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EMERGING TECH RESEARCH

VC Investment in Climate Tech

2023 VC investment in climate tech fell 14.5% from 2022 totals

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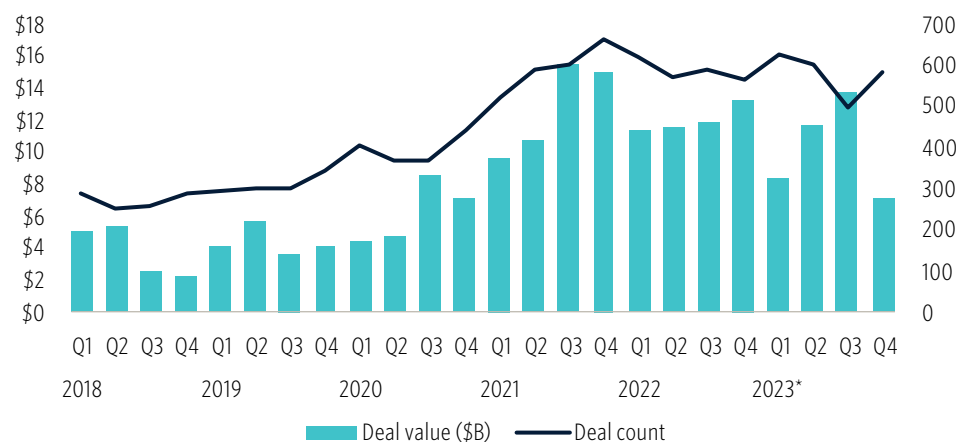
Key takeaways

- Overall VC investment in climate tech fell 14.5% to \$41.1 billion in 2023, reflecting a more challenging environment for VC investing. 2021 represents the high point, with \$51.0 billion in total VC deal value.
- Quarterly VC deal activity varied substantially during the year, reaching a high of \$13.8 billion in Q3 before falling to a low point of \$7.1 billion in Q4—the lowest quarter since Q2 2020.
- In 2023, the largest segments by total VC raised were low-carbon mobility, industry, grid infrastructure, and intermittent renewable energy sources (solar and wind).
- Regulation and policy continue to be core drivers of VC activity for climate tech, though high prices for energy and fuel as well as growing demands from consumers and investors are also influential.

Vertical introduction

“Climate tech” is a broad term, and exact definitions of climate technologies and applications vary. This note combines two analyst-curated verticals—carbon & emissions tech and clean energy—and adds climate-relevant categories from the mobility and foodtech verticals to provide a broad view of the climate tech space. This analyst note is an update to our [Q2 2023 Analyst Note: VC Investment in Climate Technology](#), and as such, we define the climate tech space as technologies that act to mitigate climate change by reducing greenhouse gas emissions. This excludes certain climate-adjacent areas such as land- and water-pollution remediation, water-use reduction, and climate adaptation technologies.

Climate tech VC deal activity by quarter



Source: PitchBook • Geography: Global • *As of December 31, 2023

The following climate tech segments are included in this note:

- **Carbon tech:** Carbon capture, utilization, and storage technologies—including point-source carbon capture, direct air capture, and biological carbon removal—plus carbon accounting software and carbon trading technologies.
- **Industry:** Industrial decarbonization through alternatives to petrochemicals, low-carbon mining approaches, low-carbon metal production, and recycling technologies.
- **Built environment:** Technologies that reduce carbon emissions from the built environment, either during construction or through improvements to the postconstruction energy efficiency of buildings.
- **Land use:** Technologies to monitor and reduce emissions from nonindustrial or commercial land, including technologies that offer fertilizer alternatives, emissions leak detection, and monitoring of land use changes.
- **Intermittent renewable energy sources:** Energy generation technologies reliant on solar and wind energy, including both hardware and analytics.
- **Dispatchable energy sources:** Clean energy generation through geothermal, hydropower, and nuclear technologies.
- **Clean fuels:** Generation of low-carbon fuels, including hydrogen, biofuels, and waste-to-energy/fuels and air-to-fuel approaches.

