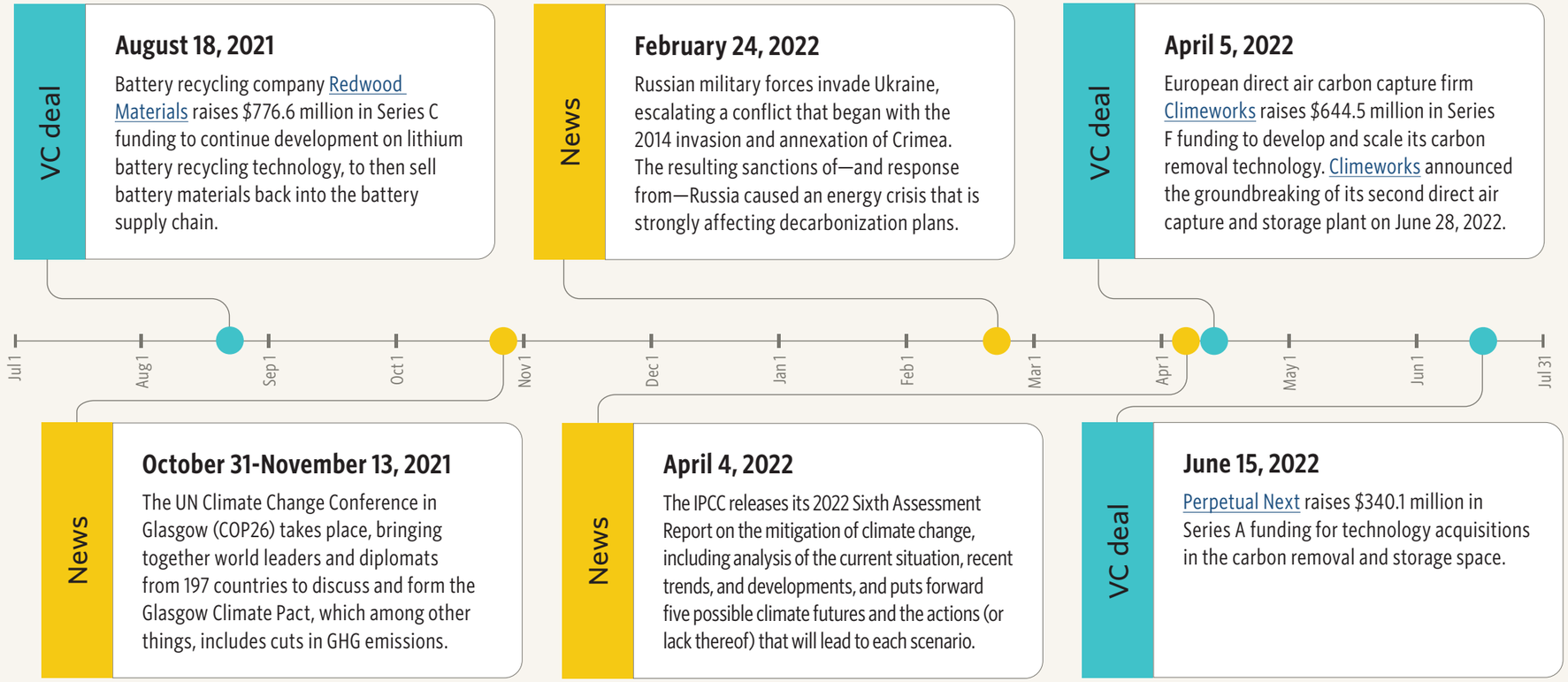
Q3 2021–Q2 2022 timeline



Deal count

142
total deals in Q2

15.4%
QoQ growth in deal count

-18.9%
YoY growth in deal count

Deal value

$3.4B
deal value in Q2

58.1%
deal value growth QoQ

-25.6%
YoY growth in deal value

5: The Glasgow Climate Pact," UKCOP26.ORG, 2021.
6: "Climate Change 2022: Mitigation of Climate Change," Intergovernmental Panel on Climate Change, 2022.

