

# Climate Tech Investment Thesis

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*‘The current population of around 7 bn grows to 9.8 billion by 2050, it will increase the demand for food, materials, transport, and energy, further increasing the risk of environmental degradation and affecting human health, livelihoods, and security.’*

OECD Environmental Outlook to 2050

# Problem: Why is it so important? (1/2)

 On Nov 28th 2019, the EU parliament declared a global climate & environmental emergency


 In Europe, frequent floods have been happening & in Australia, repetitive bushes fires endanger the country

 In India, officials declared a public health emergency & distributed 5 million masks to deal with air pollution








 In San Francisco, PG&E preemptively shut off power for several days

 In 2016, 772 weather and disaster events were reported. It's 3 times more than in 1980

 Today's greenhouse gas levels may be the highest in 3 million years

 Around 92% of the world's people live in places that fail to meet World Health Organization (WHO) air quality guidelines

# Problem: Why is it so important? (2/2)

-  The WHO has reported that around 7 million people die annually from exposure to air pollution – one death out of every eight globally
-  If current Paris Agreement pledges are kept, global average temperatures in 2100 are still expected to be 3°C above pre-industrial levels
-  Fish stocks and corals are being damaged due to the ocean acidification and warming
-  By 2030, we may fall 40% short of the amount of fresh water needed to support the global economy as pollution and climate change affect the global water cycle
-  The chemistry of the oceans has been changing more rapidly than at any time in 300 million years and the water absorbs anthropogenic greenhouse gases
-  Current deforestation rates in the Amazon Basin could lead to an 8% drop in regional rainfall by 2050, triggering a shift to a “savannah state”
-  The Earth is losing its biodiversity at mass-extinction rates. 1 in 5 species faces eradication, and estimates show that this will rise to 50% by the end of the century unless we take urgent action

# Climate Tech

## as a solution

**Climate tech** is a rapidly emerging industry in which data-driven products are developed to enable communities, companies, and governments to understand their risk and exposure to the effects of climate change and take action to adapt and become resilient *by The Collider*

