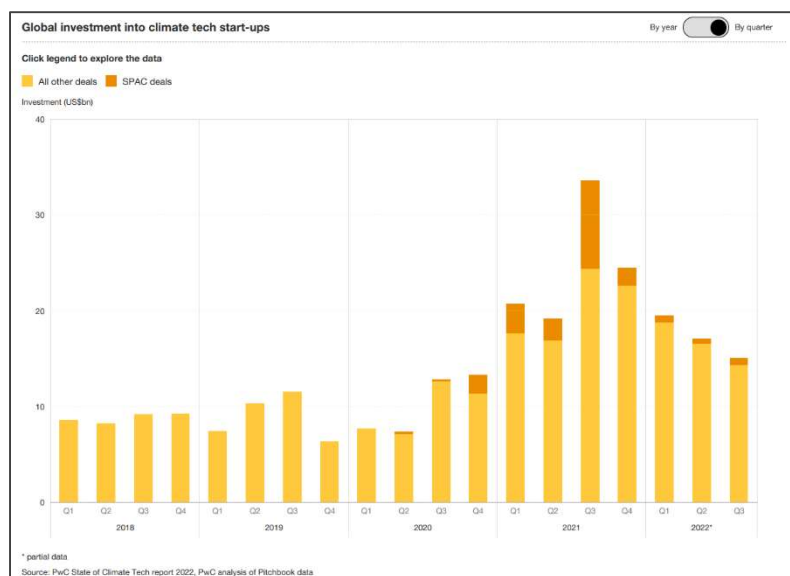


## Climate Tech VC: What Every MBA Needs to Know

### Executive Summary

Increased corporate, consumer, and policy attention to the climate crisis has created a surging demand for climate tech innovation—that is, the broad set of technologies that reduce greenhouse gas (GHG) emissions, remove CO<sub>2</sub> from the atmosphere, or otherwise address the impacts of climate change—opening up attractive opportunities for entrepreneurs and investors. The climate tech market received an extra shot in the arm when the U.S. passed the Inflation Reduction Act (IRA) in 2022 with a multitude of provisions to accelerate decarbonization.

This landscape has led to a significant uptick in capital flowing into the industry in the past 5 years. In the U.S., \$40 billion was invested across 1,000 venture and growth-stage climate tech deals in 2022.<sup>1</sup> More than one quarter of all venture capital (VC) funding is now going to climate tech investments, which range from renewable energy technologies and electric vehicles (EVs) to carbon removal technologies, software solutions for climate monitoring and action, emissions-reducing agriculture technologies, and a host of other innovations.



Source: PwC, State of Climate Tech report 2022. <https://www.pwc.com/gx/en/services/sustainability/publications/overcoming-inertia-in-climate-tech-investing.html>

### The Issue

Venture capital is a primarily equity form of investing that relies on wealthy individuals and institutions (referred to as Limited Partners, or LPs) to invest in funds managed by investors (referred to as General Partners or GPs). GPs invest the fund's capital in companies in their early stages when investments are higher risk and less attractive to traditional public equity investors or private equity investors.

Venture capital firms invest in companies in exchange for a preferred-equity ownership position until the company reaches sufficient size and credibility to be sold to a corporation or complete an initial public offering (IPO). Companies typically go through several rounds of fundraising before being acquired or going public. Initial investments are referred to as pre-seed and seed funding, when there is no precise company valuation attached to the investment, followed by subsequent Series A, B, C etc. rounds at valuations based on factors including macroeconomic conditions, market size, management team, patents, and revenues.

In return for financing the company's growth, VCs typically look for 10x or higher exit multiples over 5-10 years depending on the funding stage. Not all venture investments will provide strong returns. In fact, most won't. VCs are typically relying on just a few investments to be "home runs" or "unicorns" (private companies with a valuation over \$1 billion). For example, only 10-20 percent of companies funded need to have a successful exit for a VC to have an average 25-30% internal rate of return (IRR).

Lead Author: Maggie Edmunds, MBA '23, EDGE Fellow, Fuqua School of Business, Duke University.