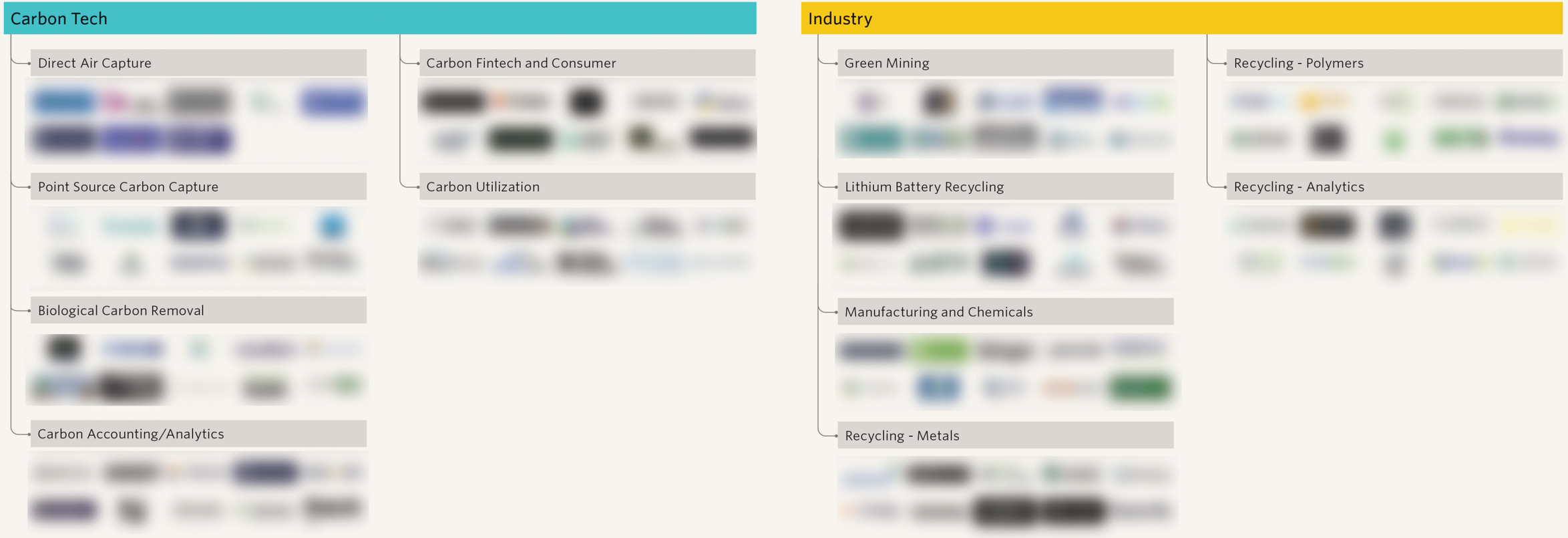
Climate tech landscape

1. Carbon tech
2. Industry
3. Built enviroment
4. Land use

Carbon & emissions tech VC ecosystem market map

Click to view the interactive market map on the PitchBook Platform.

Market map is a representative overview of venture-backed or growth-stage providers in each segment. Companies listed have received venture capital or other notable private investments.