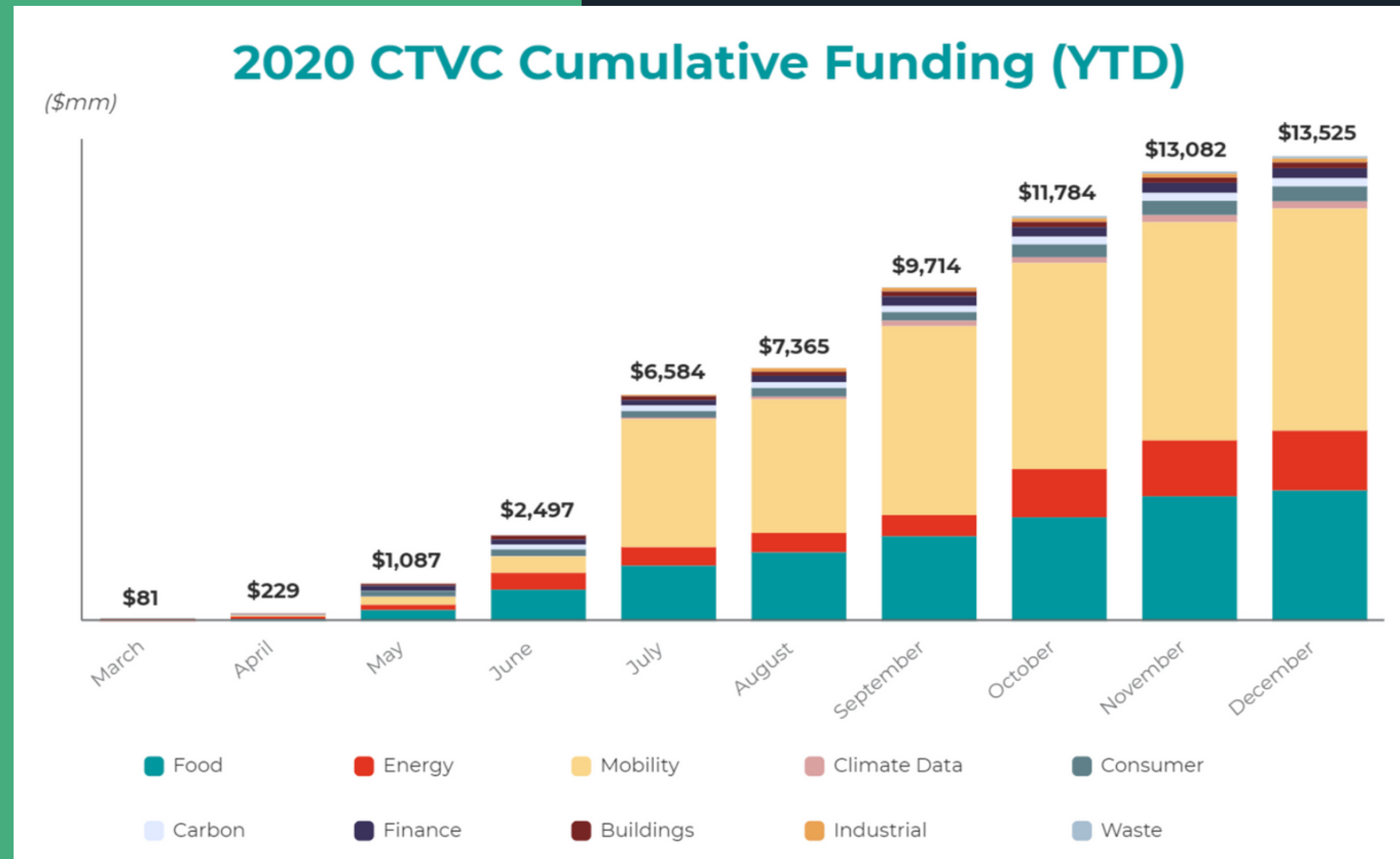
## Categories

- 🌐 Alternative Energy Sources
- 🌐 Transportation and Mobility
- 🌐 Energy Conservations
- 🌐 Waste Management
- 🌐 Agro - Forestry
- 🌐 Manufacturing
- 🌐 Buildings and Cities

# Current Financing Landscape

Research reports say that VC investment in climate tech grew 