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Silicon Valley Bank

The Future of Climate Tech

A Look at the Technologies and Economics Enabling a Sustainable Future

2021

The Future of Climate Tech 2021

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Executive Summary

A Climate Tech Path to Sustainable Growth

Temperature extremes, droughts, wildfires, and destructive weather events have become more frequent and severe as a result of climate change. One-third of plants and animals are at risk of extinction, and by 2050 it is estimated that at least 140M people will be forced to migrate. Because of this daunting reality, the outlook seems bleak. Yet, amidst this crisis, we see opportunities for a sustainable future with strong economic growth and prosperity, led by innovation and technology.

The stage for climate tech is set. There is ample capital available to companies working on solutions for climate-related issues. Venture Capital (VC) fundraising for climate tech–focused funds in 2021 is on track to hit a record $21B. Similarly, capital flowing from VC funds to climate tech companies is on course to reach a record $49B. Governments are taking a more active role in meeting their climate goals with 54% of emissions covered by policy, regulation or an official government position. Renewable energy and storage technologies have reached maturity and achieved economies of scale. They are generally cost-competitive with fossil-fuel power generation. Finally, there is an expanded exit environment for climate tech companies with the rise of special purpose acquisition companies (SPACs) providing liquidity and capital to the late-stage ecosystem. It is with these trends in mind that we are optimistic for continued growth and innovation in climate tech.

Kelly Belcher
Managing Director,
Energy and Resource Innovation

Climate Change:
Risk, Technology, and the Innovation Economy

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THE FUTURE OF CLIMATE TECH

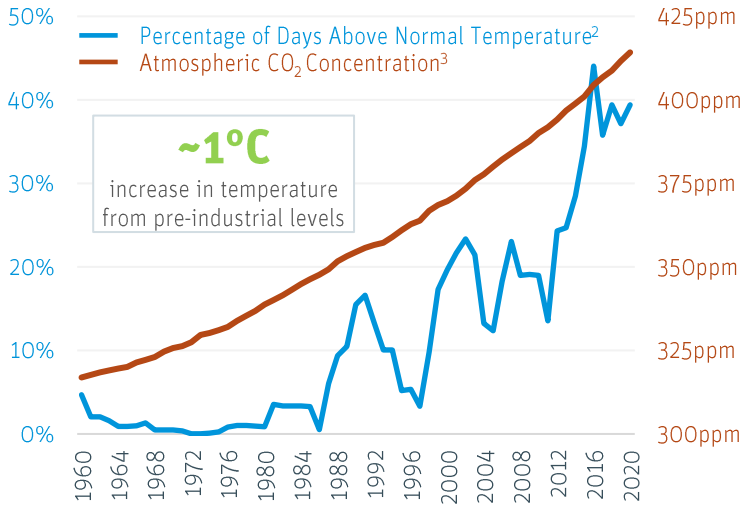
The Anthropocene and the Economy

Fossil fuels have driven economic growth since the turn of the industrial revolution at the cost of altering the atmosphere's composition. Global temperatures have already risen by ~1ºC over pre-industrial levels. Temperature extremes, droughts and destructive weather events have become more frequent and severe. According to recent research published in Proceedings of the National Academy of Sciences (PNAS), one-third of species are at risk of extinction. And by 2050 the World Bank estimates that at least 140M people will be forced to migrate. We are living in the Anthropocene: a geological period defined by the impact of humans on Earth.

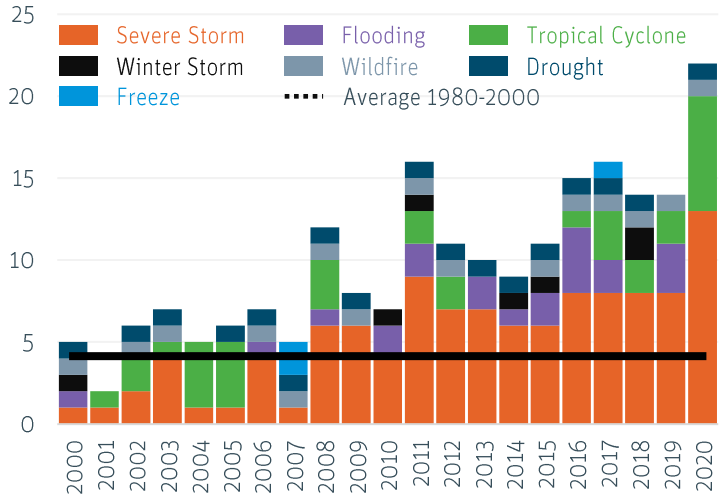
This impact can be quantified. Using conservative estimates of the economic costs from climate change, we could see more than $77T in economic damages by 2050.[1]

Increased awareness and acceptance of the dangers of climate change combined with maturing technologies and blossoming market opportunities have led many entrepreneurs and investors to turn their attention to Climate Tech—a set of sectors focused on technologies and business models to mitigate climate change.

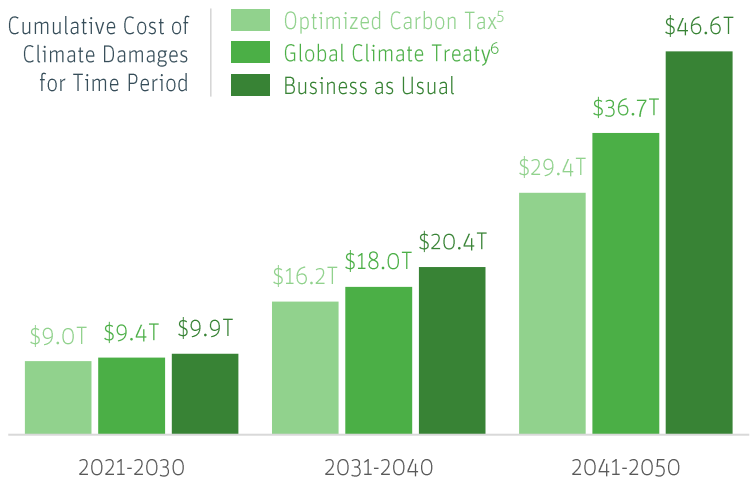
CO_2 and Extreme Temperature Trends



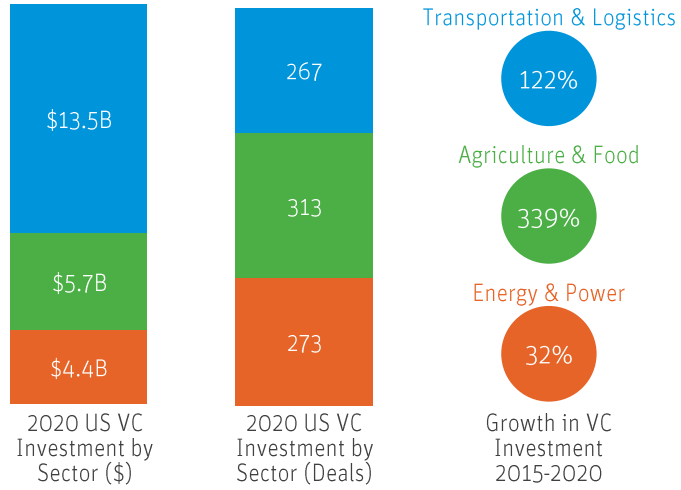
Number of US $1B+ Disaster Events[4]



Climate Change Scenarios and Costs[1]



Climate Tech: Notable Sectors



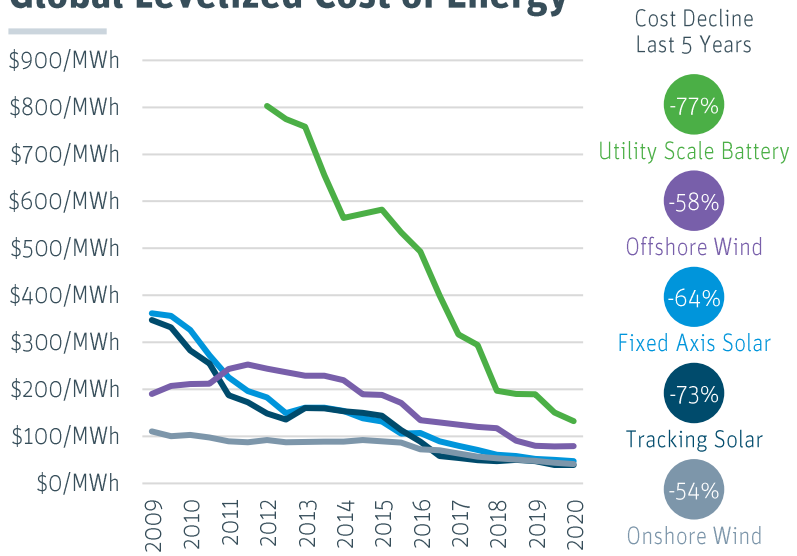
Notes: 1) Using the 2010 Dynamic Integrated Climate and Economy (DICE) model with simplified BEAM Climate Model; in 2015 dollars. 2) 5-year trailing average; share of days with a high in the 90th percentile. 3) Annual average: Mauna Loa Observatory. 4) CPI Adjusted. 5) Optimizing for maximizing GDP. 6) Assuming countries accounting for 80% of emissions participate and cut emissions by 50% by 2050 and 100% by 2100.
Source: NOAA, IPCC, RDCEP at the University of Chicago, World Banks, PNAS and SVB analysis.

