TEXAS CLIMATE TECH COLLECTIVE

2023 Report

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Houston's Climate Tech Ecosystem

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• Fervo Energy • Bucha Bio • Kanin Energy

Introduction + Executive Summary: Themes + Action Items

This report presents the first ever analysis + survey of Houston's startup ecosystem in climate / energy transition tech. It features a novel data set from **over 200 founders, investors,** and other ecosystem players, supplemented by over **20 qualitative interviews** with leaders in the ecosystem.

In the sections that follow, we share highlights from the findings; unpack the history and players in Houston's burgeoning ecosystem; and present strengths, weaknesses and recommendations for accelerating the growth of Houston's climate tech ecosystem.

Houston has spent the last century as the energy capital of the world. But as climate change has risen to the #1 issue for many global stakeholders, the city has faced immense pressure to **become the energy transition capital of the world – or be left behind by that transition**.

We've seen this firsthand – as three people born and raised in Houston and now working in climate tech. Growing up, climate change was a dirty word, shunned by our friends and families working in oil and gas. But that's changed in just the last few years; even legacy players, and the City of Houston, now recognize the need to position themselves to capitalize on the transition.

In 2019, Houston began its first concerted effort to foster a startup + innovation ecosystem. Four years in, where does it stand?

We put together this report to encourage a community-driven approach to answering the burning questions in our minds (and hopefully yours too): **What are the emerging strengths and remaining weaknesses in Houston's startup ecosystem, especially for startups working in climate + energy transition?**

We hope you find this report informative. We hope you find it useful. But most of all, we hope you use this report to start productive discussions on how we can improve the Houston energy transition / climate tech ecosystem and **cement this great city's role as the climate-first energy transition capital of the world**.

Thanks for Reading
– Taylor, Gabe, and Deanna

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Executive Summary: Themes

Clear themes emerged from the survey + interview, including...

- Houston has a **perception problem**
- Houston needs **more risk capital**, especially at the earlier stages
- Houston's **startup scene has improved radically**. Nearly 80% of respondents agreed "the ecosystem has improved dramatically over the last 5 years."
- Houston's **energy resources and infrastructure** have massive potential to create change…but are underutilized by the climate ecosystem
- Houston's **strong workforce and human capital** are one of its greatest strengths – and it should be investing in transitioning that workforce to new opportunities
- Houston knows **how to build**…but needs to put expertise that towards climate innovation

Executive Summary: Action Items

After extensive review of survey findings + in-depth interviews, we recommend 6 main priorities for Houston leaders. See subsequent pages for detailed findings and recommendations.

1. **Fighting stereotypes with open arms and an embrace of "climate" talk.** Outsider perceptions of Houston often draw on negative stereotypes. The **number one disadvantage** survey respondents chose – even more than access to VC capital – was Houston's **anti-climate reputation** outside the state.
2. **Boosting the availability of early money.** Early-stage capital remains a critical gap – and an opportunity. **53% of survey respondents** chose access to venture capital as one of the biggest challenges facing the ecosystem.
3. **Shameless self-promotion of ecosystem accomplishments.** Interviews underscored the natural advantages Houston has in climate tech, but they also highlighted **how few people outside Houston** know of its strengths. 75% of respondents agreed that "Houston is more innovative than outsiders perceive it to be," and this no doubt plays a role in the VC drought.
4. **Coordinating strategic resources.** Houston's **energy infrastructure, corporate balance sheets, hard-tech expertise, and scale-up experience** remains woefully undertapped. 29% of respondents highlighted partnerships, coordination of existing assets, and Houston's own future investments in infrastructure as potential accelerants to growth.
5. **Cultivating the workforce for transition.** 15% of respondents cited the talent pool as the one thing they wished more climate tech people knew about Houston. As a **base for engineering, technical, and project management talent**, Houston can lead the way for scaling up climate solutions that may struggle to find relevant (and affordable) talent elsewhere. The key is preparing and cultivating that talent for transition.
6. **Investing in a "greener" Houston.** Houston's potential as capital of the energy transition also requires it to **walk the walk**. 14% of respondents cited better climate-friendly infrastructure as a priority issue. While leaders have made efforts, including the city's Climate Action Plan, Houston lags other major cities like Los Angeles and New York.

Acknowledgments, Sources, and Thanks

The team is grateful to all the leaders in Houston's climate tech / energy transition ecosystem who made time to speak and offer their insights (of course, all opinions and errors in the report are ours, not theirs) – including:

- David Baldwin / Partner, SCF Partners
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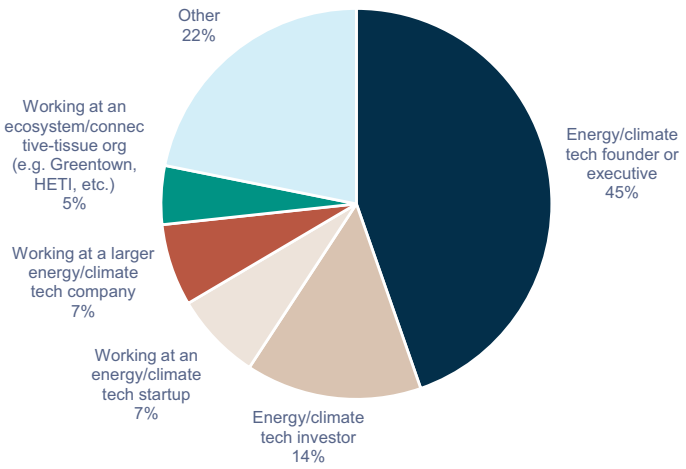
- Neal Dikeman / Partner, Energy Transition Ventures
- Kevin Doffing / Founder, Energy Underground
- Jason Ethier / formerly Greentown Labs, now Lambda Catalyzer
- Scott Gale / Halliburton Labs
- Zimri Hanshaw / CEO, Bucha Bio
- Tim Franklin-Hensler / Prime NRI
- Ed Hirs / Energy Fellow, University of Houston
- Moji Karimi / CEO, Cemvita Factory
- Tim Latimer / Co-Founder + CEO, Fervo Energy
- Yin Lu / Partner, MCJ Collective
- Scott Nyquist / Vice-Chair, HETI
- Paul Hobby / Genesis Park
- Jeremy Pitts / Managing Director, Activate Houston
- Aimee Rose / Exec Managing Director, Activate
- Eric Rubenstein / Managing Partner, New Climate Ventures
- Michael Skelly / CEO, Grid United
- Janice Tran / CEO, Kanin Energy
- Bobby Tudor / CEO, Artemis Energy Partners
- Trevor Best / CEO, Syzygy Plasmonics

Our survey data is based on responses from over 200 members of Houston's climate / energy transition community: **nearly half founders / executives** at climate tech companies, and roughly **one-sixth investors in climate** + energy transition.

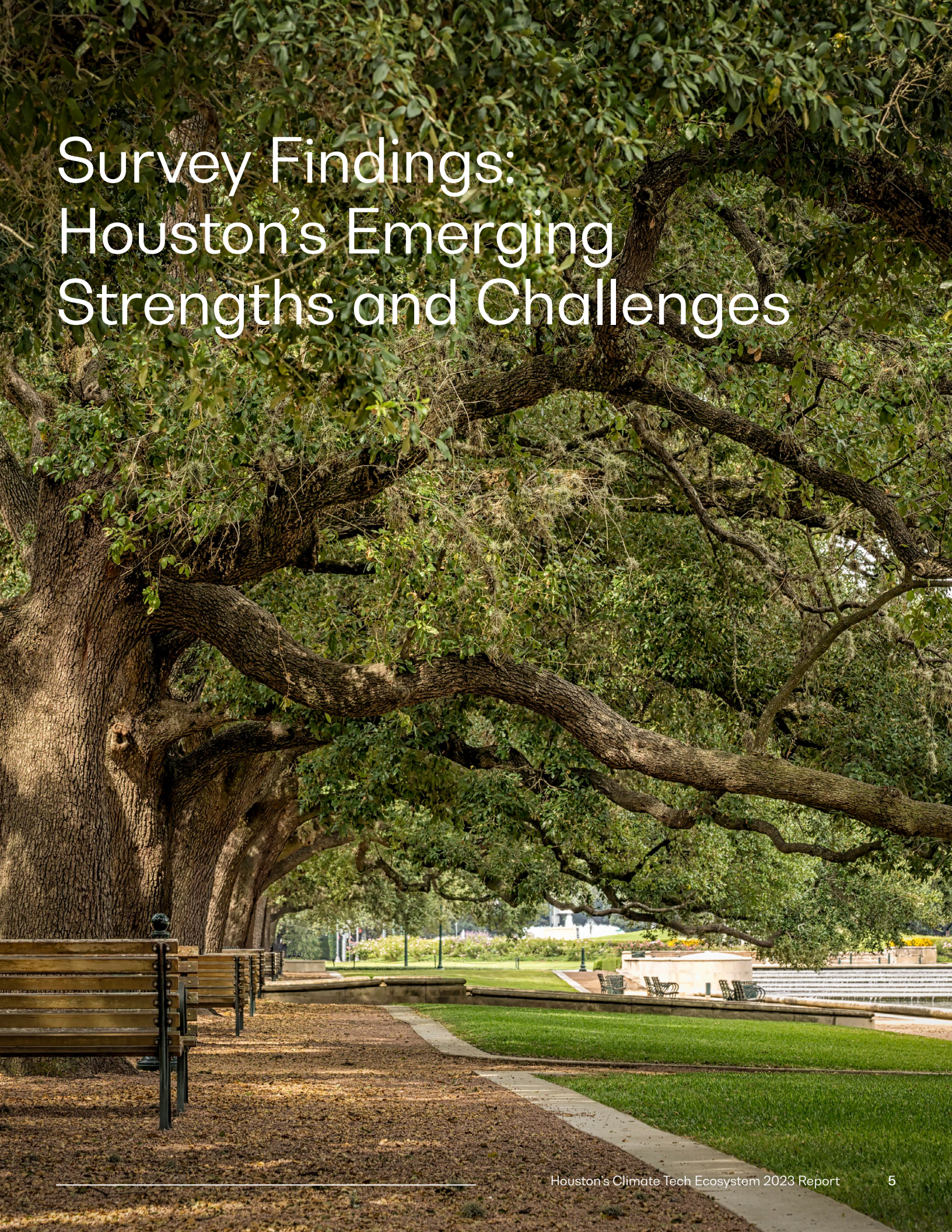
We'd like to offer special thanks to **Tom Nelson** of Compact Membrane Systems, who offered additional research support; **Greentown Labs** and **Energy Underground**, who helped distribute the survey; and **Sarah Morgan, Jimmy Chalk and Vinson & Elkins** for their in-kind support.