5x faster than venture capital overall from 2013 to 2019!

This segment has grown over 3750% in absolute terms since 2013 and it sums up to 6% of global annual VC funding in 2019.



[ClimateTechVC.org](https://climatetechvc.org)

# Thesis Assumptions and Foundations

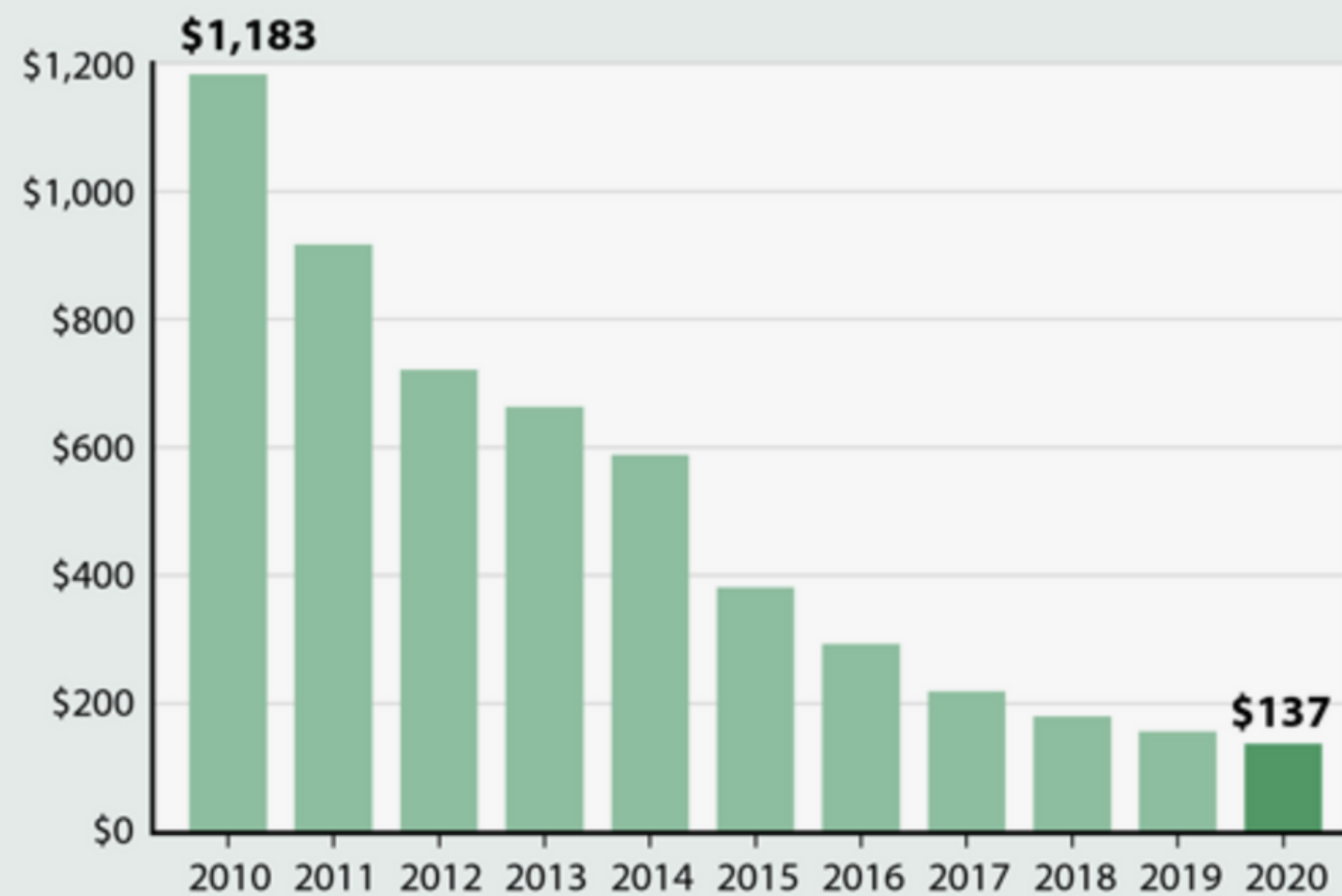
## Why now?