Setting the Stage for Climate Tech Success

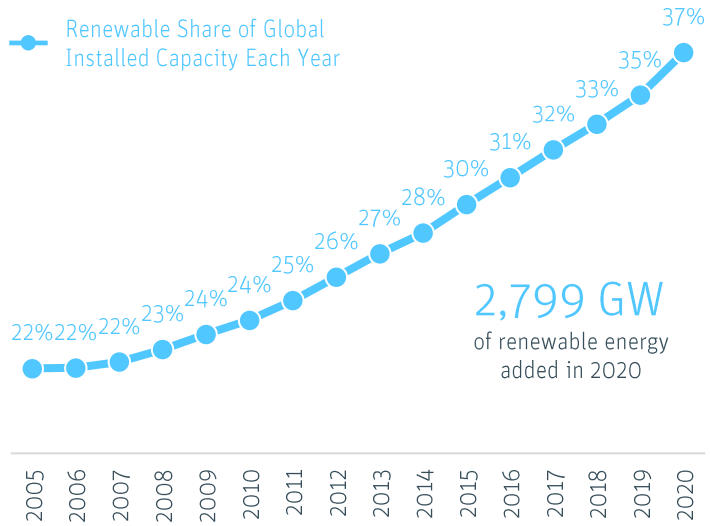
Just over a decade ago, the cleantech bubble burst. The bubble was comprised primarily of companies from thin-film solar, biofuels and energy storage. The preceding cleantech boom was built on hardware-intensive tech with long development cycles and significant execution risks. Following the great recession, developments in hydraulic fracking (i.e., cheaper oil/gas), expansion of solar production by China, and lower silicon costs wrought havoc on the economics of US-based cleantech companies. As a result, investors bailed having sunk around $25B into cleantech between 2006 and 2011. Investors were burned badly with 90% of companies funded after 2007 returning less capital than invested.

Today the narrative is fundamentally different. The foundational technologies, such as solar, wind, and storage, are competitive with fossil fuels on a cost basis. Enabling technologies such as AI/ML and advanced manufacturing have also matured enabling the next round of climate tech companies to be built more efficiently and with greater capabilities that the global political climate is ready to embrace. Anthropogenic climate change has become an international issue. More than 54% of global emissions have reduction targets placed on them. There also is a growing body of favorable legislation and willing consumers for the new crop of climate tech companies.

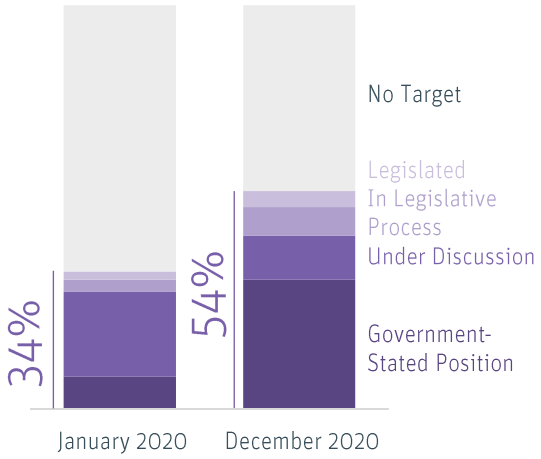
Global Levelized Cost of Energy



Renewable Share of Installed Capacity



Share of Global Greenhouse Gas (GHG) Emissions Covered by a Net-Zero Target

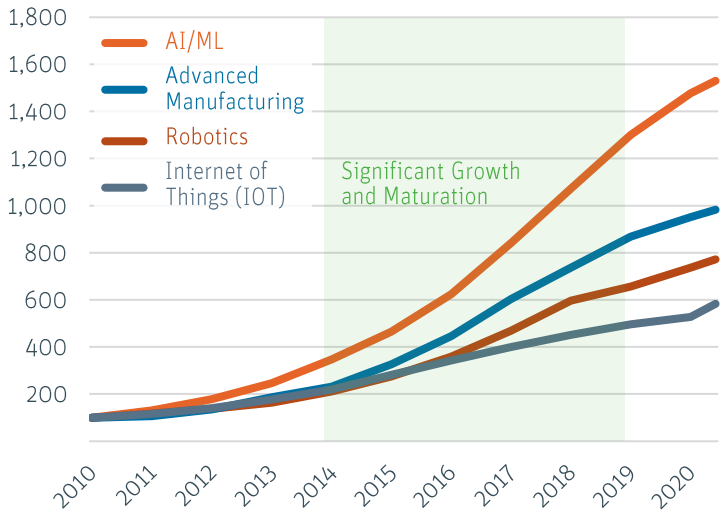


95 countries have a Net-Zero Target under discussion.

20 countries have a Net Zero Target in a policy document.

11 countries have legislated or proposed legislation for a Net-Zero Target.

Enabling Technologies Company Index[1]



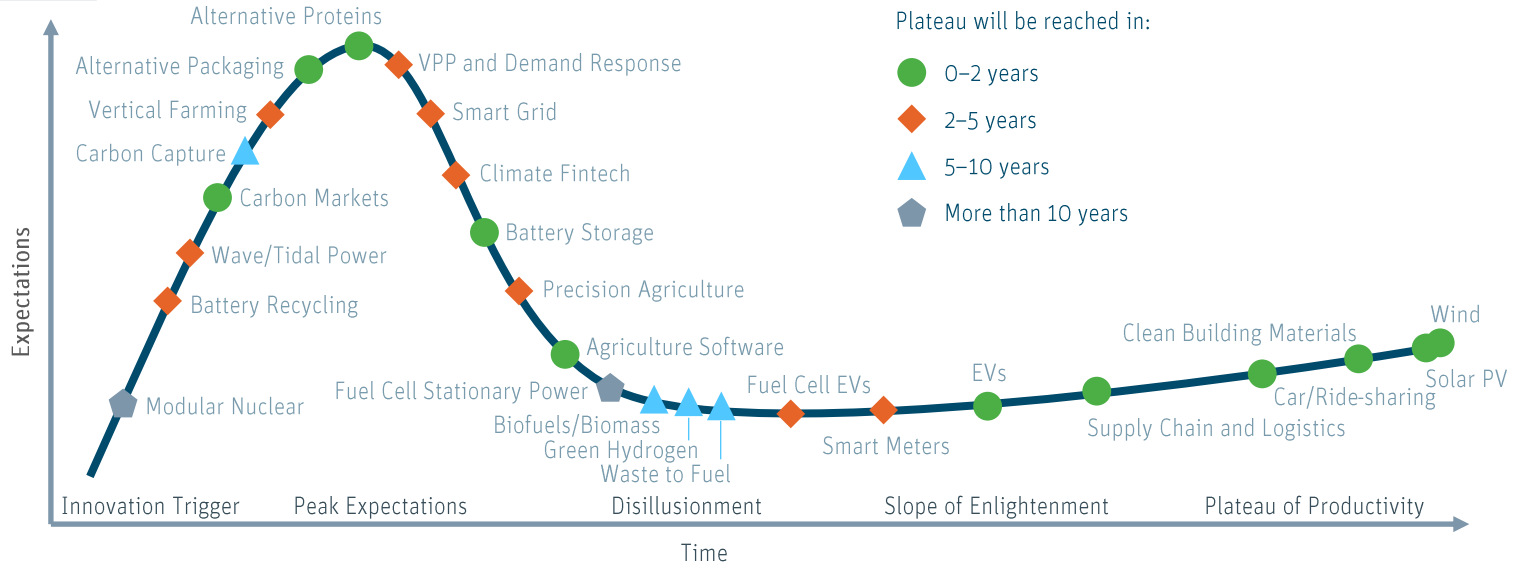
Notes: 1) Index of the number of US VC-backed companies, 2010 = 100.
Source: BNEF, PitchBook, MIT, MIT Technology Review, IRENA and SVB analysis.