Vinson&Elkins

Best Representation of Role

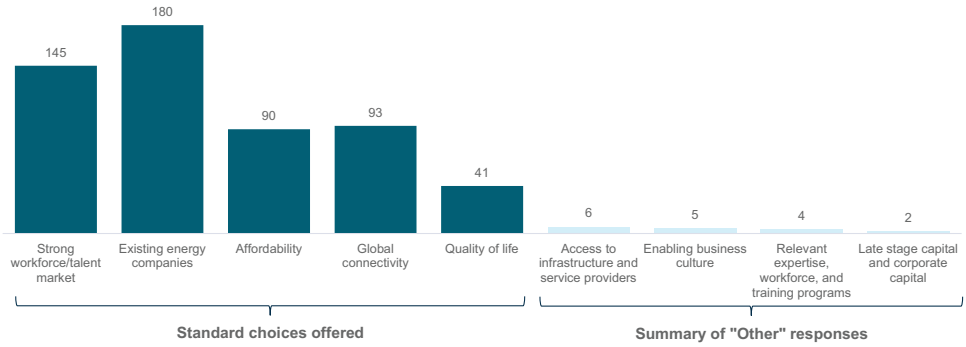


Survey Findings: Houston's Emerging Strengths and Challenges



The Data: Houston's Strengths

What are the biggest advantages Houston has as an energy/climate innovation ecosystem?

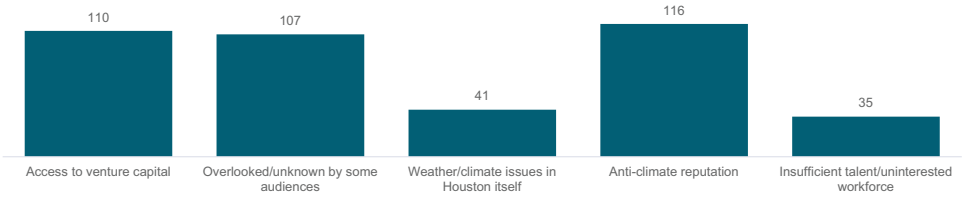


The #1 most cited advantage of Houston's ecosystem is its access to existing energy companies, followed closely by a strong workforce/talent market. Quality of life was cited least.

Some respondents chose to write in responses via the "Other" category. Access to relevant infrastructure and service providers were common responses in this category, as was an enabling business culture: multiple responses cited the Texas "can-do" attitude.

The Data: Houston's Challenges

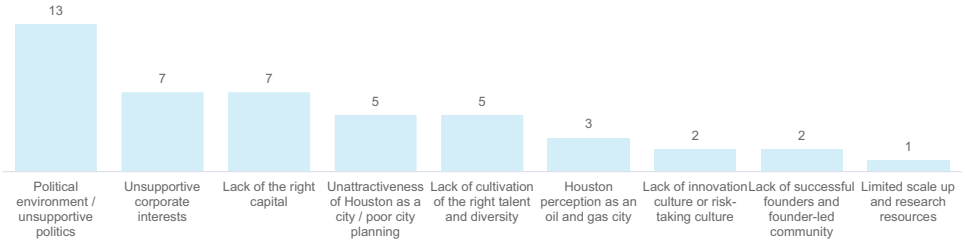
What are the biggest disadvantages Houston has as an energy/climate innovation ecosystem? (Standard choices offered)



Surprisingly "access to VC" was not the top issue cited by respondents – it ranked #2. The #1 most cited disadvantage of Houston's ecosystem was its anti-climate reputation, and a close #3 was its "overlooked" quality.

In other words, many respondents believe that **outside Texas, Houston's either overlooked – or vilified**.

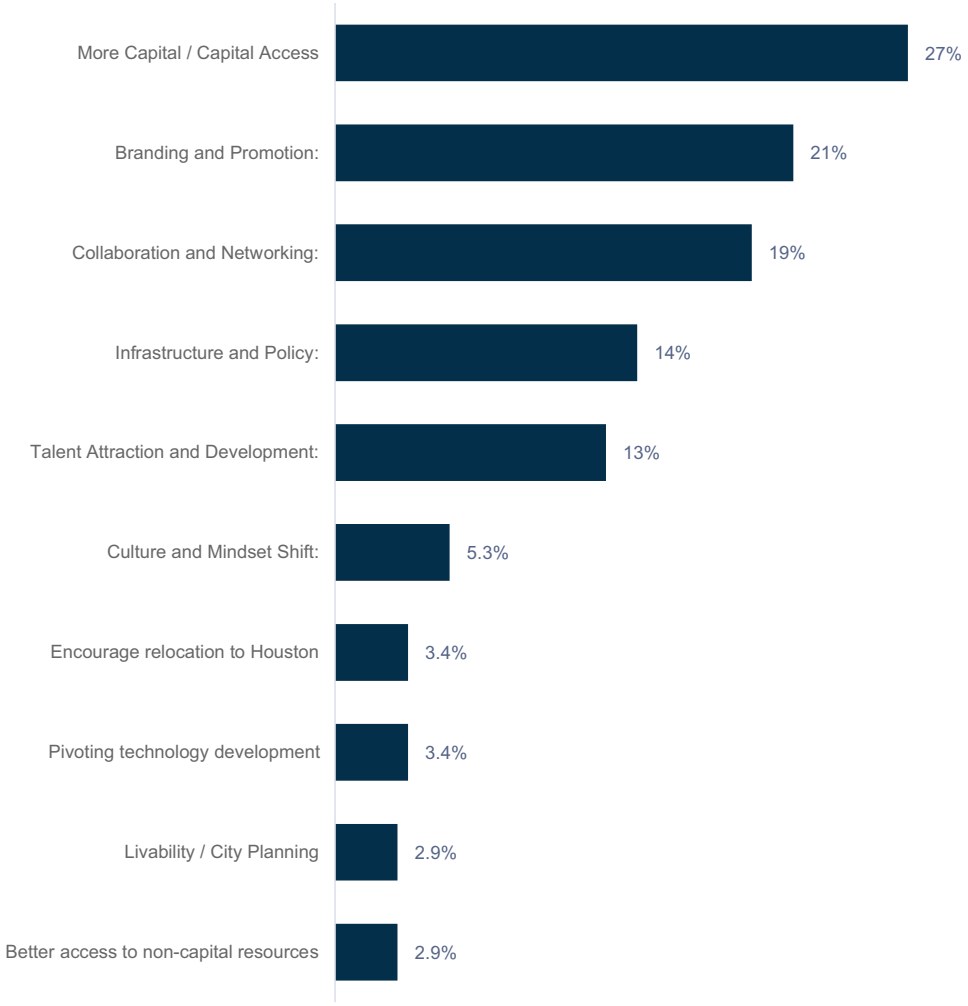
What are the biggest disadvantages Houston has as an energy/climate innovation ecosystem? (Summary of "Other" responses)



Some respondents also flagged cultural challenges within Houston, noting political and business norms that run counter to innovation and risk taking.

The Data: What should Houston prioritize?