### Example Climate Tech VC Deals 2022 (among many others)

**Carbonx**, a Paris-based startup providing access to carbon removal projects - \$900K in Pre-Seed funding

**Kodama Systems**, a MA-based drone forest restoration platform - \$7M in Seed funding

**Loop**, a CA-based EV charging station company - \$40m in Series A funding

**Nitricity**, a CA-based company using solar and wind energy to sustainably produce fertilizers - \$20.9M in Series A funding

**Swell Energy**, a CA-based virtual power plant company - \$120M in Series B funding

**Fervo Energy**, a TX-based geothermal developer - \$138M Series C funding

**Sun King**, an IL-based solar pay-as-you-go platform - \$70M in Series D funding

**Gotham Greens**, a NY-based indoor farming company - \$310M in Series E funding

**Form Energy**, a MA-based developer of wind and solar batteries - \$450m in Series E funding

Source: <https://www.ctvc.co/>

Some VCs are generalist funds that invest in companies across several sectors/themes and stages. Others specialize by theme and/or by stage. For example, a firm might invest its portfolio exclusively in pre-seed and seed stage companies developing climate solutions in the food and agriculture sector.

### Funding Rounds

**Pre-Seed & Seed:** Funding in pre-seed rounds typically comes from the founder themselves as well as friends and family. Seed funding is the first official equity raise and potential investors include VCs and wealthy individuals (“angel investors”). Startups at this stage typically do not yet have a working product, customer base, or revenue stream, so investors are evaluating deals based on qualitative information, such as the experience of the founding team, the ability for the product to solve a fundamental problem, and the size of the market opportunity. Seed funding can range from less than \$50,000 to more than \$5 million, but the majority of seed rounds come in at less than \$500,000.<sup>2</sup>

**Series A:** During this round, it is important for startups to prove they not only have a great idea, but they also have a business model that will generate long-term profit. Often one VC will lead the fundraising round in exchange for a larger equity share and board seat. Other firms (“follow-on investors”) will provide additional capital necessary to reach the round’s fundraising goal. The median Series A round in 2022 was \$15 million.<sup>3</sup>

**Series B:** In this round, the focus is on moving startups past the development stage, growing the business to meet demand, and expanding market reach. Investors in a company’s Series A round will often provide follow-on capital by reinvesting in the company’s Series B. Additionally, new investors specializing in later stage investing may also provide equity-based financing. The median Series B funding raise in 2022 was \$35 million.<sup>4</sup>

**Series C:** Series C funding is about scaling up. Companies raising capital in a Series C round are well-established and are typically looking for additional funding for new products or to expand into new markets. Series C funding rounds can often be used to boost valuations in anticipation of an IPO. While some companies choose to raise subsequent Series D, E, and F rounds, many companies end their external equity funding with Series C. The median Series C funding raise in 2022 was \$55 million.<sup>5</sup>

### Exits

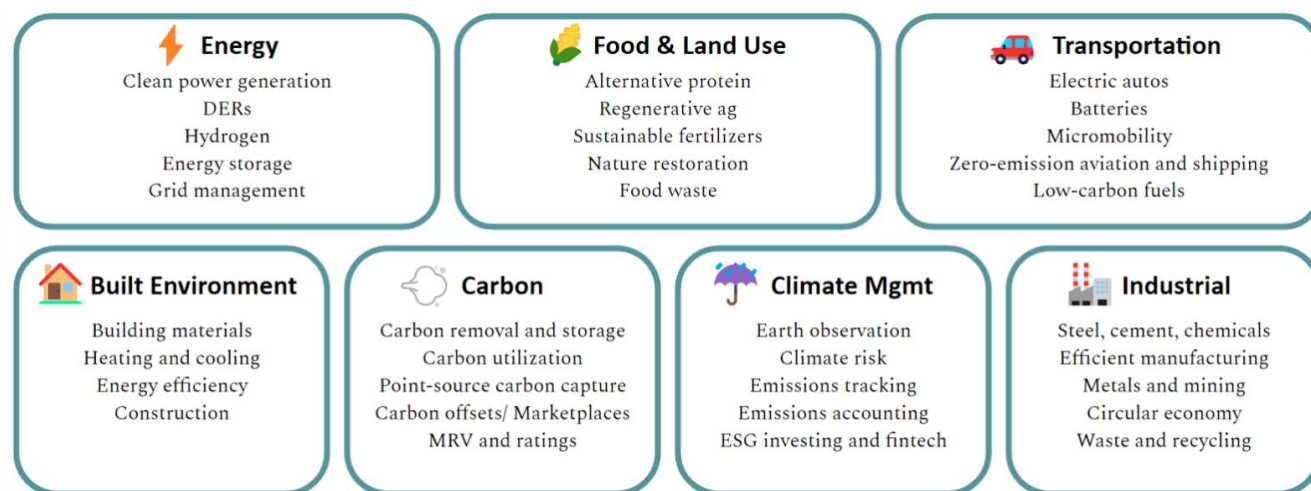
VCs realize investment returns when a startup has an exit event—typically, an initial public offering (IPO), corporate acquisition, or, recently, an IPO via a special purpose acquisition company (SPAC). (The popularity of SPACs exploded in 2020 and 2021, but since then, SPAC funding has declined with climate tech SPACs decreasing from a record high of \$9.3 billion in Q3 2021 to just \$800 million in Q3 2022.<sup>6</sup>)