Disrupting the Climate Crisis

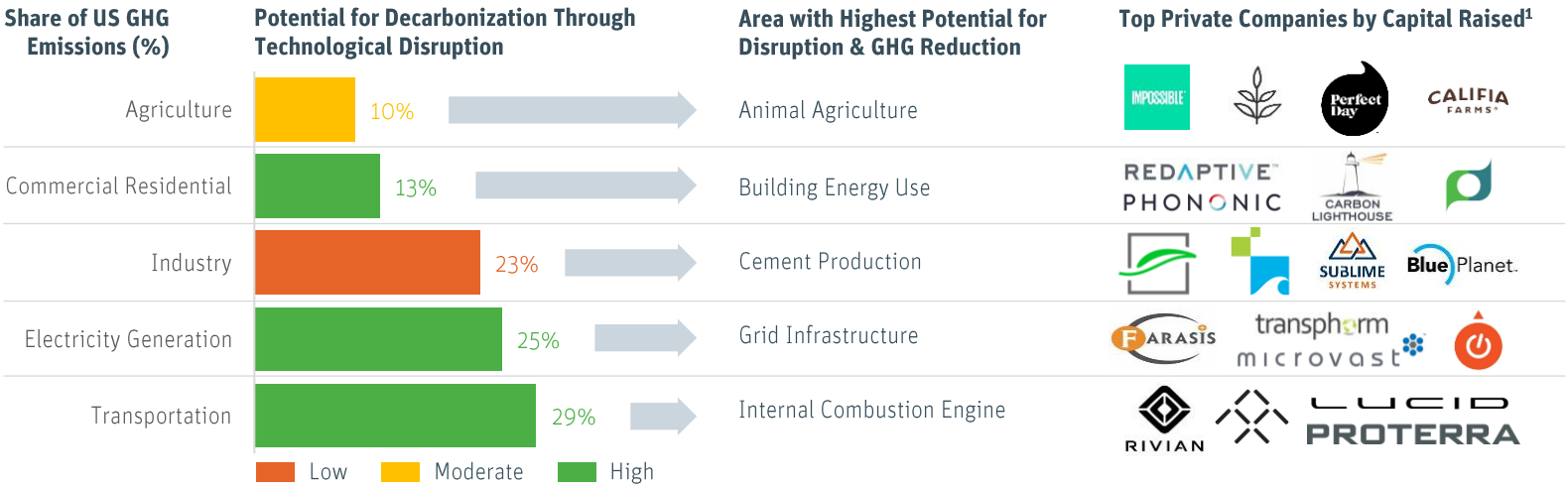
Deep decarbonization of the economy will require changes in every sector. Most experts agree that decarbonizing the power grid, coupled with electrification, is the fastest path to reducing emissions. Energy and power account for 73% of global emissions. Key technologies, such as wind, solar, and to a lesser extent battery storage, are nearing the plateau of productivity. Innovations at this stage are characterized by incremental improvements to efficiency and reducing costs. Thus, renewables will accelerate the disruption of fossil fuel energy production in the coming decade.

The majority of transportation, commercial and residential energy use is replaceable with renewable energy solutions. These applications have the highest potential for decarbonization—at least in the short-term. Solving for challenges like emissions from high-heat industrial processes or animal agriculture are further from being solved. These deep-tech industries are at the frontier of innovation and will require significant capital and time to achieve economies of scale.

Select Climate Tech Innovation Hype Curve



US GHG Emissions by Sector and Potential for Technological Disruption



Notes: 1) By total capital paid in; from left to right: Impossible Foods, LIVEKINDLY Collective, Perfect Day, Califia Farms, Redaptive, Phononic, Carbon Lighthouse, Sunverge Energy, Solidia, Fortera, Sublime Systems, Blue Planet, Ltd., Farasis Energy, Microvast, Transphorm, Smart Wires, Rivian, Faraday Future, Lucid Motors and Proterra.
Source: US EIA and SVB analysis.

Climate Tech 2.0
Fundraising and Investment

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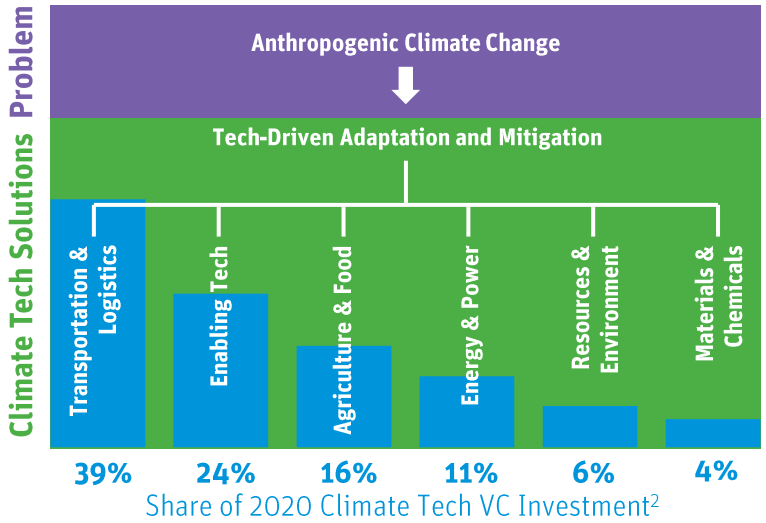
THE FUTURE OF CLIMATE TECH

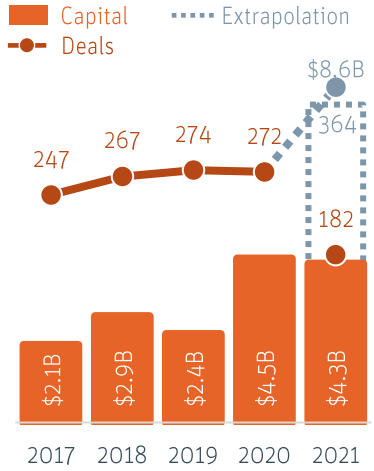
Climate Tech Emerges

Climate tech is the amalgamation of transportation and logistics, agriculture and food, energy and power, resources and environment, materials and chemicals, and other foundational sectors. Yet, the majority of investment flows to three main sectors: transportation and logistics, agriculture and food, and energy and power. In addition, enabling technologies comprise nearly a quarter of investment, including AI and LiDAR.[1] While technologies like autonomous driving or fleet management software may not directly improve the climate, their tangential impacts – such as increased adoption of electric vehicles (EVs) – have the potential to reduce GHG emissions. The transportation sector has seen massive funding rounds for EV companies spurred by the success of Tesla and Rivian. In the energy sector, energy storage solutions have captured the majority of investment. As the grid integrates more renewables and transportation becomes increasingly electrified, investments in long-duration energy storage and new battery chemistries will rise. In agriculture and food, as the world population grows and meat production becomes more costly, alternative protein companies will come to the fore—buoyed by the success of Beyond Meat and Impossible Foods.