### What's Driving the Battery Storage Boom

Battery storage systems are now a cost-competitive resource for the electricity grid, following a huge decrease in prices. The following are global average prices for lithium-ion batteries as tracked by BloombergNEF.

#### LITHIUM-ION BATTERY PRICES

Global average in U.S. dollars per kilowatt-hour, 2010-2020



SOURCE: BloombergNEF

PAUL HORN / Inside Climate News

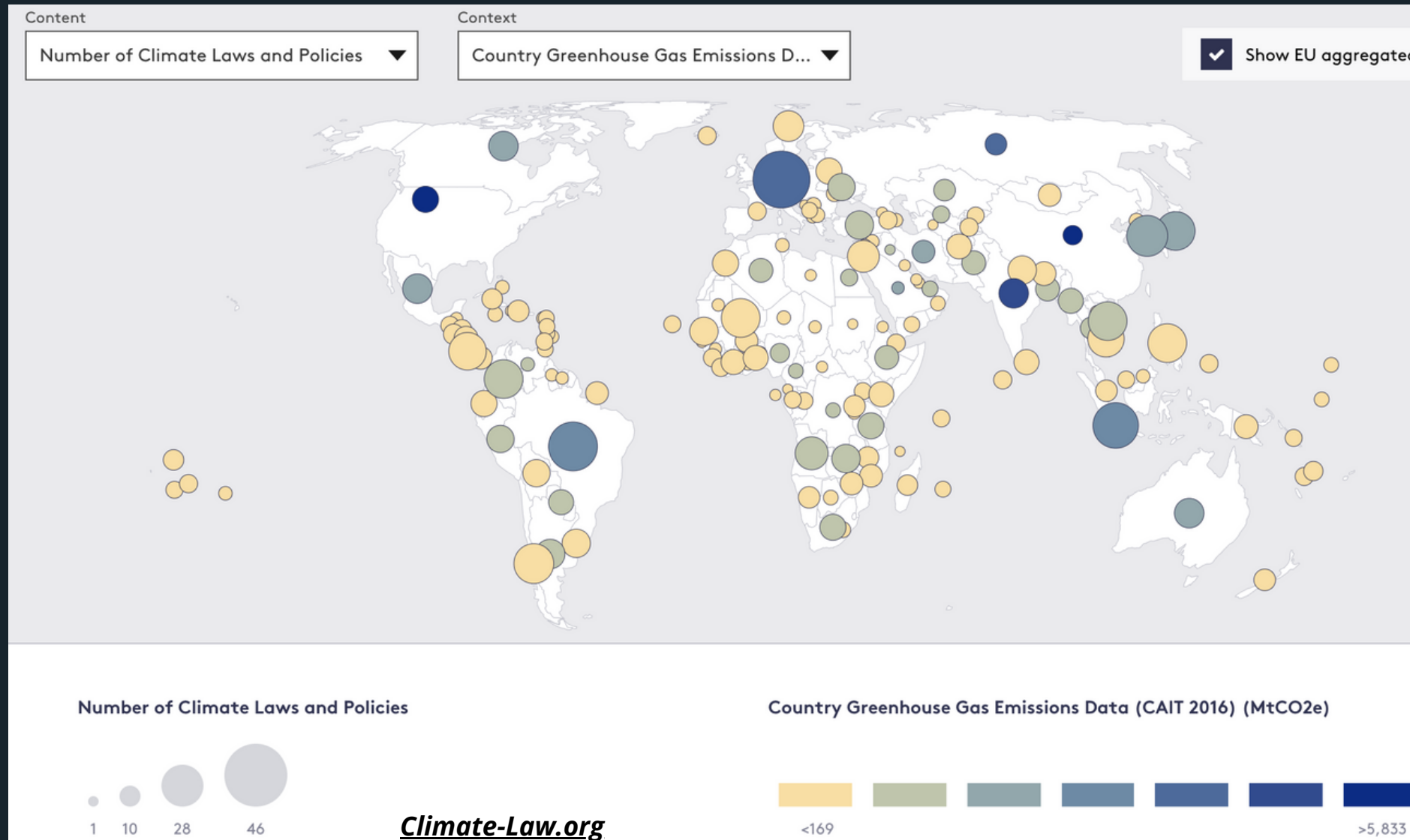
## New, cheaper sub-products & technologies available (1/4)