- **Grid infrastructure:** Technologies to improve the efficiency, stability, and resilience of electrical power grids and better incorporate nontraditional energy sources.
- **Low-carbon mobility:** Low-carbon air, land, and sea vehicles, largely involving battery or clean-fuel technologies.
- **Sustainable foods:** A heavy focus on alternative sources of protein that result in lower levels of carbon dioxide emissions, plus more environmentally sustainable packaging materials.

Climate 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.

1 Carbon tech

| | |
|--|--|
| <p>Carbon accounting/analytics</p> <p>Biological carbon removal</p> <p>Direct air capture</p> | <p>Carbon fintech & consumer</p> <p>Point-source carbon capture</p> <p>Carbon utilization</p> |
|--|--|

2 Industry

| | |
|--|---|
| <p>Green mining</p> <p>Lithium battery recycling</p> <p>Manufacturing & chemicals</p> | <p>Recycling - analytics</p> <p>Recycling - metals</p> <p>Recycling - polymers</p> |
|--|---|

3 Sustainable foods

| | |
|--|---|
| <p>Cultivated proteins</p> <p>Fermented proteins</p> <p>Food waste & traceability</p> | <p>Insect farming</p> <p>Plant-based proteins</p> <p>Sustainable packaging</p> |
|--|---|

4 Low-carbon mobility

Terrestrial/marine battery EVs



Hydrogen EVs



EV charging



EV components



Electric air vehicles



5 Dispatchable energy sources

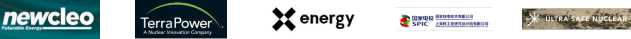
Geothermal



Hydropower



Nuclear fission



Nuclear fusion



6 Clean fuels

Hydrogen



Waste to energy/fuels



Biofuels



Clean conventional fuels



7 Built environment

Building energy efficiency



Green construction



Heating & cooling



8 Land use

Climate/Earth data



Ecosystem health & monitoring



Fertilizer alternatives



9 Intermittent renewable energy sources

Solar photovoltaic



Solar thermal



Wind



10 Grid infrastructure

Battery storage



Nonbattery storage



Analytics & grid management



VC activity

VC investment into climate tech fell for the second year in a row, down 14.5% from \$48.1 billion in 2022 to \$41.1 billion in 2023. 2022 deal value fell 5.7% from the peak of \$51.0 billion in 2021, which itself represents a significant spike from 2020's \$25.2 billion in total deal value for climate tech. This fall in deal value in the climate tech space is not unexpected considering broader VC trends, and it is also a smaller decline than has been seen in the VC space overall—from 2022 to 2023, North American VC deal value fell 29.6%,¹ while European deal value fell 45.6%.² Deal counts have remained stable for the past three years, with 2023's deal count of 2,312 falling just under the three-year average of 2,349. 2023 saw climate tech deal value somewhat evenly split between North America, Asia, and Europe, which accounted for 36.8%, 31.7%, and 29.3%, respectively—broadly similar to the geographic breakdown in 2022. Much of the decline in climate tech VC deal value from 2022 to 2023 was seen in early-stage and venture-growth deals, which fell 24.8% and 34.5% YoY, respectively. By contrast, late-stage deal value remained stable, only falling 0.6% YoY, and pre-seed/seed deal value increased 16.2%. Median pre-money valuations have risen to \$23.8 million, growing 12.1% YoY, and median deal value increased 4.1% to \$5.2 million from 2022 to 2023.

Exit activity in the climate tech space remains muted, falling 50.5% from \$18.7 billion in 2022 to \$9.3 billion in 2023. Exit activity in 2022 and 2023 is substantially lower next to the record-high point of \$106.4 billion in 2021. Exit activity is weighted strongly toward certain segments—84.1% of 2021's record exit activity was from low-carbon mobility companies.

Quarterly climate tech VC deal value was varied in 2023, reaching \$13.8 billion in Q3—the third highest quarter on record after Q3 and Q4 2021—before falling in Q4 to \$7.1 billion, the lowest quarterly value since Q2 2020. Q3's strong deal value is partly driven by a high number of large deals, with 26 deals above \$100 million. Of these 26 deals, 5 were above \$500 million.

1: See our [Q4 2023 PitchBook-NVCA Venture Monitor](#) for an overview of activity across the entire VC market.

2: See our [2023 Annual European Venture Report](#) for further coverage of VC activity in Europe.