Understanding Climate Tech



Investment Overview
Energy & Power



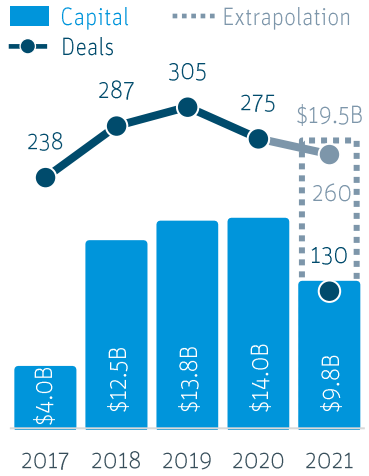
Subsectors to Watch
2020 US VC Investment

Energy Storage $1.9B

Energy Efficiency $970M

Smart Grid $498M

Investment Overview
Transportation & Logistics



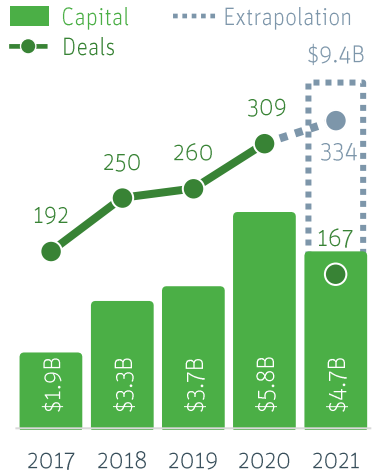
Subsectors to Watch
2020 US VC Investment

Electric Vehicles $6.5B

Autonomous Driving $3.8B[3]

Fleet Management & Logistics $1.9B[4]

Investment Overview
Agriculture & Food



Subsectors to Watch
2020 US VC Investment

Alternative Proteins $2.3B

Precision Agriculture $1.3B

Indoor Agriculture $369M

Notes: 1) Light detection and ranging. 2) From CleanTech Group's i3 database. 3) While autonomous driving companies are not explicitly climate tech, autonomous vehicles enable increased EV use and improved fuel efficiency. 4) While logistics and fleet management companies are not pure play climate tech companies, they offer improved efficiency and increased electrification of shipping and logistics.
Source: CleanTech Group, PitchBook, SVB proprietary taxonomy and SVB analysis.

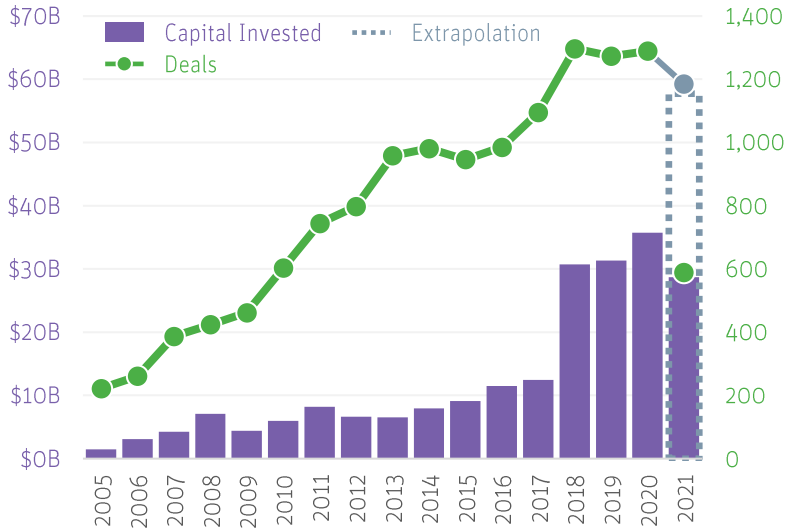
The Early Innings of Innovation

Similar to the overall VC landscape, climate tech venture investment is on track for yet another record year with California, New York and Massachusetts representing the major climate tech hubs. Incubators, accelerators, and early-stage investors like LACI, Greentown Labs, Cyclotron Road, and Powerhouse have helped develop networks in these hubs, further perpetuating the growth of new companies.

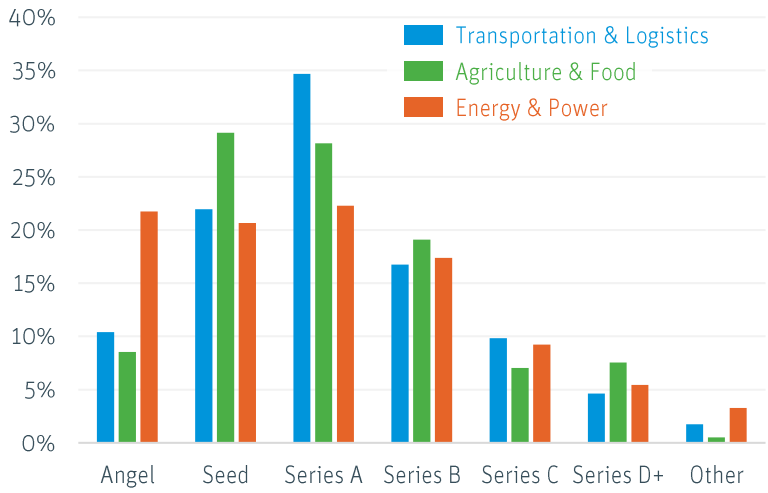
The majority of companies currently being funded are at the early-stage, with the modal series being Series A. The energy and power sector has the most companies raising angel rounds. This is likely the result of strong angel networks with deep domain expertise in the energy space. Transportation and agricultural technologies tend to require more time and capital to develop and prove, so it is not unusual for companies in those sectors to raise larger, institutional rounds earlier in their life cycle.

The valuation step-ups between rounds are generally lower for energy and power companies. This is likely a result of the long time frames for utility-scale planning/implementation, coupled with the difficulties of operating in a highly regulated market.

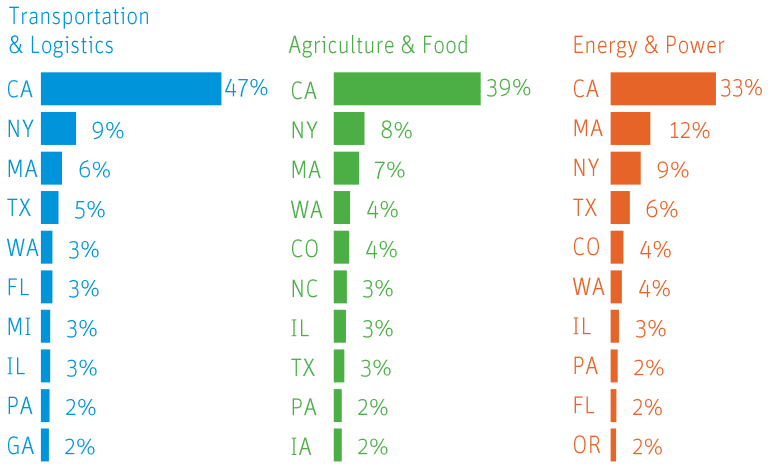
Climate Tech VC Investment Activity[1, 2]



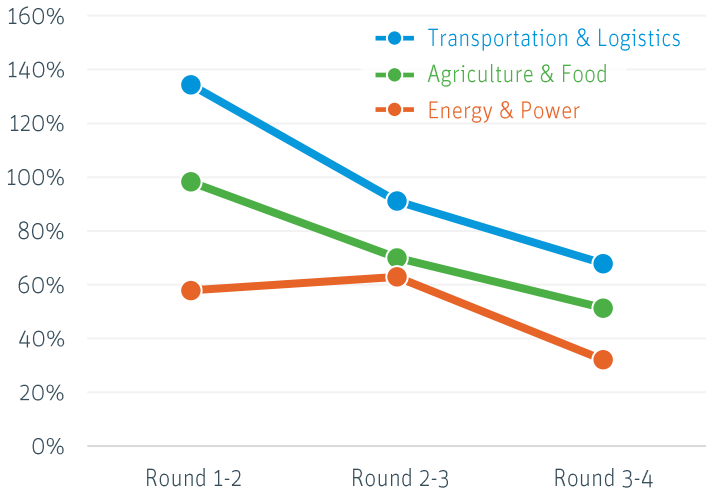
Sector Deals by Stage: Last 18 Months[1]



Geographic Distribution of Companies[1, 3]



Valuation Step-Ups Between Rounds[1]



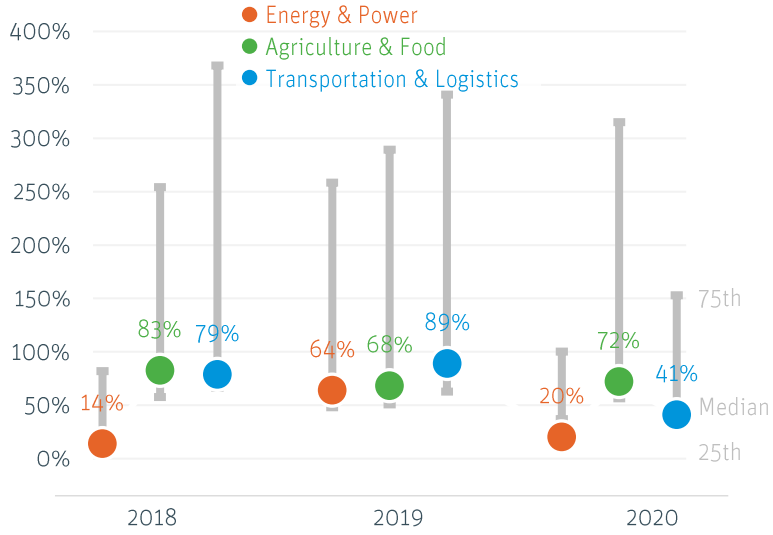
Notes: 1) US companies; from CleanTech Group's i3 database, including enabling technologies that serve more than the climate tech sector. 2) June 30, 2021. 3) By number of US companies.
Source: CleanTech Group, PitchBook, and SVB analysis.