Steps Houston should prioritize to strengthen its climate ecosystem



27% Raising more VC capital, bringing more outside capital into Houston, increasing non-dilutive funding, unlocking Houston capital for Houston startups, raising Houston-focused funds

21% Campaigning to improve Houston's reputation, improving promotion of Houston's energy transition initiatives and accomplishments, educating politicians and consumers, reversing anti-climate perception

19% Building bridges between public and private, energy corporates and startups, universities and startups, and startups and mentors; seeking partnerships with other ecosystems; improving resources for early stage startups

14% "Walking the walk" – investing in making Houston more green, building large climate projects in/around Houston, creating supportive policies like tax breaks for investing in energy innovation and promoting new energy solutions, encouraging Houstonians to live eco-friendly

13% Prioritizing transition of workforce and expertise to climate companies, building strong educational resources and supporting universities, attracting more outside talent through high quality opportunities, promoting DEI

Specific recommendations from survey responses:

3.4% Encouraging existing energy transition companies to open offices in Houston, incentivizing companies and talent to move to Houston, attracting more big VCs to open up offices in Houston

3.4% Leaning into developing more climate technologies, diversifying energy transition areas, encouraging "energy evolution" technologies

2.9% Investing more in the innovation district and other "collision" spaces, improving walkability, bikeability and public transit options, improve attractiveness to the younger generation

2.9% Improving access to EPCs, hard-tech scale up partners, labs and other prototyping sites, and resources for founders

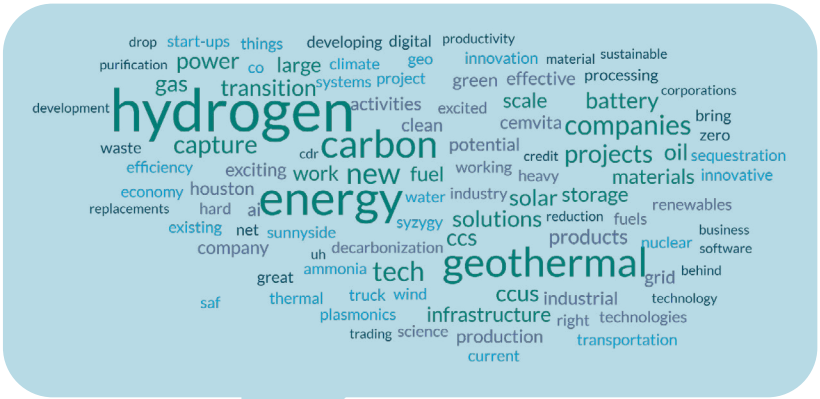
5.3% Being more culturally receptive to innovation, taking more risk, and adopting energy transition as an identity

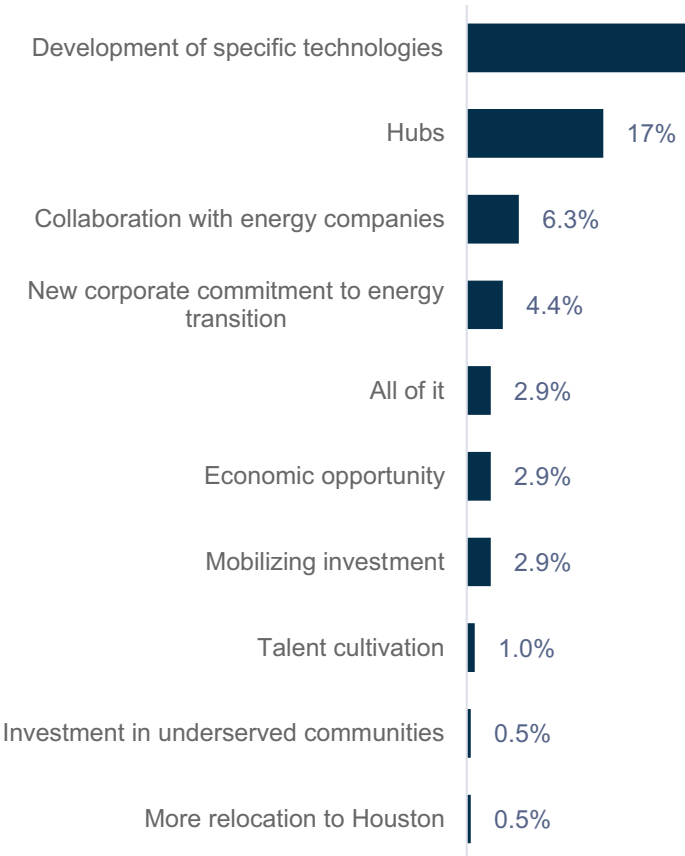
The Data: What climate innovation in Houston are you most excited about?

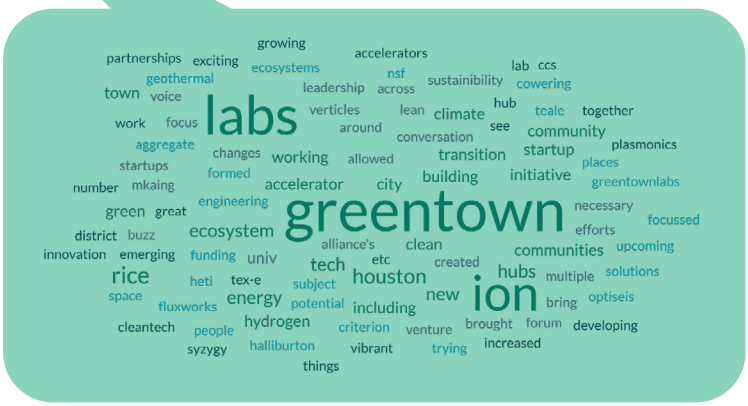
The climate innovation work in Houston respondents were most excited about

Responses in this category highlighted how **action-oriented and pragmatic** Houston climate technologists are: **52%** are most excited about "development of specific technologies."

Meanwhile, Houston's innovation hubs and collaborations are bearing fruit, claiming spots 2 and 3 in the survey.







The Data: What's the one thing you wish more climate tech people knew about Houston?

What's one thing you wish more climate tech people knew about Houston?

"Houston has the most amazing technical talent one can find in the country."

"Houston's Got Talent!"

"I wish they knew the full breadth of expertise that existed here, the innovation, and most of all the incredible human capital that exists."

"There are a lot of people here working on climate tech already."

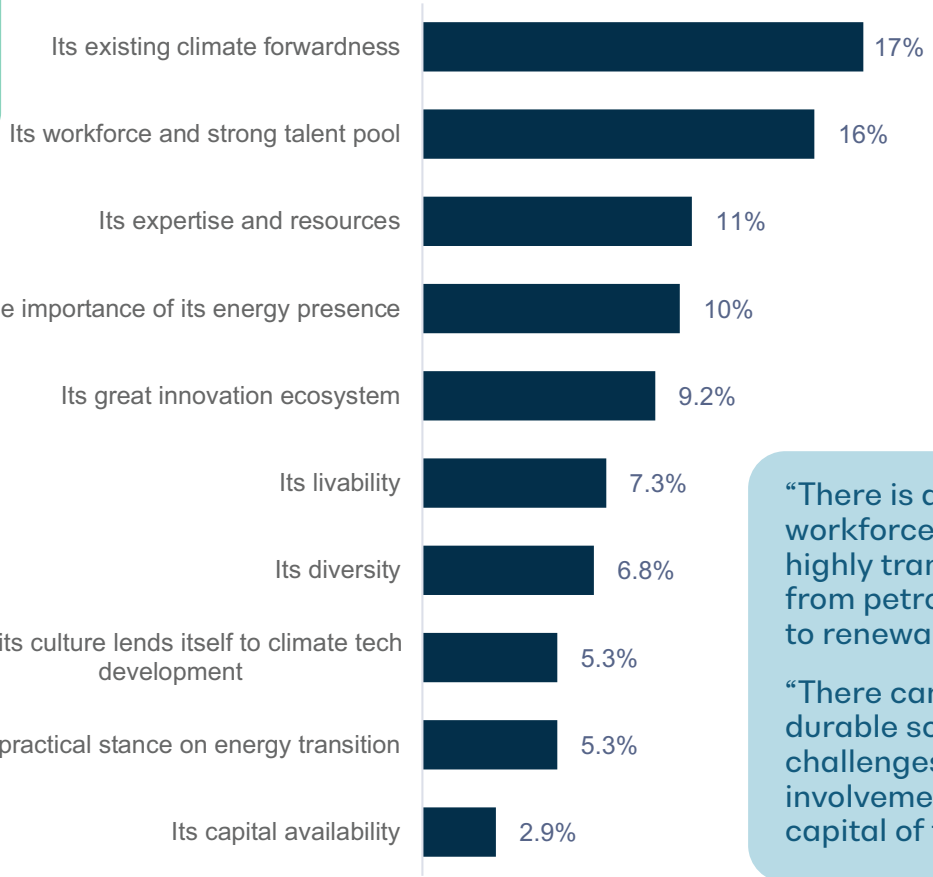
"Houston has some of the smartest technical resources who are deeply invested in sustainability and climate change."

"The oil & gas industry has many people who are pro-climate and eager to work on energy transition solutions."

"Renewable energy has a very strong foothold — it's not just O&G here in town."

"Houston is big on all energy, not just oil."

"It has been and will continue to be the center of the energy industry, including new green energy of all types."



"There is a massive workforce of people with highly transferrable skills from petrochemical industry to renewables."

"There can be no effective durable solution to climate challenges without the involvement of the energy capital of the world."

"There are investment dollars down here, lots of them in the energy focused funds looking to fund those deals."

"We're practical implementers of new tech, it has to make money first."

"Cheap energy is the key."

"City's talent and its experience in developing both successful and unsuccessful energy technologies and how that experience is critical to climate tech."

"Our ability to deal with hardgoods."

"Houston knows more about moving molecules around than anybody else."

"Your customers are here."

"The number of startups and talent based in Houston."

"That there is a booming startup ecosystem here."

"The city is open minded, fantastic to live in, and your money goes very far."

"#1 most diverse city in the US with lots of great talent and a very high quality of life."

"Houston has unmatched diversity of people which fosters diversity of thought."

"It's a terrific place to work, live and play with fantastic people from all over the world."

"Affordability of starting initiatives in Houston."

"We like getting our hands dirty."

"How diverse and dynamic it can be."

"Climate tech is a lot like wildcatting for oil and Houston has that personality in spades."

"This is a highly supportive ecosystem."

"Quality of life and how many passionate people there are!"

"'Can-do' attitude."

"The Houston ecosystem is very pragmatic and is interested in a smart transition."

"Strong capital for geothermal innovation and CCS."

"Access to corporate venture partners willing to trial new technologies."