Carbon & emissions tech VC ecosystem market map

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Built Environment

- Green Construction
- Building Energy Efficiency
- Heating and Cooling

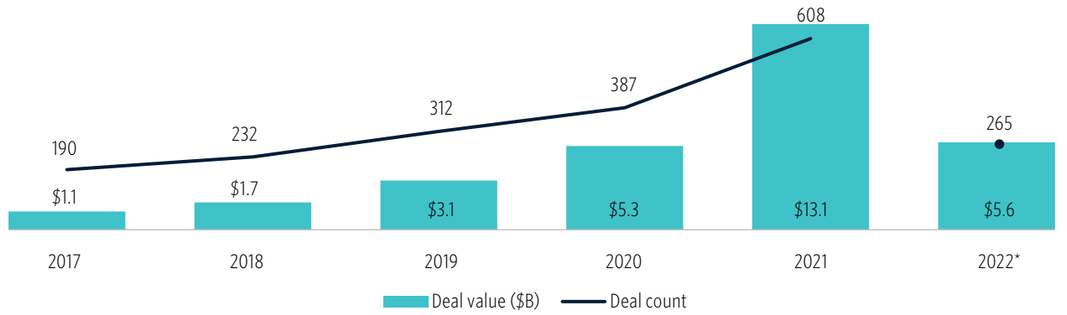
Land Use

- Fertilizer Alternatives
  - PIVOT BIO
  - Ynsect
  - AFYREN
  - Agronutris
  - JOYN BIO
  - Terramera
  - Sound Agriculture
  - concentric
  - KULA BIO
  - Entobel
- Ecosystem Health and Monitoring
  - Pachama
  - BETTER PLACE FOR FORESTS
  - NCX
  - ceres
  - Anomera
  - Terraformation
  - agerpoint
  - Hydrosat
  - NATURE METRICS
- Climate/Earth Data
  - DigitalGlobe
  - planet.
  - semios
  - Orbital Insight
  - tomorrow.io
  - one concern
  - ON
  - Climavision
  - CIBO
  - KAYRROS

VC activity

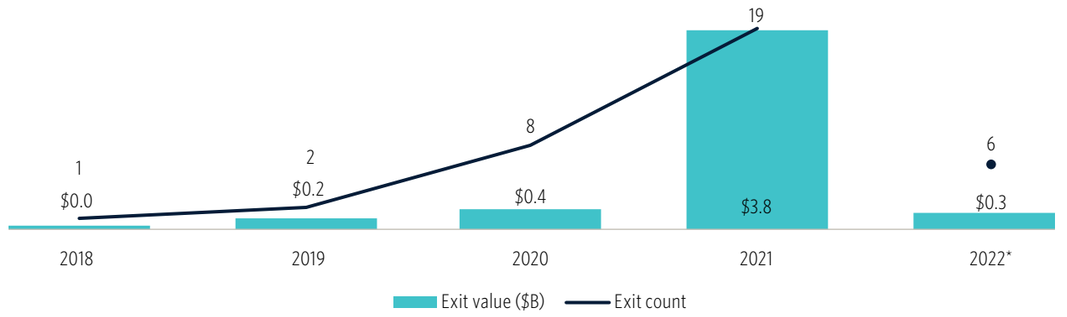
2021 represented a strong year for private markets overall, with higher deal and exit value. Carbon and emissions startups raised $5.6 billion in the first half of 2022, which is very similar to H1 2021's $5.8 billion. 2021 saw elevated investment, which should reset lower in 2022. That said, deal value in H1 2022 is still higher than the fiscal year (FY) value for all prior years except 2021, and with the growth drivers affecting the vertical, it is likely that 2021 will be considered an outlier year for VC deals. The average value per deal has been rising since 2017, from $7.1 million per deal to $23.6 million per deal in 2021 and 2022 (which have very similar average value per deal). Exit activity mirrored the trend seen in deal value and deal count, with a very strong 2021 (relative to other years), but exits in the carbon & emissions tech space are infrequent at present—in H1 2022, we have seen only six exits in the carbon & emissions tech space compared to 19 in FY 2021 (which is still low relative to other verticals).