CAPEX and Trade

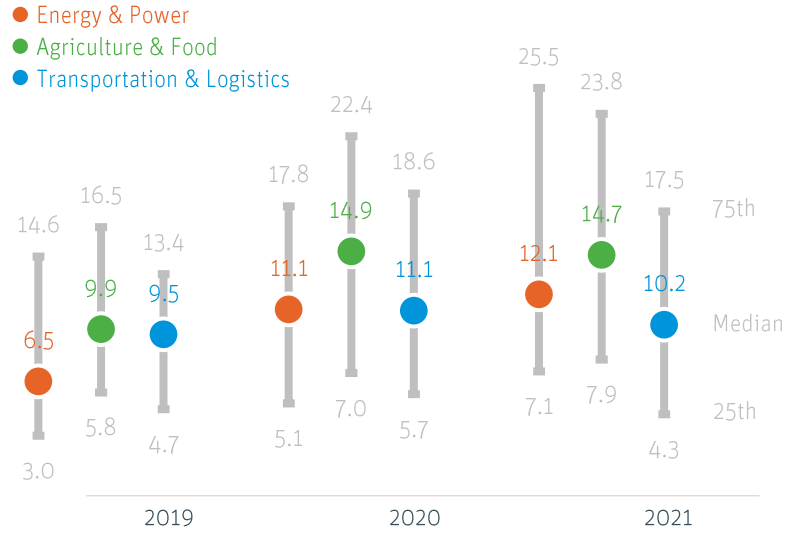
Venture investment more than doubled between 2017 and 2018, and it reached an all-time high of $35B in 2020. The increase in VC funding for climate tech companies has led to more cash on hand and generally higher cash runways, although with slightly lower ranges than more traditional tech. For example, Enterprise Software cash runway ranges from 11 to 18 months. (See State of the Markets Q2 2021).

In contrast, revenue growth has fluctuated. This can be attributed to life stage, as the vast majority of companies raising capital are early-stage with little to no revenue traction. In 2020, food and agriculture saw a boost in cash, but many climate tech companies were exposed to lower growth like the rest of the global economy, as a result of the pandemic slowing consumer demand (transportation) and energy usage (agriculture). As demand waned, companies placed greater emphasis on expense reduction and management in these verticals.

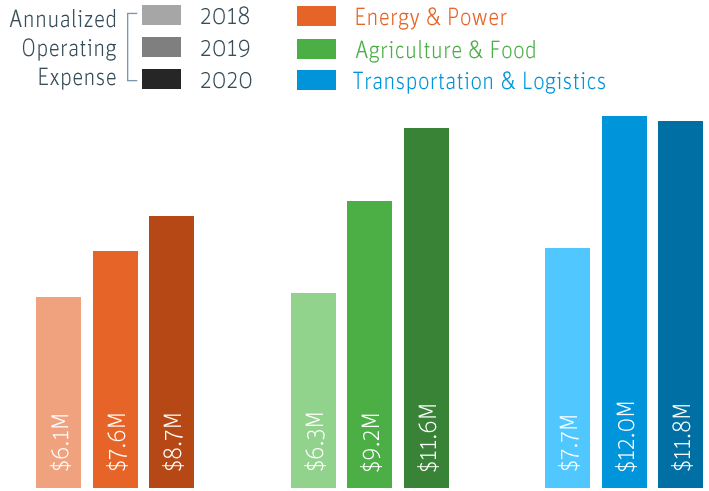
Revenue Growth Rates by Sector[1]



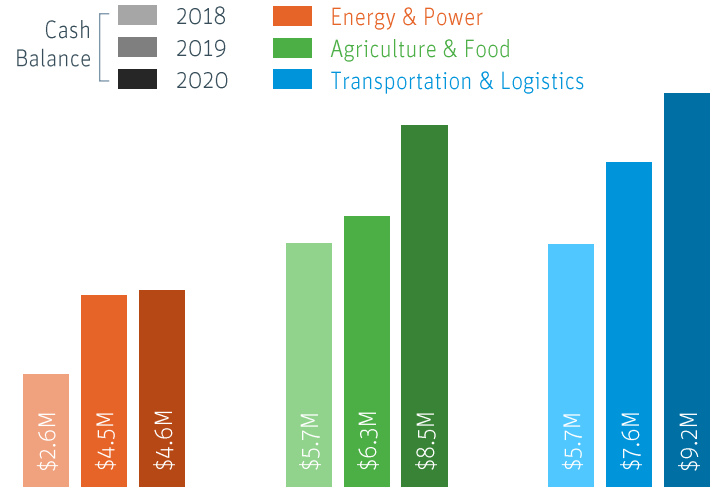
Months of Cash Runway by Sector[1, 2]



Median Operating Expense by Sector[1]



Median Cash on Hand by Sector[1]



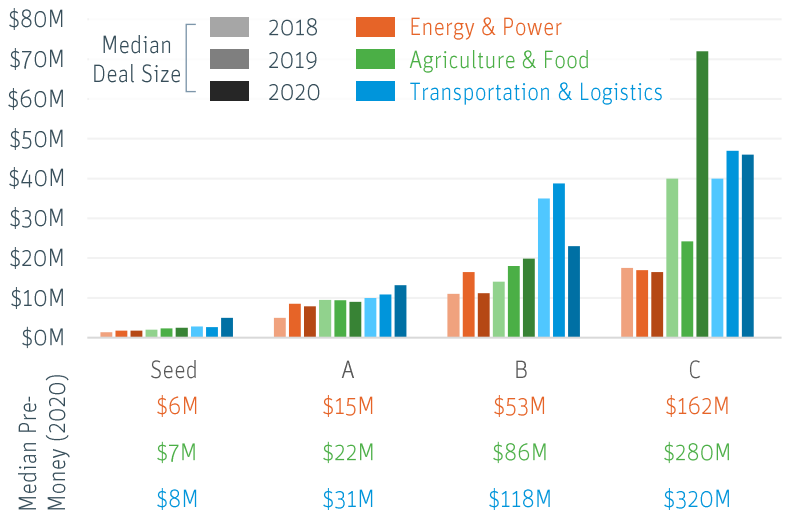
Notes: 1) US-based companies that are SVB clients. 2) For cash-burning companies.
Source: SVB proprietary data and SVB analysis.