Case Study: Fervo Energy

Founded	2017, Bay Area
Moved to Houston	2020
Notable Investors	DCVC, Capricorn, Breakthrough Energy Ventures, Devon Energy
Focus	Next-generation geothermal energy development
Headcount	65
Total raised	$187 million

On leaving the Bay Area: "The Bay Area gave us access to leading VC investors who understood startups and could help take Fervo from an idea to an actual company. But as we built toward a commercial pilot, we recognized that our next phase of growth required coordination with more traditional energy infrastructure players. The Bay Area wasn't as well suited for that scale-up process."

On choosing Houston: "Given our reliance on oil and gas drilling technology to produce geothermal energy, there was no better city for us to pick than Houston. Headquartering in Houston has helped Fervo partner with leading oilfield services providers, recruit engineers with robust drilling experience, and tap into the project management expertise abundant across Houston's broader construction ecosystem."

On Houston's Pros + Cons: Houston understands energy and has a talent base and corporate ecosystem uniquely suited to help companies like Fervo navigate the intricacies and nuances of development. Still, Houston doesn't have the VC resources that so many startups depend on. Fervo likely would not have taken shape without the support of climate-focused VCs in Silicon Valley. Bringing similar early-stage investment to Houston will allow us to foster more home-grown innovation.

Timeline: Development of Houston's Climate Startup Ecosystem

Timeline: Houston's Climate Startup Ecosystem

Year	Month	News
2018	11	Houston loses its bid for Amazon's HQ2, and Amazon pointedly notes the underdeveloped startup / innovation ecosystem in Houston, making civic leaders sit up and take notice.
2019	2	HX Venture Fund launches. With LP contributions from major Houston corporates, the fund-of-funds begins making LP commitments to established VC funds like Greycroft, largely on the West and East coasts. One goal, in addition to driving returns and fostering community, is to put Houston's startup ecosystem onto the radar for these coastal VCs.
2019	7	New "Innovation District" breaks ground in midtown Houston, anchored by Rice University's new Ion building offering coworking, events, and more.
2019	12	Rice University launches new Carbon Hub, with a focus on using hydrocarbons not as fossil fuels, but to produce advanced materials, hydrogen + other products.
2020	1	As new chair of Greater Houston Partnership (GHP), Bobby Tudor, longtime O&G banker, issues a call for Houston to proactively claim the role of energy transition capital or risk being left behind. The speech is particularly striking because many Houstonians have traditionally viewed GHP – a business-led civic group – as an institution dominated by traditional energy companies.
2020	4	City of Houston launches its first Climate Action Plan, including a commitment to purchasing 100% renewable energy for municipal operations.
2020	7	Halliburton Labs launches its accelerator to help commercialize companies with technologies that advance cleaner and more affordable energy.
2020	9	Rice Alliance launches the Rice Clean Energy Accelerator, a 12-week program to support early stage clean energy startups from around the world.
2021	3	University of Houston launches new Energy Transition Institute backed by $10M gift from Shell, with focus on 3 core areas: hydrogen, carbon management and circular plastics.
2021	4	Energy Transition Ventures launches the first venture fund in Texas exclusively dedicated to energy transition technologies.
2021	4	Greentown Labs, America's largest climate tech incubator, opens its doors in Houston – only its second location besides Cambridge, where it's deeply embedded in the Harvard / MIT climate startup ecosystem. Greentown opens just one block away from The Ion, cementing the new Innovation District as Houston's climate tech hub.
2021	6	New Climate Ventures launches a climate-focused venture fund based in Houston.
2021	6	The Greater Houston Partnership launches a new organization, the Houston Energy Transition Initiative (HETI), to accelerate Houston's efforts to become the energy transition capital.
2021	10	US Dept. of Energy awards $6M to a consortium including University of Houston, NASA and Shell to demonstrate the feasibility of large-scale liquid hydrogen storage facilities.
2022	3	United Airlines Ventures invests in Houston synthetic biology startup Cemvita Factory, with the goal of securing sustainable aviation fuel produced in part by Cemvita's microorganisms.
2022	5	The Ion opens down the block from Greentown Labs, with tenants including the energy-transition / innovation wings of giants like Chevron, Microsoft, and Schlumberger.

2022	8	Houston-headquartered Fervo Energy raises a $138-million Series C to scale its next-generation geothermal technology.
2022	9	US Dept. of Energy visits Houston's Plumbers Local 68 to announce its Geothermal Shot competition.
2022	10	Greentown Labs, MIT, and Houston-area universities launch TEX-E, a new program leveraging MIT's lessons learned to foster entrepreneurship in students at Rice, Texas A&M, University of Texas, Prairie View A&M, and University of Houston.
2022	11	Syzygy Plasmonics, a Houston climate tech startup, raises $76M in fresh venture funding. With technology developed at Rice University, Syzygy uses photocatalysts to manufacture sustainable chemicals including ammonia, hydrogen + methanol.
2022	11	Houston-headquartered Solugen raises a $200M+ Series D, placing its valuation above $2B, to scale its Bioforge process producing lower carbon chemicals using synthetic biology.
2022	12	HIF, a synthetic fuels company, announces its plan to build the world's largest "efuels" plant in Matagorda, TX, 60 miles south of Houston. The plant will follow in the footsteps of HIF's existing Chilean facility, which uses wind power and direct air capture to produce green hydrogen and hydrocarbons from "recycled CO_2."
2022	12	Bezos Earth Fund, HETI and Mission Possible Partnership announce a 2-year grant to build a plan for Houston as a hub for hydrogen, carbon capture and renewables.
2023	4	Houston secures its first US Dept. of Energy LPO renewables financing with Sunnova's $3B "Project Hestia" deal.
2023	6	ARPA-E convenes Houston energy technologists at Rice University and announces $100M in fresh funding for its SCALEUP program, which has previously funded Houston companies like Quidnet (energy storage), Zeta (batteries), and Quaise (geothermal).
2023	7	Fervo Energy successfully completes the world's most productive 30-day well test of next-gen geothermal energy. By deploying advanced drilling tech developed by the oil + gas industry, Fervo unlocks access to always-on, zero carbon baseload power in places all over the world that were previously unsuited for geothermal.
2023	8	US Dept. of Energy announces $1.2B in awards to the first 2 winners of its DAC hub program, both based on the Gulf Coast: Heirloom, Climeworks, and Gulf Coast Sequestration in the Lake Charles area; and 1PointFive (a joint venture of Carbon Engineering + Oxy), Lawrence Livermore National Lab, Carbon Direct + others on the King Ranch in Kleberg County, TX.
2023	8	Oxy announces its acquisition of Carbon Engineering, its longtime carbon-removal partner, for $1.1B.
2023	9	HX Ventures holds its second annual Venture Houston summit on the "Path to Decarbonization," vastly growing over 2022 and drawing over 1000 participants, including coastal / climate VCs like Breakthrough Energy, Energy Impact Partners, Congruent, Prelude, Lerer Hippeau, LowerCarbon, MCJ Collective, Planeteer, Propeller, and more.
2023	10	Activate, a leading hardtech incubator program that pays scientists $200K+ in nondilutive capital to build companies, launches its fourth hub in Houston.
2023	10	Houston's HyVelocity Hydrogen Hub is awarded up to $1.2B in federal government funding, one of 7 winners from among nearly 80 applicants. Partners in the project include GTI Energy, The Center for Houston's Future, University of Texas, and seven major corporate participants including Air Liquide, Chevron, Orsted, and Sempra Infrastructure.

Recommendations + Next Steps

Action Item 1: Fighting Stereotypes

Outsider perceptions of Houston often draw on negative stereotypes. **56% of respondents** cited Houston's anti-climate reputation as the number one disadvantage that Houston has as a climate tech ecosystem.

This anti-climate reputation dissuades top talent and climate-oriented investors from **relocating or exploring Houston opportunities + investments**.

In reality, Houston has made great strides over the last few years to embrace energy transition and more climate-forward technologies. **17% of respondents talked about Houston's existing climate forwardness as the one thing they wish more climate tech people knew about Houston**.

The numbers back up these respondents. An analysis of Pitchbook + other investor data sets yields **over 200 energy-transition related companies + funds** with a presence in Houston, up significantly in the past few years.

Multiple interviewees pointed out that many energy PE firms – longtime stalwarts of the Houston investing scene – have recently launched **energy-transition-specific funds**, including Riverbend Energy Partners.

"We're not all 'belt buckles and drill bits.'"
– Survey response

"I wish people knew that the majority of all government buildings / hospitals / airports/ schools, etc. in Houston are all run on clean energy."
– Survey response

"The last time I was down in Houston, maybe 8 years ago, it was just a bunch of oil and gas guys – and they were **all** guys – in the room. My impression as an outsider is that they're probably still on the wrong side of history."
– Jason Rissman, Founder, Invested in Climate; Climate Advisor, IDEO; climate investor (NYC-based)

Recommendations:

Don't be afraid of the "C" word. Historically, many leaders in Houston energy circles have avoided the term "climate," preferring terms like "energy evolution, "energy transition" or "new energy." To outsiders, this language indicates potential denial of the realities we're facing. Even worse from a business perspective, it can give outsiders a sense that Houston is lagging behind the times and slow to adopt + adapt – fundamentally unattractive attributes to VC investors in particular. Regardless of vested interests, if Houston is to emerge as the energy transition capital, it needs to use language that resonates with other ecosystems. There is so much that's happening in Houston that does not get global attention because the ecosystem does not use the right terminology. When someone Googles "climate hubs," Houston needs to be at the top. To do this, "climate" as a term needs to be deployed broadly, especially by senior leadership and others constructing the narratives for Houston.