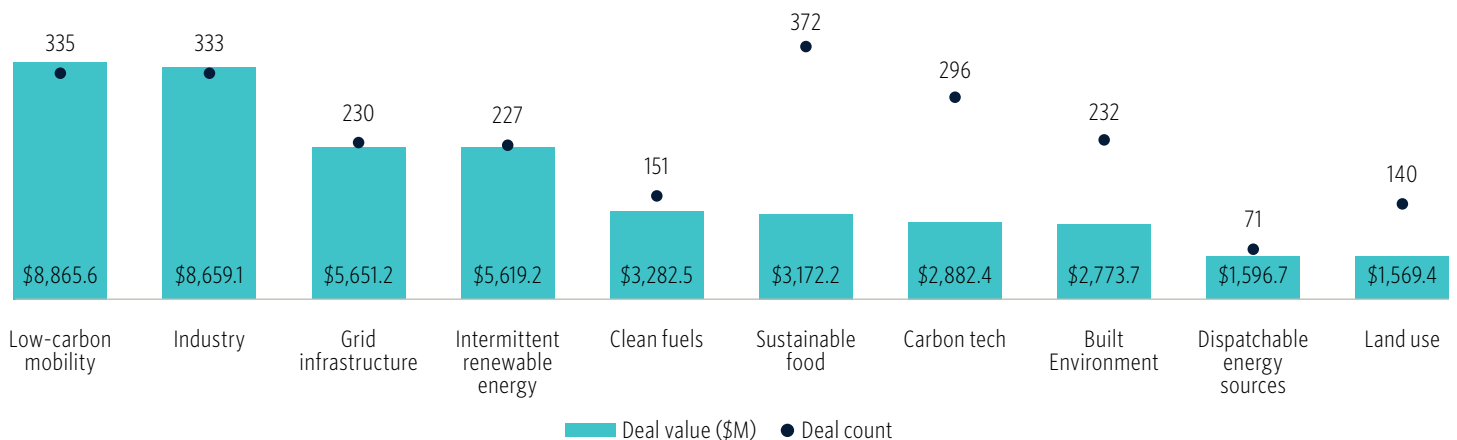
In 2023, the largest segments in the climate tech vertical were:

- **Low-carbon mobility:** \$8.9 billion raised across 335 deals.
- **Industry:** \$8.7 billion raised across 333 deals.
- **Grid infrastructure:** \$5.7 billion raised across 230 deals.
- **Intermittent renewable energy sources:** \$5.6 billion raised across 227 deals.

Looking at individual categories, solar photovoltaic technologies secured the highest VC funding in the climate tech space at \$5.4 billion, though investment in the category fell 11.0% YoY. The manufacturing & chemicals category followed this, with \$4.1 billion of deal value—an increase of 34.3% from 2022. Growth in this category is partially driven by very large deals for H2 Green Steel, Verkor, and Redwood Materials. The categories with the largest YoY increase in deal value include green mining, which saw large deals from Boston Metal, Cornish Lithium, and KoBold Metals, and metal recycling, including magnet-recycling company Noveon Magnetic’s \$125.0 million Series B.

50 VC deals for climate tech companies in 2023 exceeded \$150 million, and of these, nine exceeded \$500 million. The 10 largest deals of 2023 are best represented by the low-carbon mobility and industry categories, with four deals each in the top 10. The three largest deals of the year were H2 Green Steel’s \$1.6 billion Series B2, Verkor’s \$1.6 billion Series C,³ and AESC’s \$1.0 billion Series B.

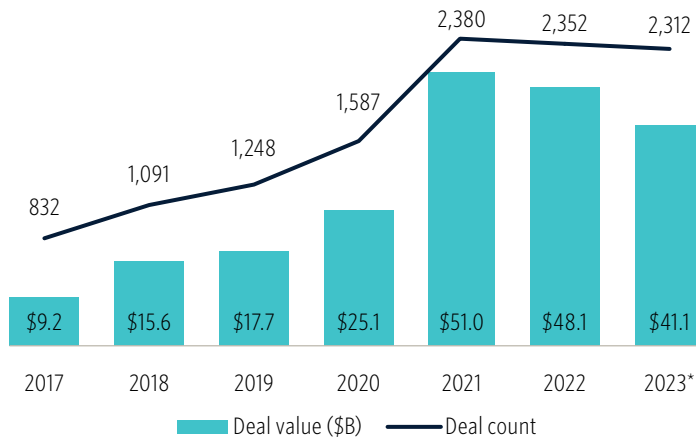
2023 climate tech VC deal activity by segment*