Series “C Levels” Rise

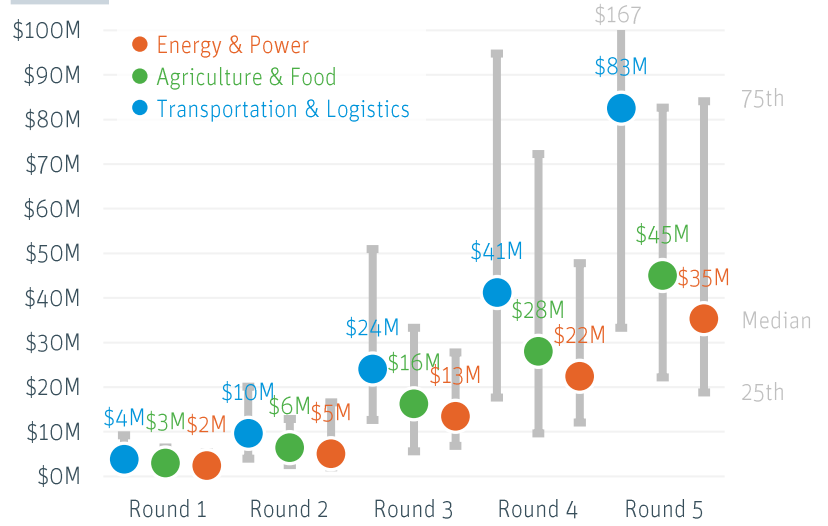
Transportation and Logistics companies have attracted traditional VCs looking for startups that will corner the market—think Lime, Scoot and Bird. Barriers to entry are high and the presence of formidable original equipment manufacturers (OEMs) make competition tough, but investors are willing to compete using mounds of cash—highlighted by marquee deals like Joby Aviation’s $590M Series C. Food and Agriculture companies are in a sweet spot when it comes to demand. A (hungry) global population is projected to hit 8B+ by 2032, while the ease to produce food is becoming less. Direct to consumer and grocery startups benefited from the COVID-19 pandemic when the world stayed home to eat and cook. Companies like Imperfect Foods and Blue Apron benefited from these macro trends. Nestlé’s $1.5B acquisition of Freshly is one of many successful exits in this space.

The Energy and Power space is challenging for traditional VC firms to invest in. Highly regulated and dominated by large oligopolies, inexperienced investors typically aren’t prepared for the complexities of the utility market or the long investment cycles. This situation might be changing, as Union Square Ventures launched its first climate-focused fund in 2021.

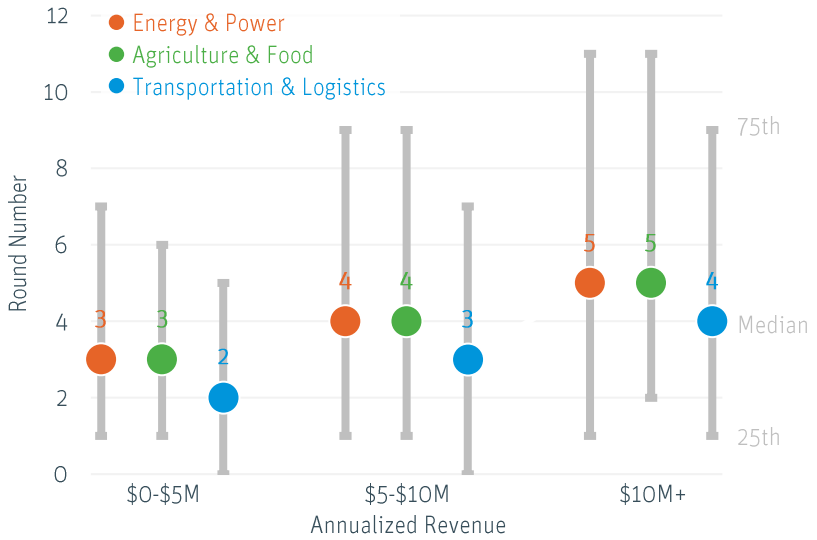
Climate Tech VC Investment by Series[1]



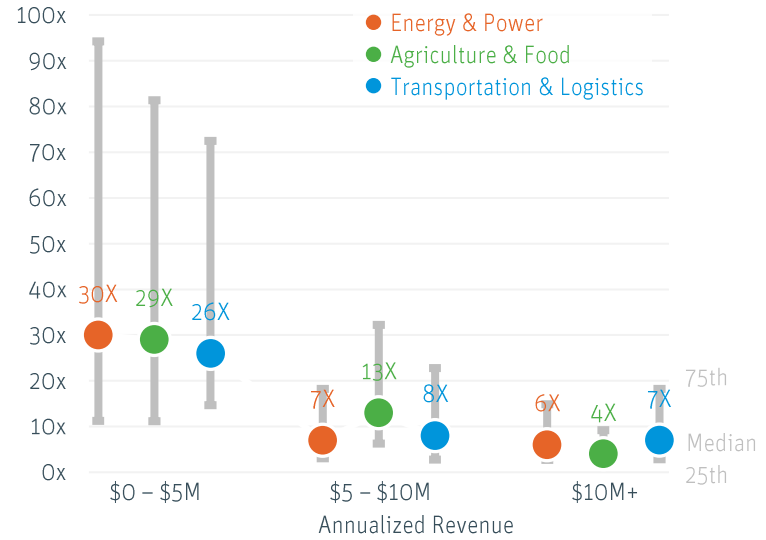
Cumulative VC Equity Raised by Round[1]



Median Round Number by Revenue Band[1]



Revenue Multiple Range by Revenue Band[1]



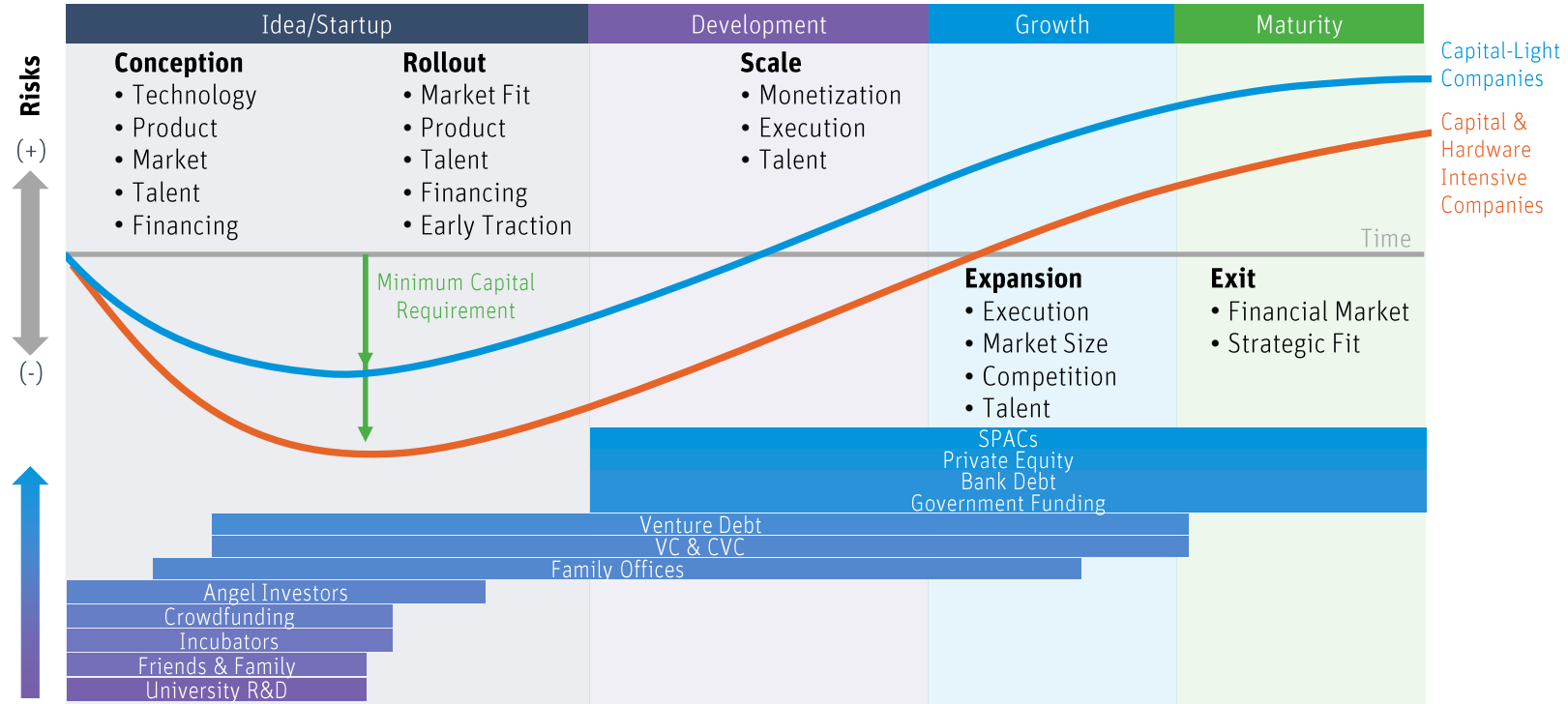
Notes: 1) US-based companies that are SVB clients.
Source: PitchBook, United Nations, SVB proprietary data and SVB analysis.