Carbon & emissions tech VC deal activity



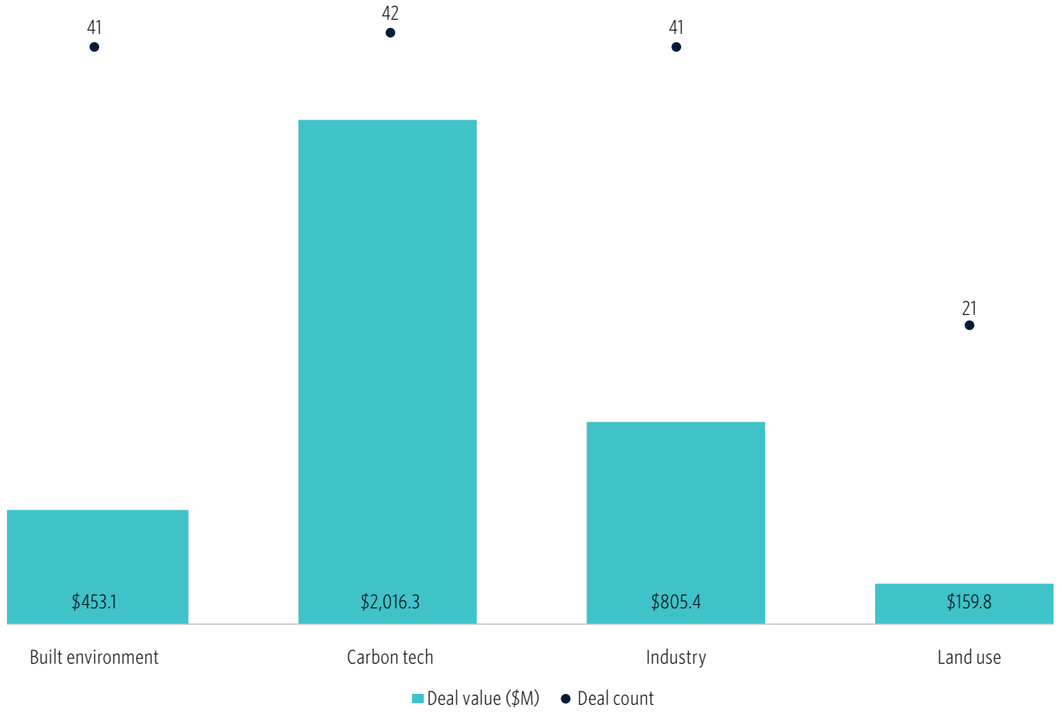
Source: PitchBook | Geography: Global | *As of June 30, 2022

Carbon & emissions tech VC exit activity



Source: PitchBook | Geography: Global | *As of June 30, 2022

Carbon & emissions tech VC deal activity by segment*



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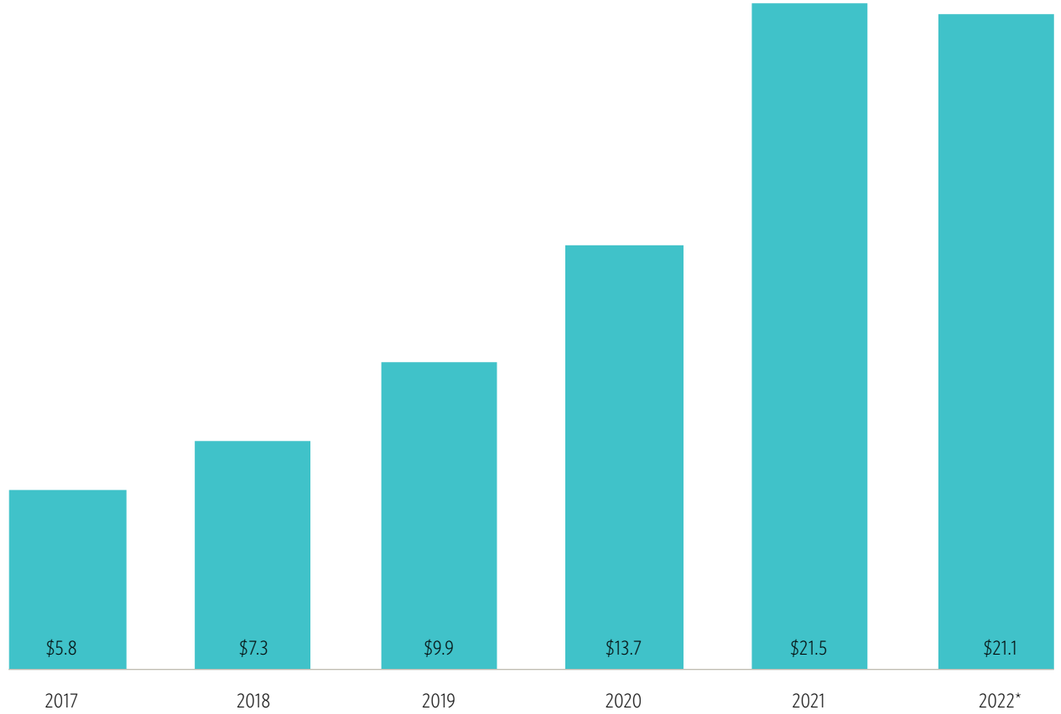
Average carbon & emissions tech VC deal value ($M)