Source: PitchBook • Geography: Global • *As of December 31, 2023

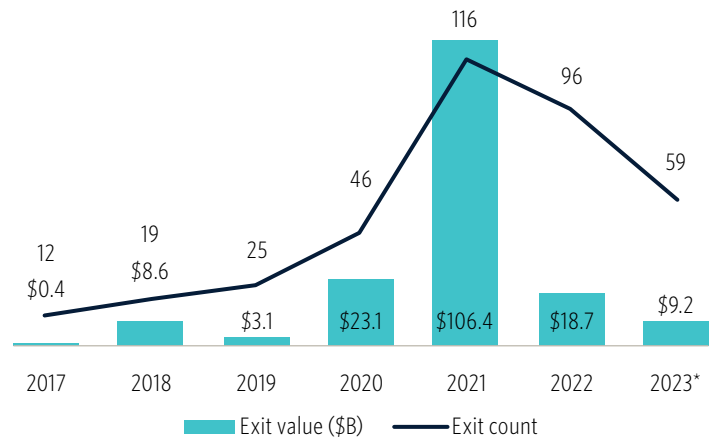
³: This deal includes \$648.5 million in debt financing.

Climate tech VC deal activity



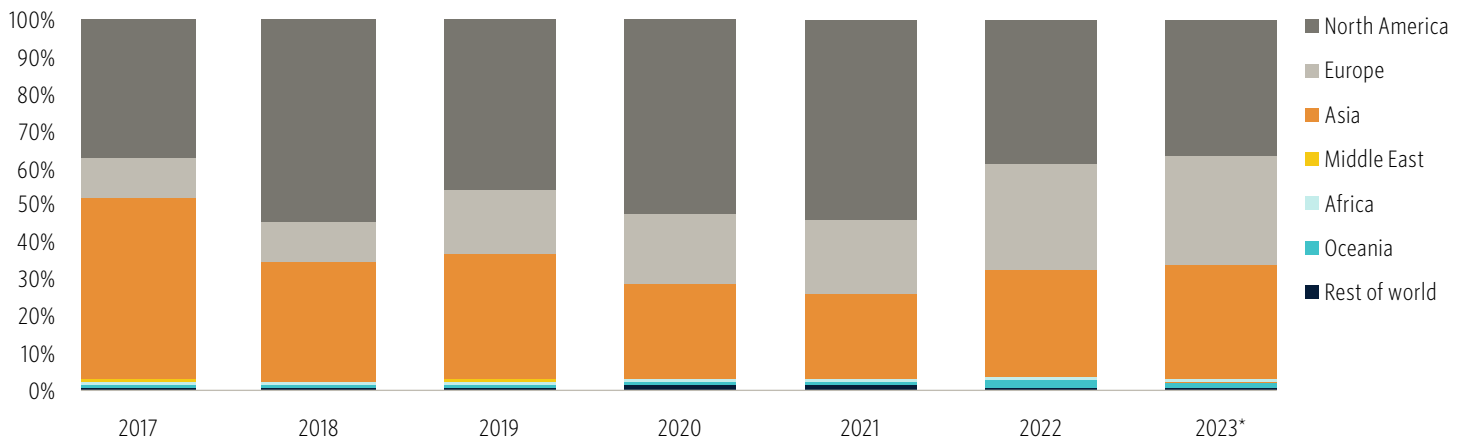
Source: PitchBook • Geography: Global • *As of December 31, 2023