Roll out the red carpet. Other cities vying for startup-hub status have well-established "welcome wagons" for startups considering relocating. They make time to meet startups + investors, show them around, and make introductions on their behalf. While Houston has a few formal (HETI, Greentown) and informal resources (New Climate Ventures, Michael Skelly), **a dedicated and staffed** startup- and VC-welcome concierge with an explicitly pro-climate-tech mandate could both draw more startups to Houston and help change its image.

Action Item 2: Early Money

Houston has no shortage of capital. An analysis by McKinsey + HETI placed the single-year capital outlay from Houston-based funds and sources at **$25.4B in 2021**. However, despite Houston's active investors, it lacks early-stage venture capital.

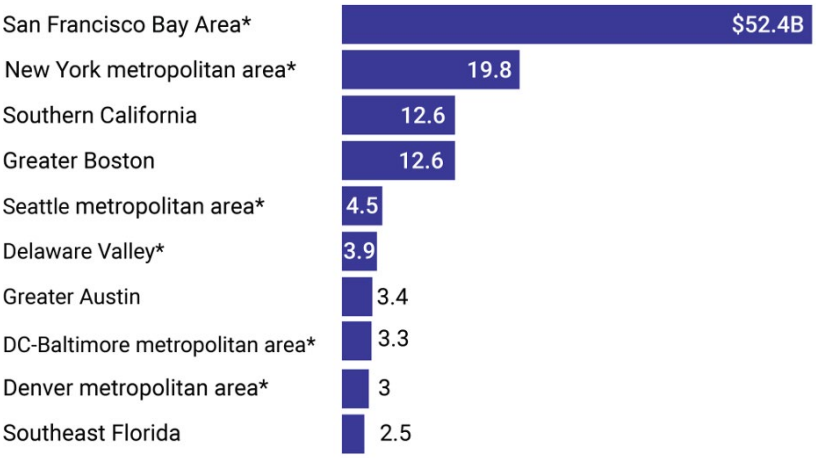
According to Pitchbook, Houston failed to crack the top 10 cities for VC investment in H1 2022 (below). HETI placed inbound VC investment into Houston at only **$0.7B in 2021**.

This VC drought reflects Houston's historically sluggish startup/VC activity. Between 2015 – 2017, for example, Houston saw only 300 VC deals, compared to Austin's 714. On a per capita basis, the numbers are starker: Austin saw 347 VC deals per 1M residents, Houston only 44. No wonder, then, that when Amazon rejected Houston's Amazon's HQ2 bid in 2018, it cited the lack of a startup/innovation ecosystem as a core reason.

Happily, this pattern is beginning to shift. Houston-based VC teams have grown, including **New Climate Ventures** and **Energy Transition Ventures**. In parallel, **HX** has worked to draw the attention of more "coastal" VCs to Houston.

Launched in 2019, HX is a fund-of-funds with a mission to attract more VC activity to Houston. Houston stalwarts like Chevron, HEB, Shell, NRG and more joined HX as LPs, and the fund has made commitments to leading coastal VCs like Greylock.

Venture capital investment in first half of 2022



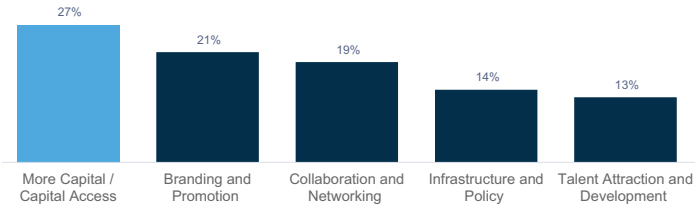
*And surrounding region
Data source: PitchBook

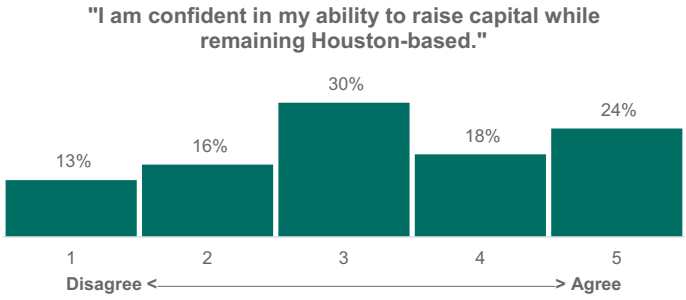
HX's strategy is showing promise: in 2023, HX hosted its second annual Venture Houston summit, drawing over 1000 participants, including Breakthrough Energy, Congruent, Energy Impact Partners, Prelude, Lerer Hippeau, LowerCarbon, Planeteer, MCJ Collective, and more.

Nonetheless, Houston needs to attract – and home-grow – more VC funding to become the energy transition capital.

53% of survey respondents cited access to VC as a significant challenge facing the ecosystem. They also listed it as the number one step that Houston should prioritize for its climate ecosystem. Out of the startups surveyed, **72% were not confident in their ability to raise capital while remaining in Houston**.

Steps Houston should prioritize to strengthen its climate ecosystem





Recommendations:

"Grease the skids" to enable more of Houston's abundant later-stage funds (PE, growth, infrastructure, corporates, family offices) to enter VC. Interviews indicate that many experienced leaders in these funds are less familiar with, and thus uncomfortable with, the different economic models (power law, etc.) of VC investing. Consider learning from:

- Vaunted programs like the **Kauffman Fellowship**, which trains the nation's most promising midcareer VCs
- Traditional funds that have launched a venture arm – like **SCF Partners**, a Houston PE fund that made a VC investment into Houston-based Revterra, an EV charging company
- Others include **CSL Capital**, **Quantum Capital Group**, and **Cathexis Holdings**

Attract more VCs to open offices in Houston. The climate tech world is already in commercialization mode and knows it needs to be closer to customers in order to scale meaningfully. Why not take advantage of this and attract VCs to have a presence in a city that knows how to build and scale and to do business in a state that is extremely business friendly? The more VCs we have in Houston, the more likely it is that Houston startups will be pitching to the right audiences. Office credits, tax breaks, and just plain marketing targeting VCs can help with this.

Launch new Houston-based and Houston-biased climate funds. The most straightforward solution to the lack of early stage capital is to raise new early stage capital. While fundraising remains challenging this year, new funds with a Houston focus or at least a Houston presence can help increase capital availability in the city. Even funds that are fund of funds can help boost fundraising for more direct investment funds (as we saw with HX). There is massive wealth that remains untapped in Houston – how can we direct that towards early stage climate investments?

"Houston's a great place to scale a company – great talent, great affordability, lots of room. But it's a tough place to start a company if you're taking the venture-backed approach. I essentially have to fly to the coasts to raise a VC round."

– Zimri Hanshaw, CEO, Bucha Bio

Case Study: Bucha Bio

Founded	2021, NYC
Moved to Houston	Jan 1, 2022
Notable Investors	SOSV IndieBio, New Climate Ventures
Focus	Next-gen materials produced via bacterial nanocellulose

On leaving New York: "Through the SOSV IndieBio program, we had space at Rockefeller University, which was great. But as that ended, I looked around as a CEO for a lab space that we could rent and still achieve 2+ years of Runway. The only place we came back with was in Jamaica, Queens – over an hour away, and dilapidated. It was just untenable."

On choosing Houston: "I believe in letting data drive my decisions, so I profiled over 20 cities, with key attributes including cost, space, engineering talent, and chemistry talent. The shortlist included Austin, NC's research triangle, San Diego, and Houston. I'm a surfer, so it was extremely hard for me not to choose San Diego. I had investors there too. But I came to Houston, and Eric [Rubinstein, of New Climate Ventures] showed me around, introduced me to the community. We moved down + haven't looked back."

On Houston's Pros + Cons: "I love how unpretentious and accessible people are here. I called people at UCSD and essentially encountered gatekeeper after gatekeeper. I called folks at Rice and they started opening doors. 'I'd love to send you interns – how many would you like?' **People here are less focused on status and more focused on getting things done.** On the other hand, early-stage capital is still a gap here. Most early-stage founders I know down here still have to fly out to the coasts to get a term sheet for their Seed or A rounds, which is a shame. And some of our team members complain about the scarcity of public transit."

Action Item 3: Shameless Self-Promotion

> "Make some bold predictions or goals and launch a massive marketing campaign globally to announce that Houston means business in this area."
> – Survey Respondent

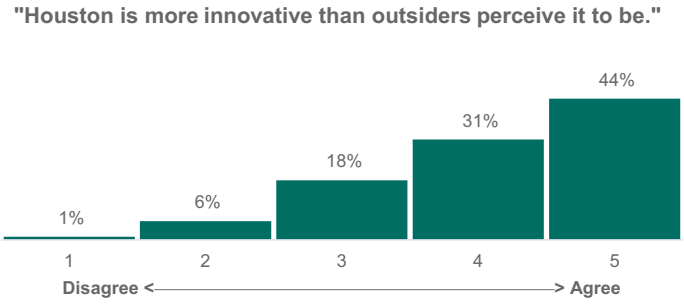
Houston can't just push back against stereotypes; it also needs to **proactively amplify messaging** about climate + innovation wins already underway across the city. Nearly **80% of respondents** agreed "the ecosystem has improved dramatically over the last 5 years," and it shows. Interviews cited the advent of the Ion, Greentown Labs, and "the big 4" – Solugen, Fervo, Syzygy, and Cemvita – as harbingers of Houston's emergence as a major – if not the major – climate tech hub.

Houston has flown under the radar in trumpeting its climate and energy transition accomplishments. Entities like Innovation Map + EnergyCapitalHTX are trying to change that – but so far, they typically reach only local audiences.