Source: PitchBook | Geography: Global | *As of June 30, 2022

Carbon tech

Overview

Carbon tech firms cover the entire technology landscape for carbon dioxide measurement; removal; storage; utilization; and trading, essentially, the capture of carbon; and processes that support this activity. Users of carbon tech are extremely broad, due to almost universal need for sectors to decarbonize (and the growth in regulatory pressure to reduce GHG emissions). This breadth shapes the technologies in the space. Carbon capture hardware is enabling continued use of high-carbon processes (such as chemical production and power generation), which currently cannot be replaced economically either through retrofit of carbon-emitting assets or direct air capture (DAC) approaches. DAC is experiencing particularly strong growth, driven by technological innovation and a supportive carbon pricing environment. Carbon utilization technologies are also rising in prominence, although many of these have high energy requirements and require clean energy to be considered viable.

The carbon tech space is relatively young due to low-carbon prices in recent history. Additionally, the industry is not dominated by large companies, providing opportunities for startups, who also benefit from the breadth of the space. There is also both competition and funding opportunity from large oil and gas firms as they seek to diversify and adapt to a low-carbon economy. Occidental Petroleum (NYSE: OXY), for example, formed a subsidiary in 2020 to develop and finance DAC approaches and carbon sequestration. Similarly, carbon tech development and investment involving large oil and gas firms is common, as seen in the Northern Lights project,[7] a joint venture between Equinor (OSL: EQNR), Shell (NYSE: SHELL), and TotalEnergies (PAR: TTE).

Carbon tech contains the following subsegments:

- **Point-source carbon capture and storage (CCS):** Technologies for removing carbon from flue (exhaust) gas streams caused by power generation and industrial gas streams, which can often be retrofit to existing infrastructure. The category includes several CO2-removal approaches including chemical absorbents (for example, amine gases), solid adsorbents, and separation membranes. The approaches include those that bind to CO2 and later release it into storage when heated, thus recharging the chemistry.
- **Direct air capture:** Technologies similar to point-source carbon capture in that they involve exposing CO_2-laden gas (in this case air) to chemical or mechanical technologies to either absorb, adsorb, or otherwise remove the CO_2. They often include additional hardware to increase air flow to the removal technology to compensate for the relatively low CO_2 concentration in the atmosphere. The chemical and mechanical approaches used are often the same as those used for point-source CCS.
- **Biological carbon removal:** Biological approaches to CO_2 removal tend to divide into two groups: forestry approaches (reforestation or afforestation), and soil carbon approaches (using either microbial approaches or biochar integration). Less commonly, some firms use algae to capture carbon.
- **Carbon utilization:** Companies in this area use captured carbon as an input into a valuable physical product, such as construction materials, fiber-reinforced plastics, and soaps.
- **Carbon fintech & consumer:** A broad category including integration of carbon and emissions into

7: "What We Do," Northern Lights, n.d., Accessed August 23, 2022.

financial products. This includes integration of carbon offsets and monitoring into banking products, marketplaces for carbon trading, and selling of tokenized carbon products.

- **Carbon accounting/analytics:** Services that monitor either the carbon footprint of an entity (individual, project, or company) or monitor the carbon sequestered by carbon removal approaches. Includes measurement, reporting, and verification companies. Analytics are often included to provide management the option to integrate with carbon offsetting offerings.