Climate tech VC exit activity



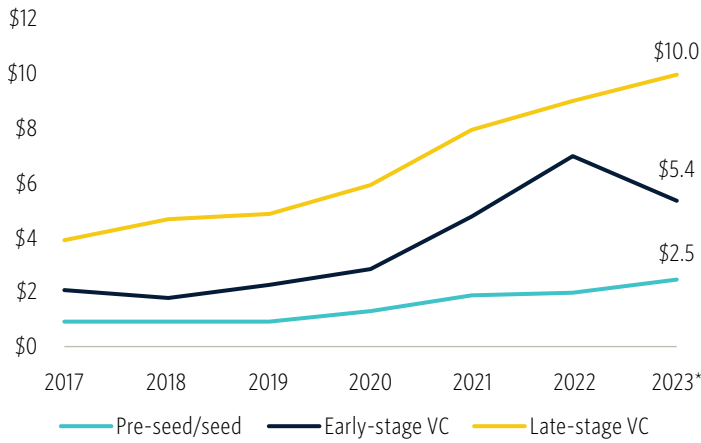
Source: PitchBook • Geography: Global • *As of December 31, 2023

Share of climate tech VC deal value by region



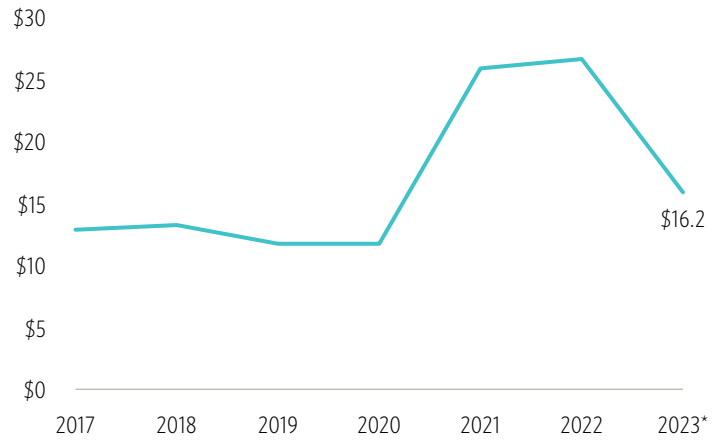
Source: PitchBook • Geography: Global • *As of December 31, 2023

Median climate tech VC deal value (\$M) by stage



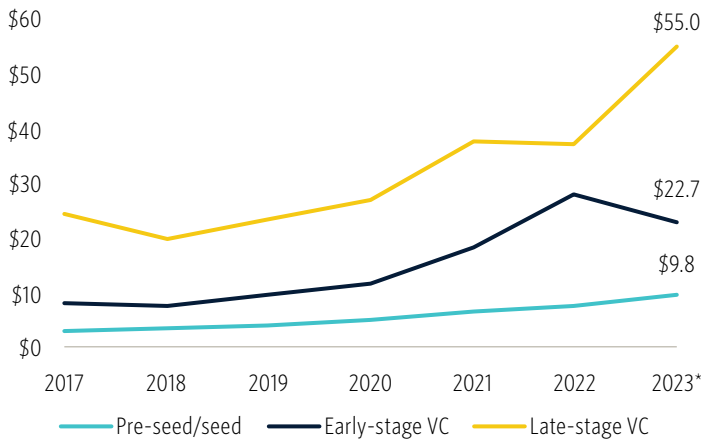
Source: PitchBook • Geography: Global • *As of December 31, 2023

Median climate tech venture-growth deal value (\$M)



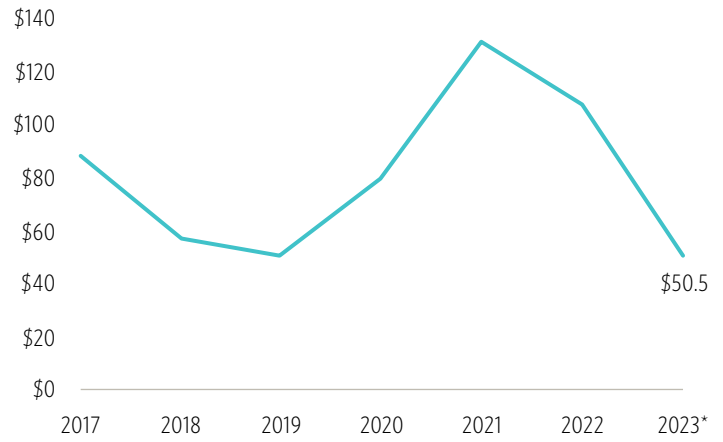
Source: PitchBook • Geography: Global • *As of December 31, 2023