From 2020 to February 2023, acquisition accounted for 57% of all climate tech exits, while IPO via SPAC accounted for 37%, and IPOs just 6%. Climate tech exit activity increased 70% year-on-year in 2021 and again in 2022<sup>7</sup>. Notable recent IPOs include solar tracker and software provider **Nextracker**, which raised \$638 million in its IPO in February 2023 at a \$3.5 billion valuation.<sup>8</sup>

**“We are looking for high growth, high margin, and high terminal value potential in our investments.”**

- Paul Straub, Managing Director,  
Wireframe Ventures

2023



Climate tech investing categories, from Climate Tech VC, 2022. <https://www.ctvc.co/40b-and-1-000-deals-in-2022-market-downtick/>

### Climate tech investment areas

Since 2020, \$100 billion of venture capital has been invested in climate tech companies.<sup>9</sup> The analytics firm **Climate Tech Venture Capital (CTVC)** helpfully organizes the climate tech startup space into 7 categories: energy, food and land use, transportation, the built environment, carbon, climate management, and industrial.

**Energy:** Climate tech startups in energy include new generation technologies and infrastructure (eg, renewables, nuclear, hydrogen), energy storage, transmission, energy management software, distributed energy resource (DER) solutions, and demand response technologies, among others.

**Food & land use:** Climate tech investments in food and agriculture include alternative proteins, regenerative farming, sustainable fertilizer and animal feed, precision agriculture, and food waste reduction, among others. Food systems are responsible for a third of human-caused global GHG emissions, making the industry ripe for climate innovation (57% of emissions in this category come from meat and dairy production<sup>10</sup>).

**Transportation:** Funds investing in transportation and mobility focus on electric vehicles (including cars, trucks, and buses), charging infrastructure, battery technologies, and sustainable aviation fuels (SAFs).

**The built environment:** Climate tech innovation in the built environment includes technologies aimed at decarbonizing the \$2-5 trillion real estate industry whose carbon footprint accounts for 40% of global greenhouse gas emissions.<sup>11</sup> Investments are focused on making buildings more energy-efficient and "smarter," as well as innovations in construction materials and methods.

**Carbon:** Investments include carbon removal technologies, carbon marketplace products, and carbon capture, utilization, and storage (CCUS) technologies. Though many carbon removal technologies are still in early stages of development, this is expected to be an increasingly important part of global climate strategy in the future. Investment in carbon grew by over 300% between 2021 and 2022, from \$0.6 billion to \$2.3 billion.<sup>12</sup>

**Climate management:** Measuring progress toward global, national, state, and corporate climate commitments is impossible without data. Investments in climate change data include technologies to sense, measure, and manage carbon emissions. One of the smaller industry categories in climate tech in terms of dollars invested, the climate data industry is growing, up 50% in 2022 over the previous year.<sup>13</sup>

**Industrial:** Industrial climate tech solutions seek to decarbonize industries such as concrete, steel, chemicals and plastics. This category might also include efficient manufacturing, mining, circular economy, waste, and recycling technologies. Heavy industry is one of the highest GHG-emitting sectors, but also one of the least invested in of the seven industries. The challenges of high capital costs and slow returns make industrial climate tech less attractive to some VCs. However, huge opportunity exists for innovation and decarbonization if the right incentives, policies, and financing structures are put in place.

Climate tech VCs may invest across one or several of these industries. Example funds (among many others) include: [Breakthrough Energy Ventures](#), [Lowercarbon Capital](#), [Wireframe Ventures](#), [Energy Impact Partners](#), [Obvious Ventures](#), and [Voyager Ventures](#). Early-stage venture investment can also come from corporate VC funds, like [ABB Technology Ventures](#), [Equinor Ventures](#), or [Microsoft's Climate Innovation Fund](#).