Funding a Climate Tech Startup

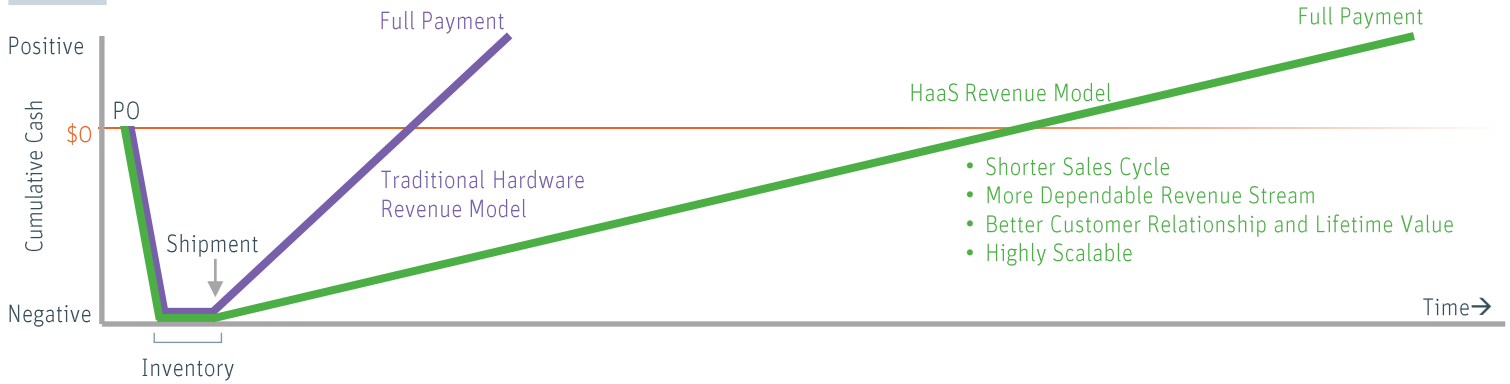
The typical climate tech company is far more capital intensive than most Silicon Valley tech companies, with a majority utilizing a hardware component, meaning the minimum fundraising requirements are generally higher. As technology development timelines and market adoption are longer, the holding period for investors is longer. Some VC funds, family offices and corporates have adapted to this by increasing the length of fund cycles or by using evergreen funds. New pools of capital are emerging, including SPACs, state and federal grants, and the Department of Energy's programs and loan office—which has $40B available to reenvision the power grid.

With respect to debt financing, new financial instruments to provide low-cost capital to robots-, infrastructure-, and hardware-as-a-service companies have emerged, providing entuned solutions to capital-intensive businesses. Many companies are gravitating towards a hardware-as-a-service model by deploying units under long-term contract vs. a one-time sale, as seen in a traditional transactional model. These companies are drawn by lower upfront costs for new customers and more consistent, long-term revenue. Thus, these companies are correspondingly searching for cost-effective ways to finance that model.

Financing Considerations for Climate Tech Startup



Hardware-as-a-Service (HaaS) vs. Traditional Hardware Revenue Model



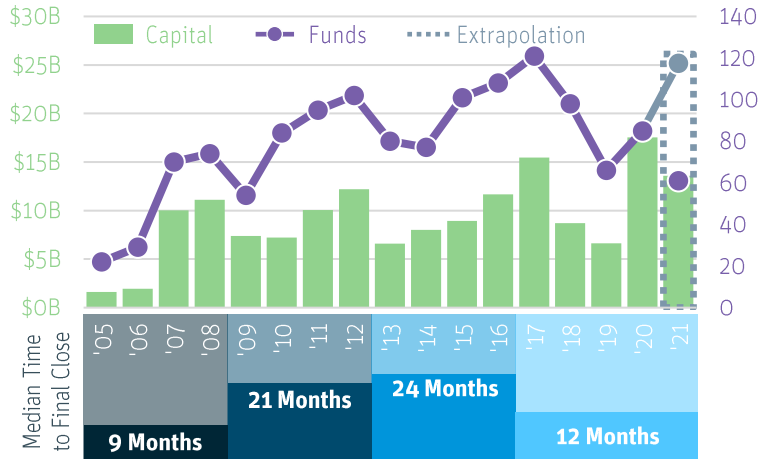
Source: SVB analysis.

Climate Capital Sources Increase

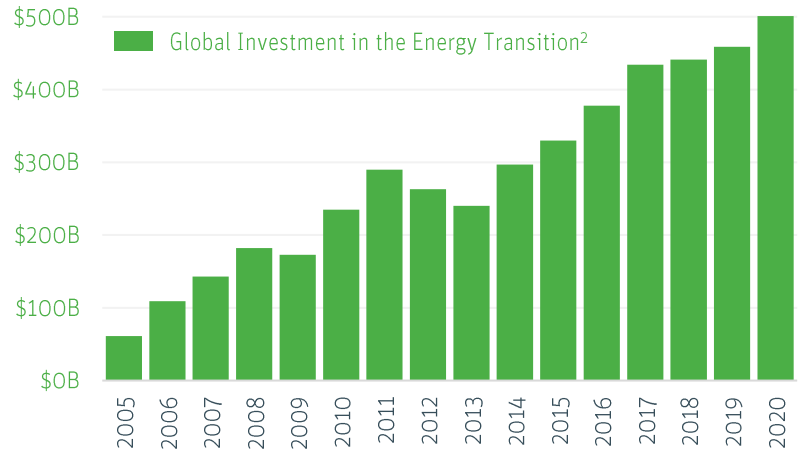
Capital flowing to venture capital focused on climate tech has increased substantially as environmental, social and governance (ESG) factors become a priority for limited partners (LPs). Major financial institutions such as Blackrock and Fidelity have made definitive statements on climate change and backed this up with funding for early-stage, capital intensive climate tech startups. During the first cleantech boom, cleantech VC funds were able to close a fund in just nine months. However, after the cleantech bust, the time to close a fund rose to two years, as LPs were hesitant to invest after being burned once before. Today, the typical climate tech fund takes a year to close, five months less than the industry average. Public support, political will and investor enthusiasm will catalyze quicker deployment of capital and in turn, expedited go-to-market for technologies in the climate tech arena.

Climate tech companies are taking advantage of the rise of SPACs as a capital source. Traditionally, most climate tech companies get bought instead of going public. However, climate tech companies are leveraging SPACs for liquidity and capital, allowing them to prioritize technological development and commercialization rather fundraising. Of the current SPAC cohort, we anticipate nearly $37B will flow to US, VC-backed climate tech companies in addition to $30B from the accompanying private and public equity (PIPE) transactions.

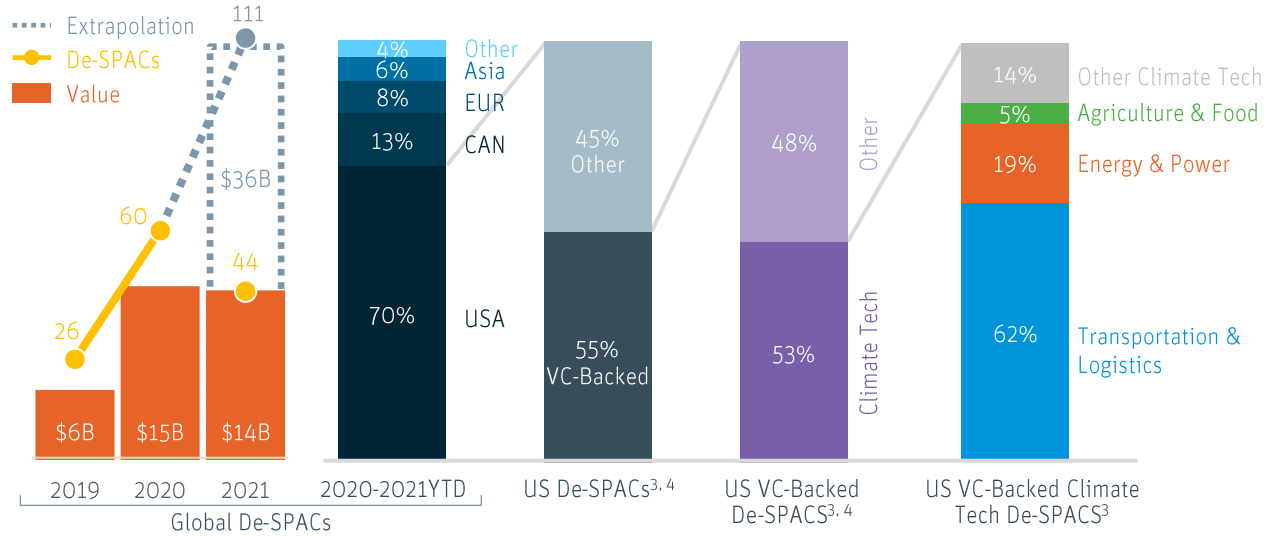
VC Fundraising: Climate Tech Focused[1]