Industry drivers

- **Net-zero emissions pledges.** The number of countries, regions, and companies making net-zero emissions pledges (plus emissions reduction pledges in general) has grown in recent years, and the end dates for these pledges tend to be between 2030 and 2050, although some significant regions have target dates beyond 2050—notably China and India. To successfully hit these target dates, decarbonization efforts are considered a key area of investment, contributing to growth in the sector.
- **Increasing carbon prices.** In the US, the 45Q tax credit provides a financial incentive for carbon capture, utilization, and storage, and this incentive has been greatly expanded by the recent signing of the Inflation Reduction Act of 2022, which increases the per-ton value to $85 (from $50) and sets a specific value for DAC, which was formerly not given special status, and thus the tax credit available will rise from the $50 base amount to $180. Coupled with this value increase, the thresholds to become eligible for the tax credits have been relaxed, and the payment of the credits is changing to make it easier for small firms to take advantage of the credits.[8] In Europe, the ETS will gradually reduce the maximum number of allowances available to various industries, thereby increasing the cost of these allowances over time. Both examples increase the cost of emitting carbon, pushing firms to reduce their emissions and increasing the value of carbon removal.
- **Growing commercial and consumer demand for offsets.** Consumers are increasingly seeking options to reduce their emissions, and the voluntary carbon market is a low-effort way to reduce emissions in hard to abate areas. Corporations' desire for offsets is similarly high—many have pledged emission reductions, and the low cost of carbon offsets allows these targets to be achieved quickly and with little impact to the business. AstraZeneca for instance, has committed to net-zero carbon by 2025 and negative carbon emissions by 2030.[9] Similarly, Microsoft has taken action to become carbon negative by 2030.[10]

8: The 45Q tax credit will now apply through direct pay rather than as a reduction in paid tax (It will essentially count as tax overpayment), reducing the tax liability required to benefit from the credit.
9: "Ambition Zero Carbon," AstraZeneca, January 22, 2020.
10: "Operating to Drive Global Change," Microsoft, 2022.

Key carbon tech VC deals over the past year*

Company	Close Date	Subsegment	Stage	Deal Size ($M)	Lead Investor(s)	Valuation Step-Up
Climeworks	April 5, 2022	Direct air capture	Series F	$644.50	GIC, Partners Group	N/A
Crusoe Energy Systems	April 20, 2022	Carbon fintech and consumer	Series C	$505.00	G2VP	3.1x
Perpetual Next	June 15, 2022	Biological carbon removal, carbon utilization	Series A	$340.1	N/A	N/A
Carbon Clean	May 11, 2022	Point-source CCS	Series C	$190.72	Chevron Technology Ventures	7.9x
Persefoni	October 27, 2021	Carbon accounting/analytics	Series B	$101.0	Prelude Ventures, The Rise Fund	5.3x
Xpansiv	September 1, 2021	Carbon fintech and consumer	Later Stage VC	$100.0	N/A	N/A
Prometheus Fuels	September 23, 2021	Direct air capture, carbon utilization	Series B	$100.0	N/A	8.1x
Sweep	April 5, 2022	Carbon accounting/analytics	Series B	$71.3	Coatue Management	2.9x

Source: PitchBook | Geography: Global | *As of June 30, 2022

Appendix

Top VC-backed carbon & emissions tech companies by total VC raised to date*

Company	Total raised to date ($M)	Segment	Subsegment
Northvolt	$6417.0	Industry	Lithium battery recycling
Generate	$3282.1	Carbon tech	Carbon fintech and consumer
Britishvolt	$2518.4	Industry	Manufacturing and chemicals
Enerkem	$989.2	Industry	Manufacturing and chemicals
Redwood Materials	$824.6	Industry	Lithium battery recycling
Climeworks	$786.7	Carbon tech	Direct air capture
Crusoe Energy Systems	$708.1	Carbon tech	Carbon Fintech and consumer
Pivot Bio	$691.8	Land use	Fertilizer alternatives
Tado	$668.9	Built environment	Building energy efficiency
Veev	$652.8	Built environment	Green construction

Source: PitchBook | Geography: Global | *As of June 30, 2022

Top VC investors in carbon & emissions tech companies since 2011*

Investor name	Deal count
SOSV	31
Prelude Ventures	30
Cycle Capital Management	28
Enterprise Ireland	25
Keiretsu Forum	23
MCJ Collective	19
Climate Capital	17
Khosla Ventures	17
Clean Energy Ventures	15
Sustainable Development Technology Canada	15

Source: PitchBook | Geography: Global | *As of June 30, 2022

About PitchBook Emerging Tech Research

Independent, objective and timely market intel

As the private markets continue to grow in complexity and competition, it's essential for investors to understand the industries, sectors and companies driving the asset class.

Our Emerging Tech Research provides detailed analysis of nascent tech sectors so you can better navigate the changing markets you operate in—and pursue new opportunities with confidence.

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