- Startups leverage capital well and don't need trillions to make significant progress
- More accessible and efficient use of AI/ML due to more data available, increased computing power, emerging experts in the field, etc.
- Venture funding in AI startups had reached a mind-blowing \$61 bn from 2010 through the first quarter of 2020
- The price of photovoltaic cells, devices that convert sunlight into energy, have dropped 82% since 2010 while the number of solar installations has risen sixfold over the past decade
- Although currently too expensive for widespread use, carbon sequestration technologies are seeing their prices drop just as EV batteries and solar panels had previously



# Thesis Assumptions and Foundations

## Why now?



- The Department of Transportation is required to set standards that improve the fuel economy of motor vehicles.
- The Department of Defense is required to plan for the global security consequences of climate change

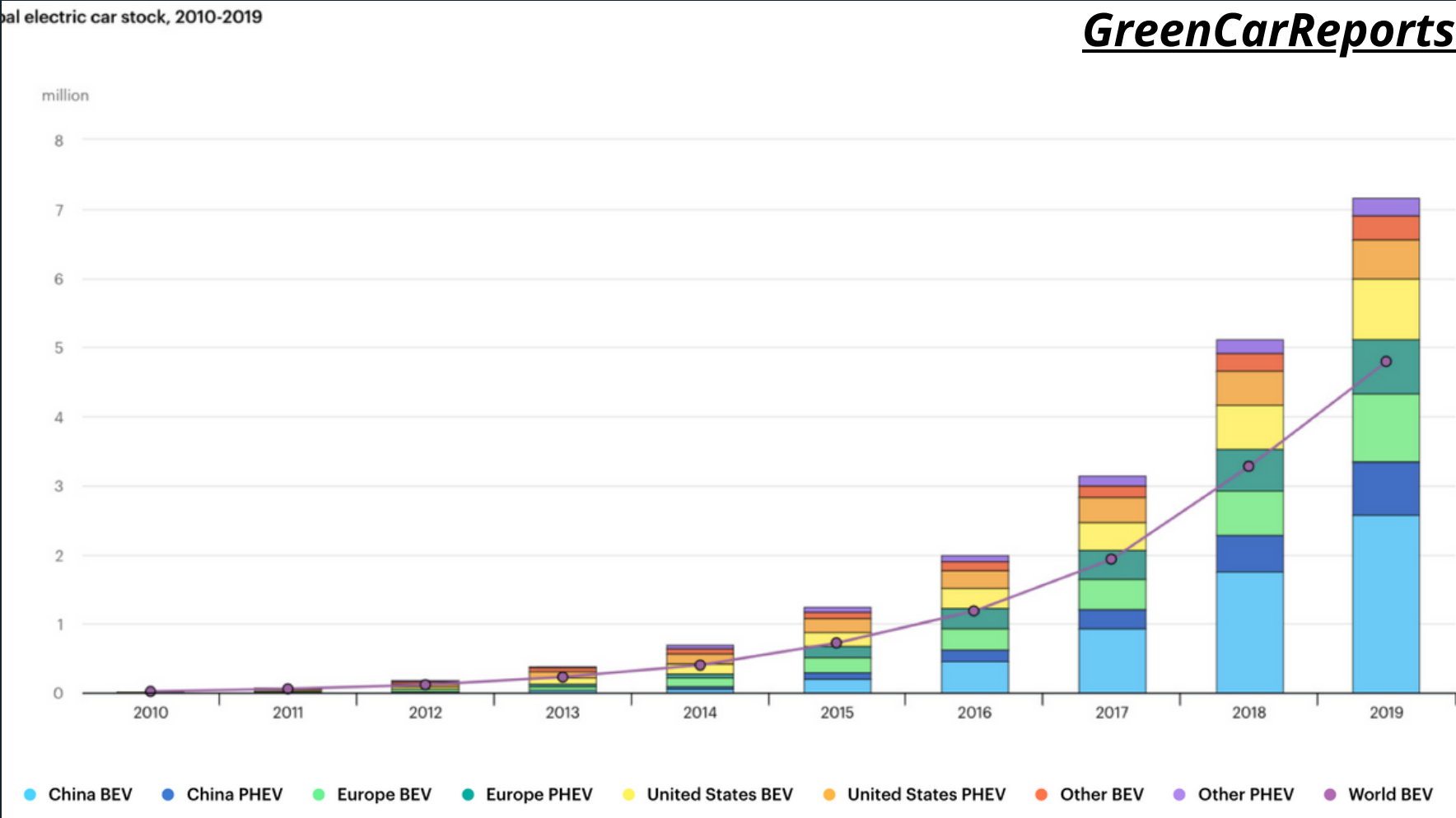
## More supportive policies and regulations (2/4)

- There has been a 20-fold increase in the number of global climate change laws since 1997
- The Paris Agreement as a legally binding international treaty on climate change. Adopted by 196 Parties on 12 December 2015 and entered into force on 4 November 2016. Its goal is to limit global warming to well below 2, preferably to 1.5 degrees Celsius, compared to pre-industrial levels
- The Clean Air Act requires the Environmental Protection Agency to work with states to reduce greenhouse gas emissions, including carbon dioxide and methane
- Energy policy laws require the Department of Energy to partner with the private sector to research, develop, and deploy clean energy technologies, and to set energy efficiency standards for appliances and equipment

# Thesis Assumptions and Foundations

## Why now?

### Global electric car stock, 2010-2019



- 62% of new car buyers believe they will own at least 1 full-electric vehicle in their household within 10 years

### Greater consumer and corporate demand (3/4)

- Reports predict that the share of automobiles that are expected to be electric will increase from 3% in 2020 to up to 30% by 2030 globally
- Repsol is doubling down on its transition away from the slippery elixir. It'll spend around \$6.5 billion growing its renewable energy business fivefold by 2025
- China invested \$100B in clean energy, the US \$64B (2018)
- Microsoft's AI for Earth program has committed \$50 million over five years to create and test new applications for AI
- The Department of Energy's SLAC National Accelerator Laboratory operated by Stanford University will use machine learning and artificial intelligence to identify vulnerabilities in the grid, strengthen them in advance of failures, and restore power more quickly when failures occur

# Thesis Assumptions and Foundations

## Why now?

### The World's Largest Climate Tech Hubs

VC funding raised by climate tech startups headquartered in the following cities from 2013-2019