Median 2023 climate tech VC pre-money valuation (\$M) by stage



Source: PitchBook • Geography: Global • *As of December 31, 2023

Median climate tech venture-growth pre-money valuation (\$M)



Source: PitchBook • Geography: Global • *As of December 31, 2023

Key climate tech pre-seed/seed VC deals in 2023*

| Company | Close date | Segment | Deal value (\$M) | Lead investor(s) |
|-------------------------|-------------|-------------------------------|------------------|---|
| Neo Fusion | May 19 | Dispatchable energy sources | \$216.6 | N/A |
| Hunan Highstar | November 8 | Grid infrastructure | \$41.2 | N/A |
| Exodigo | January 18 | Built environment | \$41.0 | 10D, Zeev Ventures |
| RCB Nanotechnologies | October 1 | Industry | \$29.1 | N/A |
| Type One Energy | February 17 | Dispatchable energy sources | \$28.8 | Breakthrough Energy, Doral Energy Tech Ventures, TDK Ventures |
| GWD Energy | May 26 | Intermittent renewable energy | \$28.7 | N/A |
| Zhongjingxin New Energy | June 21 | Low-carbon mobility | \$28.1 | N/A |
| On.Energy | December 15 | Grid infrastructure | \$25.0 | Ultra Capital |
| Isometric | July 18 | Carbon tech | \$25.0 | Lowercarbon Capital, Plural Platform |
| Eleccq | November 2 | Low-carbon mobility | \$20.6 | Shunwei Capital |

Source: PitchBook • Geography: Global • *As of December 31, 2023

Key climate tech early-stage VC deals in 2023*

| Company | Close date | Segment | Deal value (\$M) | Lead investor(s) |
|------------------|-------------|--|------------------|--|
| H2 Green Steel | September 7 | Industry | \$1,629.2 | Altor Equity Partners, GIC (Singapore), Hy24, Just Climate |
| ZEEKR Automobile | February 13 | Low-carbon mobility | \$750.0 | Amnon Shashua, Yuexiu Financial Holdings |
| AVATR Technology | August 31 | Low-carbon mobility | \$414.8 | N/A |
| Atlas Agro | August 14 | Land use | \$325.0 | Macquarie Bank |
| HUMARA | December 15 | Industry | \$305.5 | N/A |
| HuaSun Energy | January 19 | Intermittent renewable energy | \$291.1 | CNBM Investment |
| Ambient Fuels | May 2 | Clean fuels | \$250.0 | Generate |
| 1KOMMA5 | June 23 | Intermittent renewable energy | \$232.1 | G2 Venture Partners |
| Qingdian Solar | May 9 | Intermittent renewable energy | \$217.5 | Beijing Energy Tongxin Investment, Hefei Industry Investment Group |
| Numbat | October 16 | Grid infrastructure, low-carbon mobility | \$148.2 | DAL Deutsche Anlagen-Leasing |

Source: PitchBook • Geography: Global • *As of December 31, 2023

Key climate tech late-stage VC deals in 2023*

| Company | Close date | Segment | Deal value (\$M) | Lead investor(s) |
|----------------------|--------------|-------------------------------|------------------|---|
| Verkor | September 14 | Grid infrastructure, industry | \$1,567.1 | Macquarie Group |
| Envision AESC | June 30 | Low-carbon mobility | \$1,000.0 | N/A |
| Redwood Materials | August 29 | Industry | \$997.2 | Capricorn Investment Group, Goldman Sachs Asset Management |
| Hithium | June 30 | Grid infrastructure | \$629.0 | Beijing Financial Street Capital Operation Center, China Life Private Equity |
| Ascend Elements | September 5 | Industry | \$542.0 | Decarbonization Partners, Qatar Investment Authority, Temasek Holdings |
| EcoCeres | January 12 | Clean fuels | \$400.0 | N/A |
| Electric Hydrogen | April 6 | Clean fuels | \$380.6 | Energy Impact Partners, Fifth Wall, Fortescue Future Industries, Microsoft Climate Fund |
| Libode | April 11 | Low-carbon mobility | \$374.7 | N/A |
| Juniper Green Energy | September 13 | Intermittent renewable energy | \$350.0 | Vitol |
| Astronergy | July 24 | Intermittent renewable energy | \$277.4 | Chaoxi Capital |