Global Investments in Decarbonization[2]



De-SPAC Landscape for Climate Tech Companies



$6.4B
Total Capital Raised via SPAC for VC-Backed Climate Tech Companies

$5.5B
Total Capital Raised via the Associated PIPE[5] Transactions

$35B–$40B
Estimated Value of SPACs That May De-SPAC a US VC-Backed Climate Tech Company Within the Next 24 Months

Notes: 1) Global funds with a stated interest in Cleantech and Agtech. 2) Investments in technologies/infrastructure enabling a zero-carbon energy future: renewable energy, electrified heat, electrified transportation, energy storage, carbon capture and sequestration and hydrogen. 3) 2020-2021 De-SPACs. 4) Graphic sum above 100%: rounded up 47.5% and 52.5%. 5) Private investment in public equity (PIPE).
Source: Preqin, BNEF, IRENA and SVB analysis.

Looking to the Future:
Climate Tech and the Net Zero Economy

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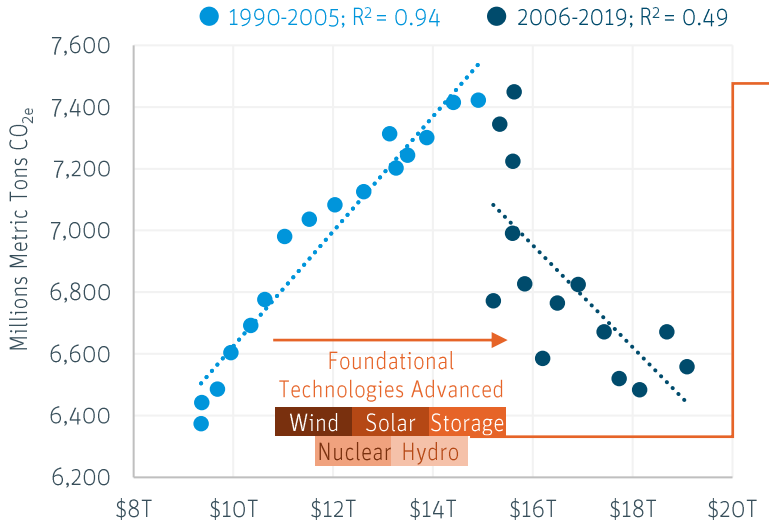
A Path to a Sustainable Economy

GDP and emissions have moved in lockstep for decades, but in the last decade this relationship has reversed due to renewable electricity generation displacing electricity generated from fossil fuels. This was possible due to cost reductions and efficiency improvements for renewable energy technologies over the past decade. With further expansion of electrification of transportation, industry, and our homes, we have the ability to power this electrification fully with renewables and reduce emissions by about 70% in the process.

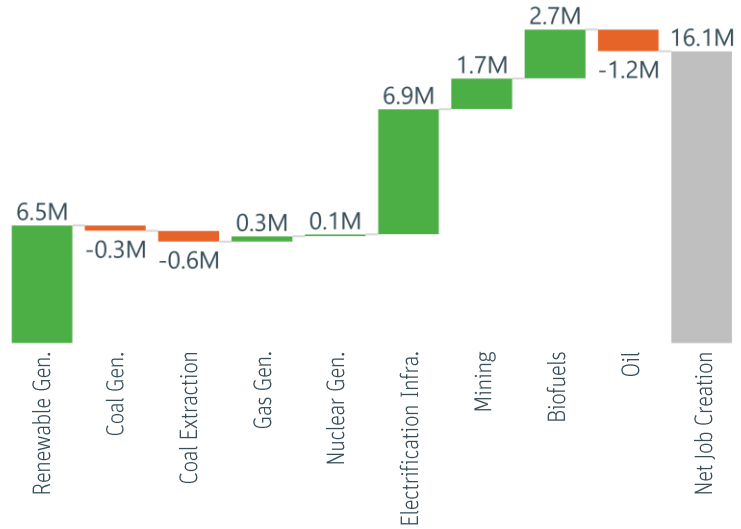
From establishing efficient markets enabling the sale of excess electricity to developing a smart grid that enables two-way communication down to the individual appliance level, technology is helping drive every facet of electrification.

While electrification presents challenges in terms of grid stability — such as load balancing — it also presents an opportunity to upgrade aging infrastructure, creating millions of net new jobs in the process. Ultimately, climate tech is poised to not only reduce human impacts on the climate, but also improve our economies, livelihoods and quality of life.

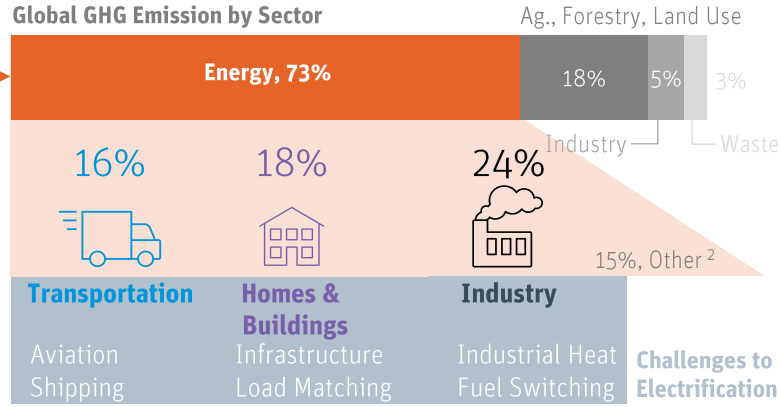
US GHG Emissions and US Real GDP[1]



Global Potential Net Job Creation by 2030



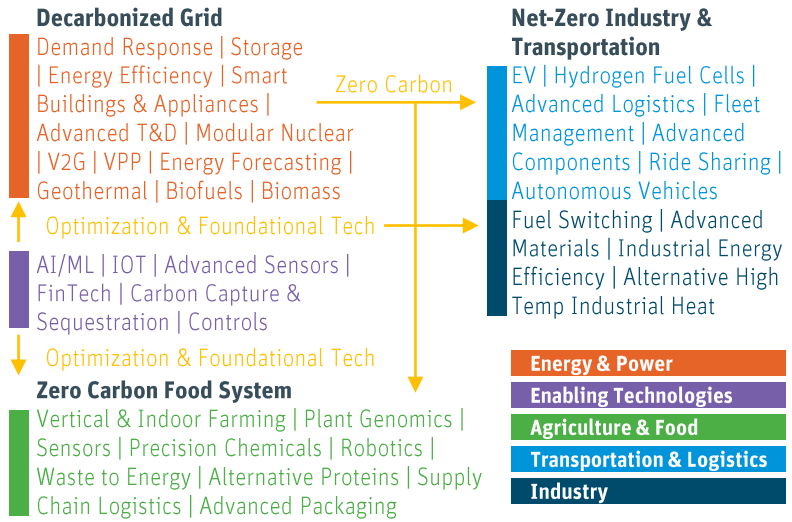
Electrification: Fast Track to Cut Emissions



~70%
Emissions Reduction Possible via Decarbonizing the Grid and Electrification

50%
of Fuel Used for Industry Could be Replaced with Existing Technologies

Climate Tech Enabling Net Zero



Notes: 1) GDP seasonally adjusted; reported in 2012 dollars. 2) Incudes Unallocated Emissions, Fugitive Emissions, Agri/Fishing Emissions.
Source: US EPA, US BEA, Goldman Sachs, McKinsey, Climate Watch, World Resource Institute and SVB analysis.

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