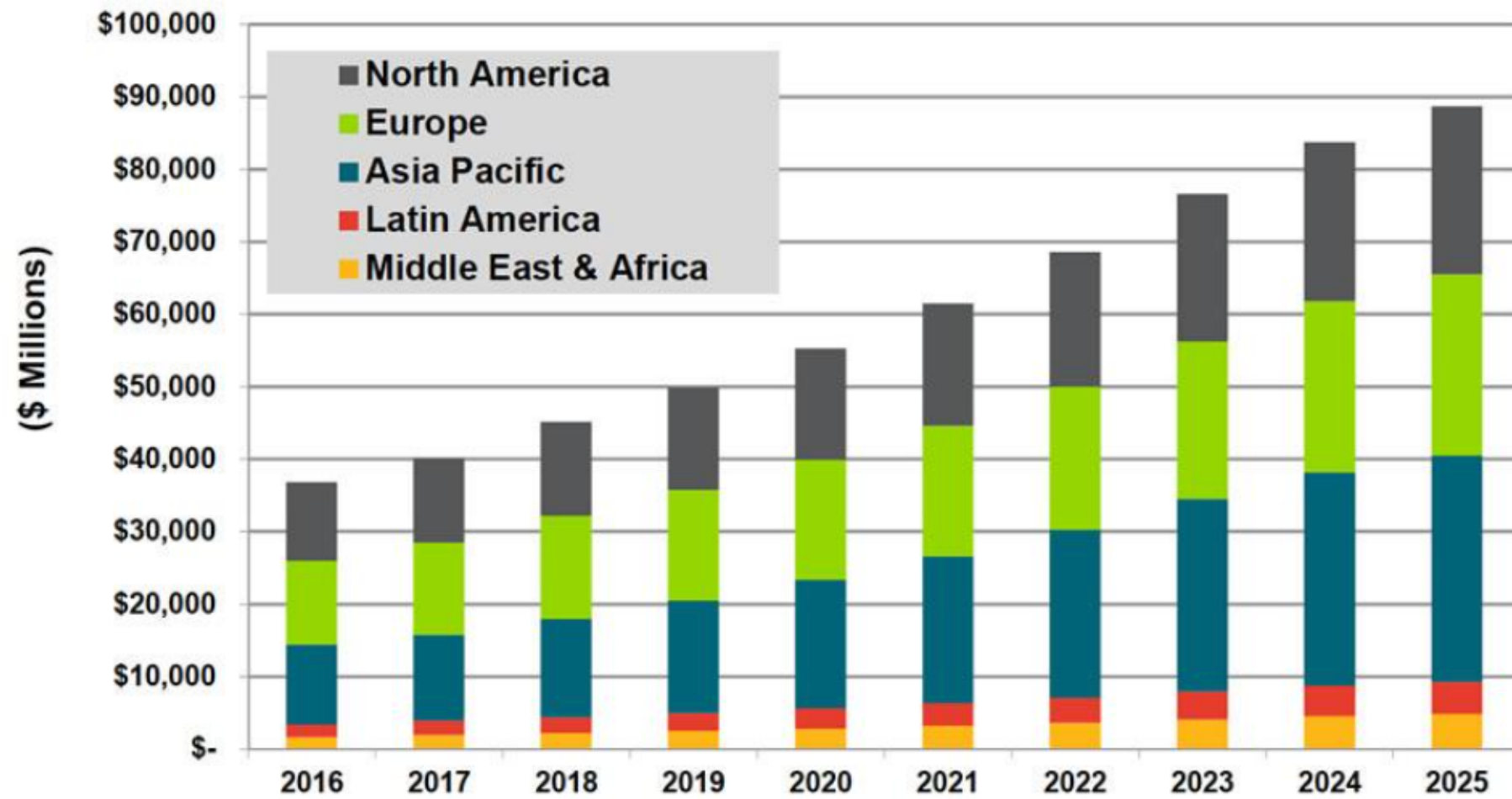
Sources: PwC, Dealroom

[Statista.com](https://www.statista.com)

## Recognized urgency of the problem (4/4)

- World Bank estimates that investments in climate and cleantech will reach up to \$23 trillion by 2030
- Close to 300 companies now have a commitment to achieve net zero emissions before 2050
- Business leaders joined forces and established: Amazon's \$2 billion 'Climate Pledge' venture fund, Microsoft's \$1 billion Climate Innovation Fund, and Unilever's €1 billion climate funds
- The world has 10 y to halve global greenhouse gas emissions and avoid global warming of above 1.5°C, an amount beyond which scientists warn dangerous impacts will kick in