Source: PitchBook • Geography: Global • *As of December 31, 2023

Key climate tech venture-growth deals in 2023*

| Company | Close date | Segment | Deal value (\$M) | Lead investor(s) |
|-----------------|--------------|-------------------------------|------------------|--|
| Neta Auto | August 29 | Low-carbon mobility | \$969.4 | N/A |
| Xpansiv | January 11 | Carbon tech | \$525.0 | Bank of America, Blackstone, The Goldman Sachs Group |
| Nexamp | May 31 | Intermittent renewable energy | \$400.0 | Mitsubishi UFJ Financial Group, U.S. Bank |
| Newlight | August 3 | Carbon tech | \$271.2 | GenZero |
| Redaptive | May 3 | Built environment | \$250.0 | N/A |
| X Energy | December 5 | Dispatchable energy sources | \$235.0 | N/A |
| Cornish Lithium | September 8 | Industry | \$212.6 | N/A |
| Lyten | September 12 | Low-carbon mobility | \$200.0 | Prime Movers Lab |
| Infinitem | November 1 | Low-carbon mobility | \$200.0 | Just Climate |
| Ynsect | April 16 | Sustainable food, land use | \$175.0 | N/A |

Source: PitchBook • Geography: Global • *As of December 31, 2023

Key climate tech VC exits in 2023*

| Company | Close date | Segment | Exit value (\$M) | Acquirer(s) |
|----------------------|-------------|-------------------------------|------------------|----------------------------|
| REPT BATTERO | December 18 | Grid infrastructure | \$5,066.4 | N/A |
| Carbon Engineering | August 15 | Carbon tech | \$1,100.0 | Occidental Petroleum |
| GaN Systems | March 2 | Grid infrastructure | \$830.0 | Infineon Technologies |
| VIA | January 31 | Low-carbon mobility | \$630.0 | Ideanomics |
| Paguld | July 14 | Intermittent renewable energy | \$587.2 | N/A |
| Weili Transmission | August 8 | Intermittent renewable energy | \$268.1 | N/A |
| EVPassport | October 12 | Low-carbon mobility | \$200.0 | Northleaf Capital Partners |
| Borealis Foods | February 1 | Sustainable food | \$150.0 | Oxus Acquisition |
| Energy Pv-tech | February 22 | Intermittent renewable energy | \$94.1 | Soochow Securities Company |
| Surpass Sun Electric | March 3 | Grid infrastructure | \$59.8 | BorgWarner |

Source: PitchBook • Geography: Global • *As of December 31, 2023

Top VC investors in 2023 climate tech companies since 2017*

| Investor | Deal count |
|--------------------------|------------|
| Climate Capital | 168 |
| SOSV | 165 |
| Lowercarbon Capital | 109 |
| Energy Impact Partners | 82 |
| CPT Capital | 73 |
| Blue Horizon Corporation | 72 |
| Collaborative Fund | 70 |
| Alumni Ventures | 67 |
| Prelude Ventures | 67 |
| Shell Ventures | 61 |

Source: PitchBook • Geography: Global • *As of December 31, 2023

Top VC-backed climate tech companies by total VC raised to date*

| Company | Segment | VC raised to date (\$M) |
|-----------------------------|-------------------------------|-------------------------|
| Northvolt | Industry | \$5,667.5 |
| Neta Auto | Low-carbon mobility | \$3,591.8 |
| SVOLT | Grid infrastructure | \$3,231.3 |
| GAC Aion | Low-carbon mobility | \$2,965.4 |
| Commonwealth Fusion Systems | Dispatchable energy sources | \$1,999.0 |
| H2 Green Steel | Industry | \$1,988.5 |
| Verkor | Grid infrastructure, industry | \$1,955.5 |
| Impossible Foods | Sustainable food | \$1,862.5 |
| Redwood Materials | Industry | \$1,815.8 |
| SUNWODA EVB | Low-carbon mobility | \$1,615.4 |

Source: PitchBook • Geography: Global • *As of December 31, 2023

Climate tech drivers

Climate technology is not immune to the wider trends that have influenced VC overall. The space has been affected by challenging macroeconomic conditions, including high interest rates and lower fundraising activity. While the climate tech space is very broad, and many areas within it have their own unique drivers, there are a few areas that have strong influence across climate technologies.