75% of respondents believed that "Houston is more innovative than outsiders perceive it to be," with 44% believing in this statement very strongly. 52% of respondents cited a disadvantage of Houston's climate ecosystem was that it was **overlooked / unknown by some audiences**.

Recommendations:

PR, PR, PR. Startups headquartered in Houston have also pioneered major breakthroughs in clean energy and heavy industry; meanwhile, Houston has secured billions in government funding for direct air capture and hydrogen, just in 2023. These wins can + should be amplified in national media. Tactics include:



1. **Opportunistic media outreach.** Ecosystem leaders should look for openings to tie in Houston's growing ecosystem to relevant developments + milestones already hitting the press (e.g. the announcement of the federal Hydrogen + DAC hubs; announcements of large funding rounds for Houston-based startups; even major sports / non-climate events). These media spotlights present opportunities to flag Houston's growth + changes.
2. **Climate media cultivation.** Prominent companies, funds and city officials should reach out to climate reporters at major outlets (e.g. David Gelles, NYT) and climate-specific media (Canary, Grist, CTVC, The Cool Down) to build relationships. They should get in the habit of pitching stories to these reporters monthly; with persistence, some of these stories will stick.
3. **Op-Eds + letters.** Houston universities + companies teem with brilliant scientists + innovators; they should be weighing in on the issues of the day with op-eds + letters to the editor, as Zeke Hausfather does in the NYT.
4. **Multi-year marketing.** Other cities advertise; why not Houston? United Airlines + its affiliated media, for one, offer a major platform.

Live interaction with other ecosystems. Part of the business of getting famous is being seen with other famous people. Houston should strengthen its relationships with other climate ecosystems like New York, Boston (where it's made progress already), San Francisco/Silicon Valley, London, LA, Denver/Boulder, Paris, Berlin, and Oslo. That could include:

1. **Sending contingents** of Houston city officials, startup founders, investors to these cities on a regular basis;
2. Ensuring that **major events** like NYC Climate Week and Verge feature Houston-oriented panels (or at least happy hours); and
3. Building structured **exchange programs**, e.g. student exchanges / trips with Stanford's Doerr School, Columbia's Climate School, Yale School of the Environment and more.

Action Item 4: Coordinating Resources

87% of respondents pointed to Houston's existing energy companies as an advantage for the climate ecosystem. But when asked about the work they were most excited by, **only 6%** of respondents pointed to collaboration with energy companies.

Energy companies have assets, permitted sites, and low cost-of-capital balance sheets that could be used to build new climate projects faster. But corporate organizational structures can be hard to navigate.

Groups like Climate Impact Capital and Eunike Ventures help break down these corporate barriers – but more resources, and more proof points, are needed. Oxy's $1.1B acquisition of Carbon Engineering, less than a month after the US Dept. of Energy awarded over $500M to the Direct Air Capture project they're jointly leading on the King Ranch, offers one such proof point, but some remain skeptical.

Houston's infrastructure is another benefit: it hosts one of the world's only existing networks of hydrogen pipelines, and it's particularly advantaged for CCUS, offshore, and geothermal development. It's also home to hundreds of machine shops + equipment providers. Houston's manufacturing GDP is second-largest among U.S. metros – but so far, this manufacturing ecosystem largely does not interact with the climate ecosystem.

Only 3% of respondents highlighted Houston's infrastructure and service providers as a current advantage. So how do we direct these resources to climate?

Recommendations:

Create a hub for all strategic resources. If a startup wants to develop a new carbon capture system, who are the first 3 companies they should be talking to? What facilities or sites are available for them to test at or on, and how do they learn about permitting? What machine shops can they talk to about manufacturing their demonstration unit? All of these resources should be easily accessible to a startup in Houston and a startup moving to Houston. Tactically, can we staff a concierge or "hotline"? Put together a "cheat sheet" of all of these resources for the community?

"Silicon Valley's unbeatable in software. But the energy transition isn't a software problem – it's a molecules problem. And no one does molecules better than Houston."
– Scott Nyquist, Vice-Chair, Houston Energy Transition Initiative

"Tremendous research universities and NASA — all overlooked time and again."
– Survey Respondent

"Lots of pilot opportunities with major industry players (though long sales cycle)."
– Survey Respondent

Mobilize untapped Houston resources to work for climate. Many contract manufacturers in Houston have never interacted with the Houston innovation ecosystem. The average warehouse owner does not go to the climate events at Greentown Labs. But all of these parties can contribute – and stand to benefit from a future climate-tech ecosystem. How do we proactively build these relationships? As a first step, curating interactions between industry associations and growing startups, especially in more physical fields (e.g. at East End Maker Hub) could help build relationships + awareness.

Lay down tracks for collaboration between corporates and startups. Deploying major climate tech infrastructure will require frequent large-scale collaborations between corporates and startups at the operational level, something that has no precedent at the scale that we need. Most of these joint ventures and collaboration paradigms are negotiated ad hoc, which extends timelines and slows deployment. Just as SAFEs standardized and thus catalyzed early stage venture investment, is there a new type of agreement we can standardize for collaborations between corporates and startups? Other parts of climate tech are moving this direction, with Google publishing its standardized PPA for renewable energy providers. What's next? Houston has the potential to be the epicenter of corporate-startup collaboration in the energy transition – if it's willing to lead the way.

Case Study: Kanin Energy

Founded	2020, Calgary
Moved to Houston	July 2022
Notable Investors	Earthshot Ventures, Bandera Capital, Climate Capital, Keiki Capital, Woven Earth
Focus	Waste heat to power
Headcount	13

On choosing Houston for its proximity to customers: "We found that the decision making for many of our customers was centralized in Houston since many of them are headquartered in Houston. So it's nice to understand who our customers are by living close to them, talking with them, and being able to meet with them."

On Houston's workforce: "Houston is a great place to build a clean energy company like Kanin because the highly skilled talent is here. We need mechanical engineers, process engineers, power traders, project finance and business development professionals. These are specialized skillsets and many can be found in Houston…it's a great place to build a business because the talent is here."

On what Houston can improve on: "The clean energy ecosystem is still pretty small. Because of that, you're not getting the best access to resources, innovative thought, and capital that can help startups leapfrog in progress within climate tech. While there are plenty of those resources geared towards the traditional energy system, the climate tech ecosystem is still early. **What we need are anchors,** where innovative start ups cultivate and breed a new crop of more early innovators that will go and start their own endeavors. There is a flywheel that kicks into effect once more innovators and anchor companies start setting up in Houston. We see this is Silicon Valley and other innovation hubs, and we certainly see this in the traditional energy ecosystem in Houston. **We now need to kickstart that fly wheel in Houston by attracting more of those companies to grow their companies in Houston.**"

Action Item 5: Cultivating and Transitioning Talent

16% of respondents wish the one thing climate tech people knew more about Houston was its strong talent pool. On the other hand, 13% of respondents believe that Houston should prioritize attracting and developing talent.

Because of its strength in energy, healthcare, and space technology – and its stellar diversity and immigrant population, Houston is home to some of the highest caliber **engineers, scientists, project managers, asset developers, and hard tech financiers in the nation**.

There's no question that many skills will transfer: offshore oil to offshore wind, microbes for medicine to microbes for chemical production, robotics for space to robotics for ocean tech…the list goes on. It's just a matter of creating educational programs, recruiting channels, and training tools to foster that inter-industry movement.

The other side of nurturing the already stellar talent pool in Houston is making sure the pipeline of great talent into Houston continues. That means attracting more **talent from other cities (and countries) into Houston** and ensuring a steady stream of graduates from universities + technical schools who will stay in Houston.

Entities like Activate, which creates fellowships to transform scientists into deep tech (and often climate tech) founders, help both transition talent in Houston to climate and attract outside talent to move to Houston.

> "Houston has amazing scientific + engineering talent, many already in industry. Part of the challenge is to encourage them to take the leap, leave a steady and 'safe' job, and enter a newer field."
>
> – Aimee Rose, Executive Managing Director, Activate

#1

Houston has more chemistry PhDs per capita than any city on Earth.

Recommendations:

Create recruiting channels for talent from energy and other legacy Houston industries. Recruiting talent from industry can be difficult without intentional action and the right curated networks. HETI, Center for Houston's Future, and other "connective tissue" organizations should step up to bring together climate employers and talent from legacy industries.

Build more climate degree programs. Universities like Rice, UT, A&M, Texas Tech, and/or the University of Houston should build degree programs (or concentrations) for climate tech and energy transition. Much as A&M's petroleum engineering program evolved decades ago, proximity to Houston's growing transition scene can enable both industry experience and forward-thinking curriculum. (Witness Rice MBA's "Capital Themes in Climate Tech," largely taught by Houston industry practitioners, as one example.) More funding for these programs can help increase their breadth, depth and exposure.

Incentivize businesses to offer transition training. Companies like Clean Energy Services and Workrise already incorporate training as part of their value offering to employees and contractors looking to move from industries like oil and gas and construction. Government incentives or grant funding for these programs can enable more companies to do the same.

Cultivate talent to move from other cities. While Houston still punches below its weight in national media, many who spend actual time here – think of Rice students from around the country – fall in love. Consider building concerted internship + placement programs like Yale's "Bulldogs on the Bayou" program, emphasizing Houston's strengths in climate, healthcare + diversity – and food, art and culture.

Action Item 6:

Building A Greener Houston

Houston can talk the talk, but can it walk the walk? Despite its burgeoning work in climate, Houston lacks policies + incentives like those in California, Massachusetts, and New York's cities for reducing its carbon footprint and scaling new climate infrastructure.