## Business Risks

While the climate tech VC market is hot, there are several trends that present risks to investors and startups.

### A cooling fundraising environment

Rising interest rates and concerns about an economic slowdown led to slower VC capital deployment in the second half of 2022, particularly among mid-stage Series B and C deals.<sup>14</sup> This led to a growth in bridge rounds, which "bridge" the gap between larger fundraising rounds, often using convertible debt instruments.

### Another clean tech bubble?

The very public bankruptcy of Solyndra in 2011, among many other factors, signaled the end of the last major "clean tech" investing bubble (sometimes called "Cleantech 1.0"). Analysts today speculate about whether the volume of capital pouring into climate tech today will lead to a similar fate. While conditions are cooling, there are [reasons to believe this time might be different](#). For one thing, the financial incentives, tax credits, R&D investments, and loan guarantees included in the IRA provide stability for the sector. Likewise, demand for climate tech solutions is being pulled ahead by corporations like [Microsoft](#), [Unilever](#), and the approximately [1,700 others](#) (and growing) that have made public commitments to reaching "Net Zero" greenhouse gas emissions goals—commitments that would be difficult to walk back. Additionally, innovative purchase agreements like the [Frontier advanced market commitment](#) provide guaranteed purchasers for carbon removal credits before they are actually produced. So, while there are risks that some climate tech investments may be over-valued, there are also mitigating factors.

### Pace of climate action

While significant investment is going into climate tech, the pace of climate action—which hinges not only on capital availability, but also regulatory/policy action, permitting, infrastructure development, consumers, corporate buyers, supply chain development, carbon markets, and more—may not be sufficient to limit global warming to 1.5°C. Even if all the capital that has been raised for climate tech is deployed, it will take 5-20 years before today's startups reach real scale. Additionally, investment in critical infrastructure (such as power transmission and EV charging infrastructure) and supply chains (for instance, battery production) are needed to accelerate the deployment of climate tech solutions.

### Technology risk

Many climate tech and carbon tech solutions are first-of-a-kind (FOAK) projects, which face unique challenges when it comes to financing solutions from demonstration scale to commercialization. These risky investments where commercial scale is still unproven often fall into the "missing middle" or "valley of death" that exists between venture stage financing (financing for lab-scale, pilot projects) and later-stage project financing (financing for low-risk proven technologies with predictable cash flows).<sup>15</sup>

### Shifting policy environment

Some climate tech ventures address markets opportunities that are supported by tax credits, carbon markets, production mandates, or other policy incentives—which can be subject to political whims. For example, in the U.S., the Investment Tax Credit (ITC) and Production Tax Credit (PTC) for renewable energy projects have been subjected to stops and starts over the last two decades as a result of changing political agendas. The inconsistency of the policy environment presents market risk for some climate tech ventures.

## Business Opportunities

### Massive market opportunity

The scale of investment needed to meet the climate challenge is enormous. Consider the level of investment needed to transition the global economy to a 100% renewable system: researchers estimate this at about \$73 trillion.<sup>16</sup> Mitigating and removing carbon emissions will require innovation in nearly every industry—from transforming agricultural practices to rethinking real estate investments and redesigning supply chains. In a Sept. 2022 report, [PitchBook](#) estimated that companies with technologies that remove or reduce carbon emissions are expected to reach a value of \$1.4 trillion by 2027.<sup>17</sup>

**“These are the world’s biggest markets we’re talking about: energy, food and materials production, transportation.”**

- Sarah Sclarsic,  
Co-Founder & Managing Partner,  
Voyager Ventures

### Available dry powder

Despite the cooling fundraising environment, there is capital ready to be invested in climate tech. Climate tech venture and growth funds had, at the end of 2022, an estimated \$40 billion of “dry powder”<sup>18</sup> (dry powder refers to the investable capital that funds have available for immediate deployment). Many climate VCs are not only hiring at the GP level, but they are also reporting strong hiring trends among their portfolio companies.