Regulation and policy

Guidance continues to emerge on how best to access the support and incentives that the Inflation Reduction Act provides.

Regulation and policy are still critical for investment in climate tech. Though certain climate tech applications such as renewable energy, building energy efficiency, and electric vehicles offer benefits outside of their emissions reduction, many technologies in the space are ultimately dependent on support specifically for decarbonization. Regulation and policy support for climate tech is strong in key geographies. In the US, more than a year after the signing of the Inflation Reduction Act (IRA), guidance continues to emerge on how best to access the support and incentives that the IRA provides.^{4,5} This remains a core enabler of climate tech deployment, and thus investment in technology development.

European regulation similarly incentivizes climate tech deployment, though it leans more heavily toward a compliance-based approach, as opposed to the US' incentives-based support. The EU's Emissions Trading System (ETS) sets a cap on the carbon emissions for certain industry sectors, and issues allowances to market participants. Those that emit more than their held allowances must purchase more, and those emitting less can sell their allowances to other market participants. By reducing the number of allowances each year, overall emissions are reduced, as companies otherwise must purchase credits from an annually decreasing supply. Last year, allowance prices reached a record high of over €100.⁶ The current ETS does not cover some sectors such as the built environment and road transport sectors, and a second "ETS II" is planned to cover these additional sectors, with initial reporting starting in 2025 and full operations beginning in 2027.⁷ Further, the EU has begun to introduce a Carbon Border Adjustment Mechanism (CBAM), which will work to prevent "carbon leakage" (where high-carbon processes are moved out of the region, rather than decarbonized) by placing a price on the carbon emissions of certain goods imported into the EU. The CBAM's introduction is also being phased in, with the first reporting requirements starting in January 2024 and the full system becoming operational in 2026.⁸

4: "IRS Provides Additional Guidance for Advanced Energy Projects," Internal Revenue Service, May 31, 2023.

5: "U.S. Department of the Treasury, IRS Release Guidance to Build out U.S. Clean Vehicle Charging Infrastructure," U.S. Department of the Treasury, January 19, 2024.

6: "EU Carbon Hits 100 Euros Taking Cost of Polluting to Record High," Reuters, Susanna Twidale, Kate Abnett, and Nina Chestney, February 21, 2023.

7: "ETS 2: Buildings, Road Transport and Additional Sectors," European Commission, n.d., accessed February 23, 2024.

8: "Carbon Border Adjustment Mechanism," European Commission, n.d., accessed February 23, 2024.

Awareness and energy cost reduction

Consumer technologies such as residential energy systems and electric vehicles are also affected by a growing demand from consumers for ways to reduce their carbon footprints.⁹ Awareness of climate change and its impacts has increased, alongside awareness of the impacts of continued carbon emissions. This change affects consumer preference for purchased goods, which can push manufacturers to switch to low-carbon inputs or processes, develop low-emissions alternatives, or engage in alternative decarbonization options such as voluntary carbon markets. Investor pressure is also strong in this regard as focus on emissions grows.^{10, 11}

In addition to interest in reducing the effects of climate change, some elements of climate tech offer benefits even for those with no interest in decarbonization. Reducing grid energy usage is a common way to reduce carbon emissions, as most geographies derive a large proportion of their power-grid energy from fossil fuels, and technologies that allow companies and individuals to reduce energy consumption can also reduce overall energy costs. In many instances, this may be the primary incentive for adopting climate technologies. High energy costs over the past two years have accelerated the uptake of home energy technologies, including both energy generation and storage, as well as energy use efficiency technologies.

9: "The Sustainable Consumer 2023," Deloitte, n.d., accessed February 23, 2024.

10: "HSBC Caves to Investor Pressure on Capital Markets Emissions," Financial Times, Kenza Bryan, February 10, 2024.

11: "Glencore to Update Climate Plan in 2024 After Investor Pressure," Reuters, Clara Denina and Eva Mathews, December 13, 2023.