14% of respondents cited green infrastructure and climate-friendly policies as a top priority for Houston's climate ecosystem. In order to be energy transition capital of the world, Houston needs to show it's serious about locating infrastructure within its city limits. Moves like the Sunnyside solar project on a former City of Houston landfill are a good start, but not enough. Houston needs to show commitment through policy, incentives, and building.

The Innovation District and the Medical Center's growing innovation campus are a great start, but Houston needs more showpieces like the Houston Endowment's new net-zero headquarters. What can Houston – a city of builders – build that will make the global climate community sit up and take notice?

> "Stop marketing and start doing. Get city officials to step up."
>
> – Survey response from Managing Director at Houston-based energy transition fund

Recommendations:

Pilot programs for new technologies. Houston has the assets and the mandate for civic upgrades; will it incentivize climate tech companies to pilot in Houston by offering attractive city-level incentives or grants? Are there ways to provide grants for pilots located in Houston?

Give Houston world-class green – and blue – spaces. The Parks By You initiative made major progress – and its bond issuance passed by a bigger margin than anything else on the ballot that year, showing just how popular it is. Now that Houston's connecting its bayous, hiking + biking, can it take the next step? The historically polluted Hudson River saw its first Manhattan beach open in summer 2023; does Houston, the Bayou City, have the wherewithal to get its bayous ready for citizen enjoyment?

Match coastal incentives for efficiency and resiliency, EVs, and large infrastructure projects. Houston's green incentives and climate policies are mediocre compared to other climate hubs. Can Houston leaders work to benchmark against other incentive programs and develop more aggressive programs for businesses and consumers in the city to transition?

About the Authors

Taylor Chapman, Senior Fellow at Cascade Climate, is an investor, advisor + operator in mission driven businesses. In 2023, he returned to his hometown of Houston after 12 years in NYC, where he had maintained his Houston ties as a mentor to startups at Greentown Houston + Rice Alliance Clean Energy Accelerator. Previously, he was a consultant and engagement manager at McKinsey's NYC office; an operator at two VC-backed startups in NYC and SF; and the M&A and corporate VC lead at SEI, a publicly traded edtech firm. When not at work, you can find him home with his wife and two kids, out photographing, or on the water: in 2022, he paddleboarded 103 miles down the Hudson and 26 miles down Buffalo Bayou.

Gabe Malek is Chief of Staff at Fervo Energy, a next-generation geothermal developer leveraging proven oil and gas technology to deliver 24/7 carbon-free electricity. At Fervo, Gabe helps manage cross-functional special projects, including Fervo's Inflation Reduction Act strategy. Prior to Fervo, Gabe served as Deputy Chief of Staff to Mark Carney, Co-Chair of the Glasgow Financial Alliance for Net Zero and former Governor of the Bank of England. Gabe began his career at Environmental Defense Fund, where he helped formalize and scale the organization's financial sector engagement program. Gabe is a native Houstonian who returned to the city in 2022.

Deanna Zhang is an independent consultant specializing in the FOAK funding gap in climate tech. She is the creator of EtechMonkey, a blog on climate tech, and ETM Advisors, a climate tech-focused financial consulting firm. Before starting EtechMonkey, she led the Energy Technology Banking division at Tudor, Pickering, Holt & Co., covering clients in areas such as energy software, industrial technology, environmental infrastructure, and alternative energy. She is a frequent speaker and writer on climate tech, energy transition, and climate finance. In her free time, she enjoys skiing, running, and spending time with her fiance and corgi.

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Appendix: Survey Data

Community Survey: All Respondents

We sent the survey out with three main sections for all respondents:

Rated on a 1 – 5 scale (1 = strongly disagree to 5 = strongly agree):

- I am confident Houston will be the global capital of the energy transition
- Houston is more innovative than outsiders perceive it to be
- The Houston energy transition ecosystem has improved dramatically over the last five years
- Houston already has everything it needs to become the global capital for the energy transition
- Houston has the capital resources to ensure continued investment in the energy transition

Open-ended questions:

- What steps should Houston prioritize to strengthen its energy transition/climate ecosystem?
- What energy transition/climate innovation work in Houston are you most excited about?
- What's the one thing you wish more climate tech people knew about Houston?

Multiple Choice (select multiple):

- What are the biggest advantages Houston has as an energy/climate innovation ecosystem?
  - Strong workforce/talent market
  - Existing energy companies
  - Affordability
  - Global connectivity
  - Quality of life
  - Other
- What are the biggest disadvantages Houston has as an energy/climate innovation ecosystem?
  - Access to venture capital
  - Overlooked/unknown by some audiences
  - Anti-climate reputation
  - Weather/climate issues in Houston itself
  - Insufficient talent/uninterested workforce
  - Other

Community Survey: Startup or Investor Specific

The survey also contained questions specific to startups and investors:

For startups to rate on a 1 – 5 scale (1 = strongly disagree to 5 = strongly agree):

- I am confident in my ability to raise capital while remaining Houston-based

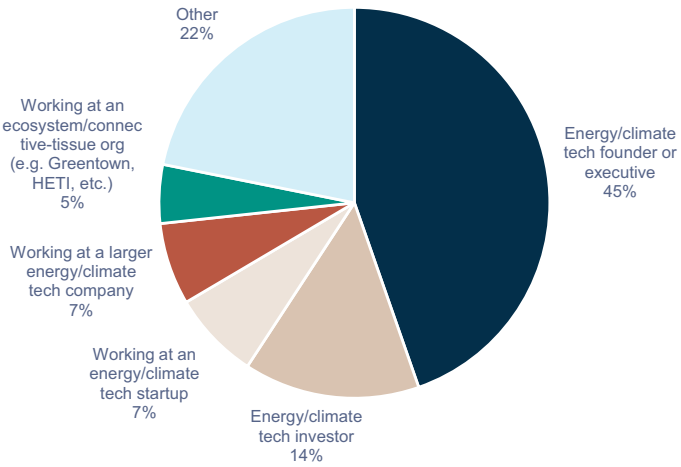
For investors to rate on a 1 – 5 scale (1 = strongly disagree to 5 = strongly agree):

- I am able to find sufficient dealflow in Houston to meet my investment goals
- Startups in Houston are more sophisticated today than they were five years ago
- Startups in Houston carry a valuation discount relative to startups in other markets

Respondent Demographics Part 1

At least 78% of respondents worked in energy / climate in some form. 45% of all respondents were in a senior role at an energy / climate startup or energy / startup company. 80% of respondents hailed from smaller organizations (<40 people), implying that most respondents were from earlier stage startups and smaller VCs, while a sizeable portion (10%) of the survey was filled by people representing large corporates.

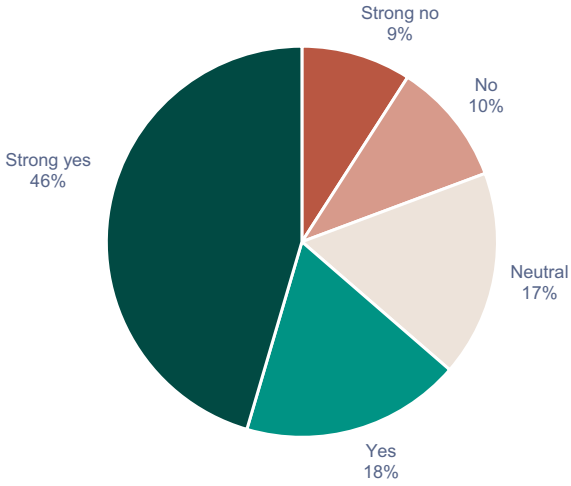
Best Representation of Role



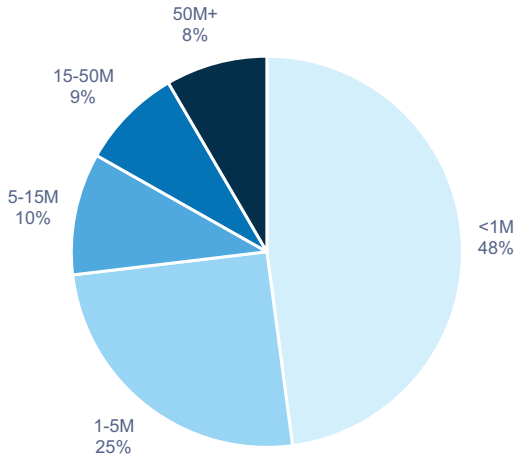
Respondent Demographics: Startups

64% of startups surveyed were in fundraising mode. Most were raising capital at the early stage, with 48% raising at the pre-seed or seed level.