Bloomberg TV, 2022  
<https://www.bloomberg.com/news/videos/2022-09-23/voyager-ventures-on-climate-tech-investing-video>

### IRA market incentives

It’s difficult to overstate the importance of the U.S. Inflation Reduction Act (IRA), passed in 2022, which earmarks some \$370 billion in tax incentives, grants, and government investments in renewable energy, electric mobility, sustainable fuels, consumer energy efficiency rebates, climate-smart agtech, industrial decarbonization, carbon removal, and more (for details, see [Climate Tech VC’s IRA Tracker AirTable](#)). IRA investment is expected to stimulate supply chain development, create new purchasing contracts, and bring down the costs of many climate technologies; for example, some experts expect the cost of direct air capture to decrease by 30-70%, and carbon capture, utilization, and storage costs to decrease by 70%.<sup>19</sup>

### Future policy developments

Globally, climate policy continues to evolve as climate impacts become more urgent, consumers and companies become more aware of climate risks, and countries negotiate at each annual COP (Council of the Parties) climate meeting. The U.S.’s passage of the IRA has also prompted incentives from other countries; in early 2023, for instance, [Canada announced](#) \$60 billion in clean energy tax credits and \$20 billion in sustainable infrastructure investments as part of its 2023 budget and the EU announced plans to develop a [Net Zero Industry Act](#). Future climate policies—for instance, a tax on carbon or mandatory cap-and-trade emissions policy—could further accelerate the market for climate tech.

### Early-stage investment

Despite a slowing in Series B and C investing in 2022,<sup>20</sup> climate tech seed round investing was up 51% and Series A funding up 64% YoY in 2022.<sup>21</sup> This could be attributed in part to the growing number of emerging managers (newer firms, typically raising or investing their first, second, or third fund) and first-time investors looking to invest in smaller companies and smaller rounds. The continued investment into Seed and Series A is a strong signal that investors have faith in the future of climate tech startups despite economic uncertainty.

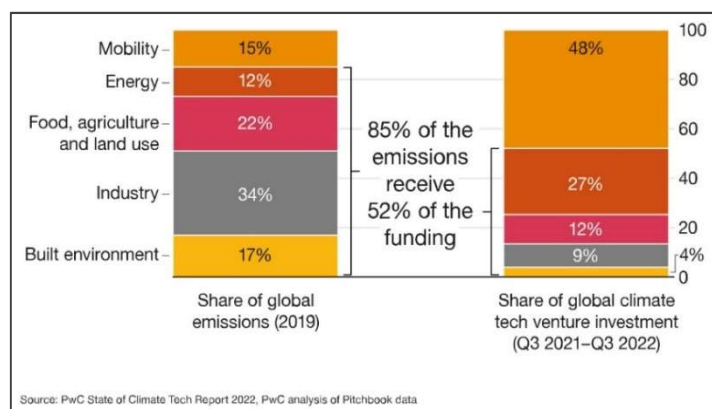
### Increased focus on diversity, equity, & inclusion

The VC community has historically been an industry dominated by white men (white men control roughly 93% of VC dollars<sup>22</sup> and 77% of VC funding goes to white founders<sup>23</sup>), but investors are waking up to the critical importance of diversifying both the founder and the investor pools. [Energy Impact Partners](#) created a \$120 million sub-fund in 2021 called Elevate Future Fund, aimed at expanding access to capital for underrepresented founders and communities advancing the low carbon economy.<sup>24</sup>



### Latent climate impact opportunities

As analysis by [PwC](#) illustrates, not every climate tech startup has the same potential for reducing CO<sub>2</sub> emissions. Investment decisions hinge on many factors, including market size, tech readiness, and commercialization potential, in addition to climate impact; however, in terms of maximizing climate mitigation efforts, there is room for additional investment in decarbonizing heavy industry, food and agriculture, and the built environment.



Source: PwC State of Climate Tech Report.  
<https://www.pwc.com/gx/en/services/sustainability/publications/overcoming-inertia-in-climate-tech-investing.html>

### Climate adaptation technologies

In 2022, [Breakthrough Energy Ventures](#), the climate tech VC fund founded by Bill Gates, [announced](#) it would make adaptation technologies a bigger part of its portfolio. As the world deals with warming temperatures, more extreme weather events, more frequent flooding, and increasing sea level rise, it is likely that infrastructure solutions that help us adapt to new climate realities will be a growth area for climate tech VC investment.

### Climate tech incubators & accelerators

Incubators and accelerators provide catalytic support, including mentoring, to early-stage entrepreneurs. In recent years, this support network has grown dramatically for climate tech ventures. [Elemental Exceleator](#), [Third Derivative](#), and [Los Angeles Cleantech Incubator \(LACI\)](#) (among others) offer support to pre-seed and seed-stage climate ventures. [Greentown Labs](#), based in Boston, opened a second branch in Houston in 2021.