Plans to raise capital this year



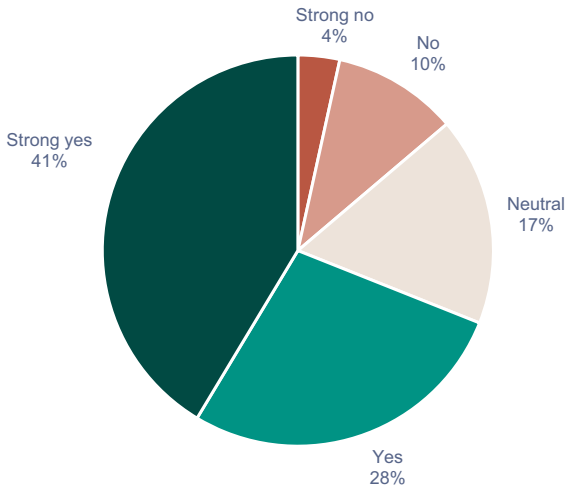
Amount of capital to be raised



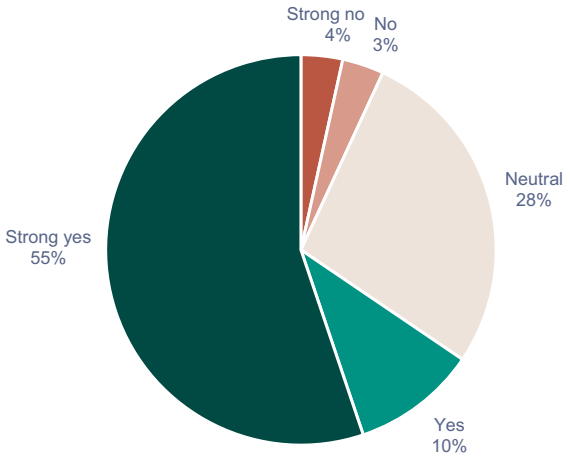
Respondent Demographics: Investors

65% of surveyed investors were actively looking for investments in Houston. 52% are smaller investors, likely VCs, with <$10M of AUM. 21% were from larger funds, likely private equity or infrastructure investors with >$500M of AUM.

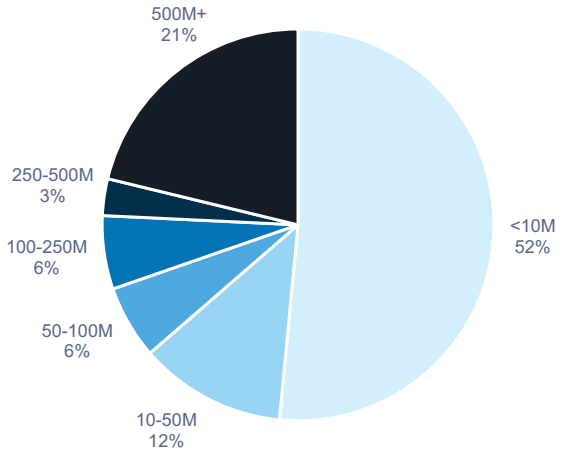
Actively investing in startups this year



Looking for investments in Houston



AUM ($)



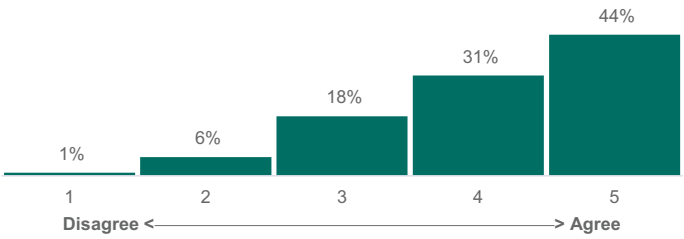
Responses: Community Perception of Houston

44% of the community strongly agreed that Houston is more innovative than outsiders perceived it to be.

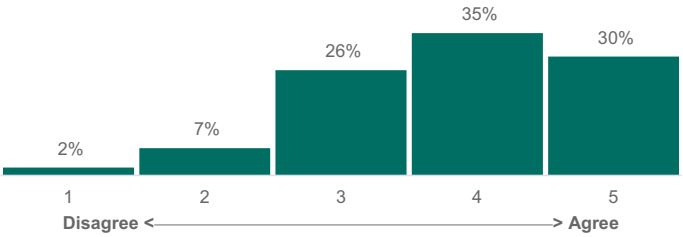
The proportion shifted to the left on ecosystem improvement. While, most respondents (78%) agreed that the energy transition ecosystem has improved dramatically over the last five years, not as many (37%) strongly agreed.

The proportion shifted farther to the left when speaking on Houston as the global capital of energy transition. Only 30% held strong confidence. But the majority (65%) still had some sort of confidence.

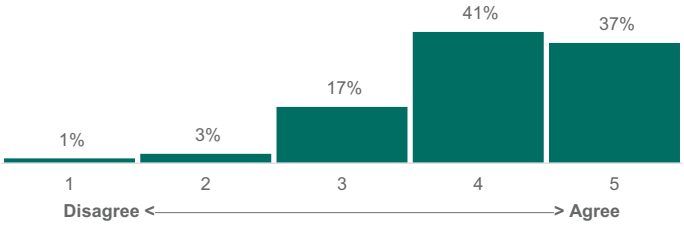
"Houston is more innovative than outsiders perceive it to be."



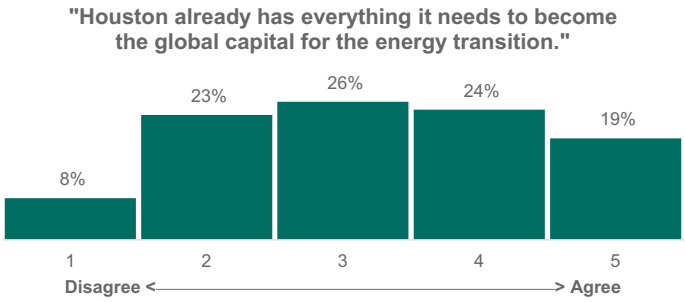
"I am confident Houston will be the global capital of the energy transition."

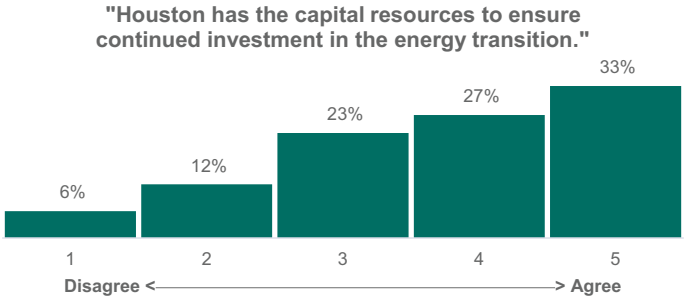


"The Houston energy transition ecosystem has improved dramatically over the last five years."



Responses: Availability of Houston Resources

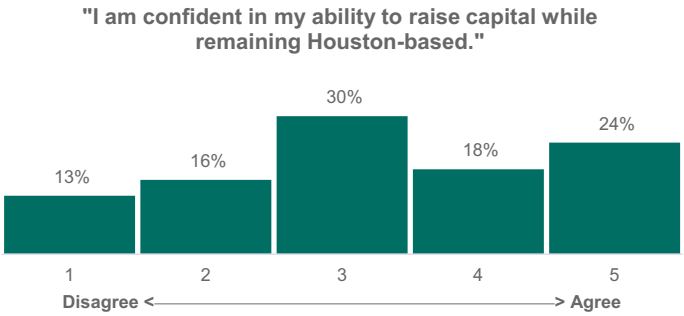




By far the most evenly distributed question was whether Houston has everything it needs to become the global capital of energy transition. Only 19% of respondents strongly agreed with that statement. 57% disagreed or were neutral.

33% of respondents strongly agreed that Houston has the capital resources to ensure continued investment in energy transition. But a good portion (41%) either disagreed or were neutral on this statement.

Responses: Raising Capital in Houston for Startups

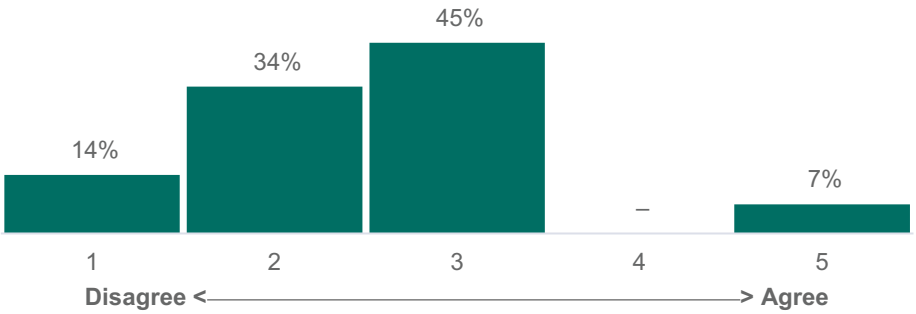


Surveyed startups expressed some lack in confidence in being able to raise capital while remaining Houston-based. The majority (58%) of respondents were at best unsure.

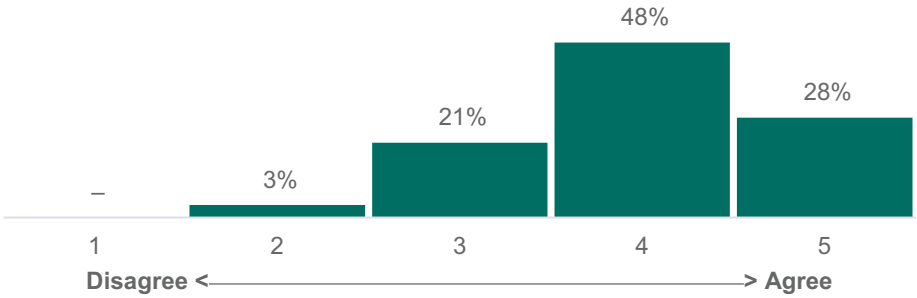
Responses: Investing in Houston for Investors

While most (76%) surveyed investors acknowledged that startups in Houston are more sophisticated than they were five years ago, the overwhelming majority (93%) have to look outside of Houston for dealflow. Of note, 52% of investors believe that startups in Houston carry a valuation discount compared to startups in other markets.

"I am able to find sufficient dealflow in Houston to meet my investment goals."



"Startups in Houston are more sophisticated today than they were five years ago."



"Startups in Houston carry a valuation discount relative to startups in other markets."