## Takeaways for MBAs

1. Climate tech VC is a hot space. More than a quarter of all VC funding is now going into climate tech deals.
2. Policy is crucial to the success of reaching carbon emission reduction goals. The IRA was a shot in the arm for climate tech; government incentives and R&D funding will help reduce risk for some early-stage companies.
3. Much more capital, innovation, and deployment is still needed to mitigate the worst effects of climate change; additional investment is particularly needed in decarbonizing heavy industry, food & agriculture, and the built environment.

## Further Reading

[Annual State of Climate Tech Report](#), PwC

["\\$40B and 1,000+ deals in 2022 market downtick: 2022 climate tech market report."](#) Climate Tech VC, 2023

[Climate Tech VC weekly newsletter](#)

[US's 50+ Top Climate VCs to Know](#), ClimateHack Weekly, 2023

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- <sup>1</sup> <https://www.ctvc.co/40b-and-1-000-deals-in-2022-market-downtick/>
  - <sup>2</sup> <https://news.crunchbase.com/data/its-not-just-you-seed-rounds-are-actually-getting-bigger/>
  - <sup>3</sup> <https://www.fundz.net/what-is-series-a-funding-series-b-funding-and-more>
  - <sup>4</sup> <https://www.fundz.net/what-is-series-a-funding-series-b-funding-and-more>
  - <sup>5</sup> <https://www.fundz.net/what-is-series-a-funding-series-b-funding-and-more>
  - <sup>6</sup> <https://www.pwc.com/gx/en/services/sustainability/publications/overcoming-inertia-in-climate-tech-investing.html>
  - <sup>7</sup> <https://www.ctvc.co/exits-analysis-clean-tech-climate-tech/>
  - <sup>8</sup> <https://www.axios.com/2023/02/09/nextracker-years-largest-ipo?ref-climate-tech-vc>
  - <sup>9</sup> <https://www.ctvc.co/40b-and-1-000-deals-in-2022-market-downtick/>
  - <sup>10</sup> <https://www.theguardian.com/environment/2021/nov/10/nine-charts-why-us-tackle-food-emissions>
  - <sup>11</sup> <https://www.bloomberg.com/press-releases/2022-07-21/fifth-wall-closes-500-million-for-its-first-climate-fund>
  - <sup>12</sup> <https://www.ctvc.co/40b-and-1-000-deals-in-2022-market-downtick/>
  - <sup>13</sup> <https://www.ctvc.co/40b-and-1-000-deals-in-2022-market-downtick/>
  - <sup>14</sup> <https://www.ctvc.co/40b-and-1-000-deals-in-2022-market-downtick/>
  - <sup>15</sup> <https://www.primecoalition.org/library/barriers-to-the-timely-deployment-of-climate-infrastructure>
  - <sup>16</sup> <https://e360.yale.edu/digest/the-global-price-tag-for-100-percent-renewable-energy-73-trillion>
  - <sup>17</sup> <https://carbonherald.com/new-report-expects-emissions-reduction-industry-to-reach-1-4t-by-2027/>
  - <sup>18</sup> <https://www.ctvc.co/new-dry-powder-for-a-new-climate/>
  - <sup>19</sup> <https://www.ctvc.co/ira-and-the-new-capital-cost/>
  - <sup>20</sup> <https://www.ctvc.co/40b-and-1-000-deals-in-2022-market-downtick/>
  - <sup>21</sup> <https://www.ctvc.co/40b-and-1-000-deals-in-2022-market-downtick/>
  - <sup>22</sup> <https://news.crunchbase.com/venture/untapped-opportunity-minority-founders-still-being-overlooked/>
  - <sup>23</sup> <https://news.crunchbase.com/venture/untapped-opportunity-minority-founders-still-being-overlooked/>
  - <sup>24</sup> <https://www.businesswire.com/news/home/20210728005171/en/Energy-Impact-Partners%2Aand-its-Global-Corporate-Partners%2ALaunch%2Aand-Elevate-Future-Fund%2Ato%2AAdvance%2Aand-Diversity%2Aand-Equity%2Aand-Inclusion%2Ain-the-Energy-Transition%2A?ref-climate-tech-vc>