Chart 1.1 Annual Smart City Revenue by Region, World Markets: 2016-2025



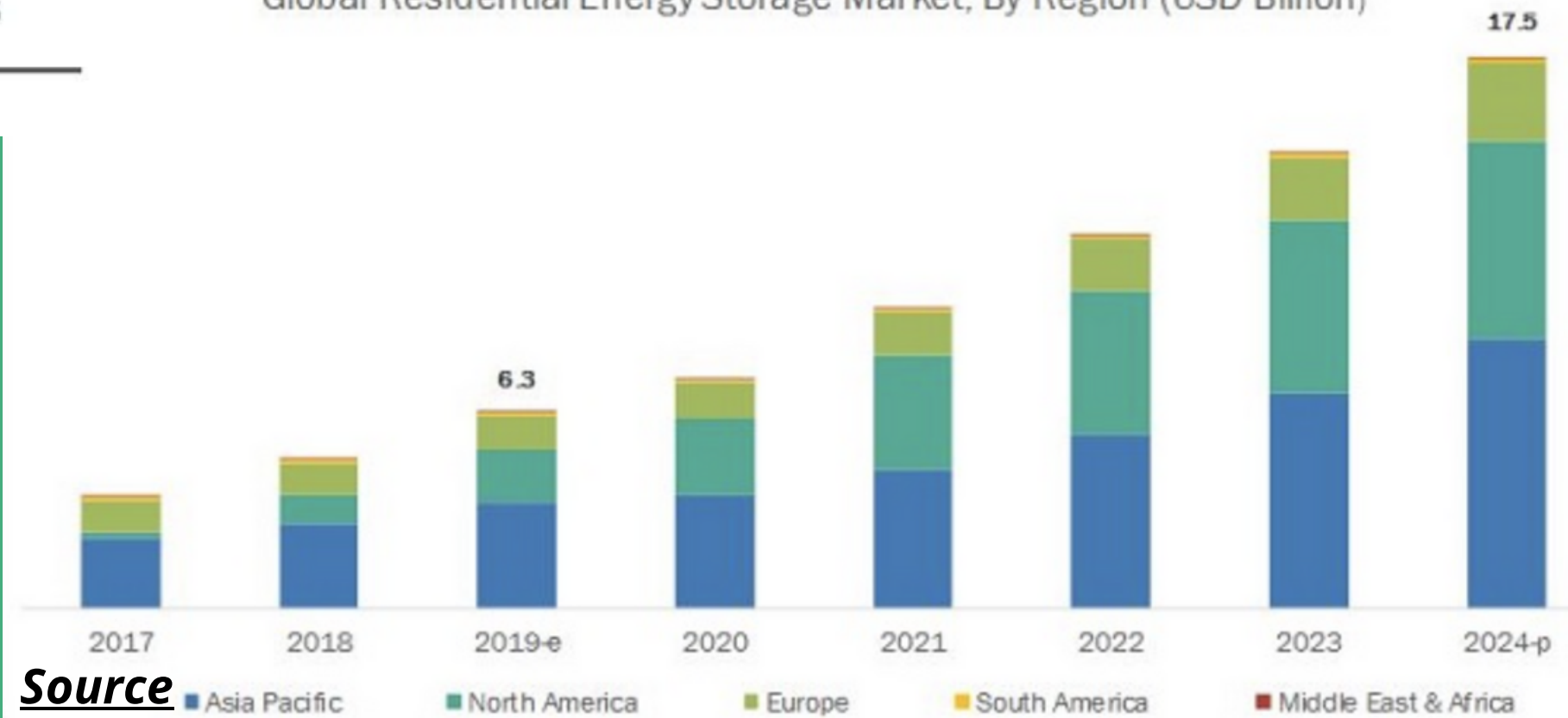
Source

(Source: Navigant Research)

# Market Opportunity

*selected categories*

Global Residential Energy Storage Market, By Region (USD Billion)



Source

The \$6.4 Trillion Climate and Clean Technology Opportunity  
*by The Carbon Trust estimation*

# VCS in Climate Tech



# Startups in Climate Tech



# Startups Highlight

early stage

## **Myst.AI**

Focused on time series forecasting in electricity. Forecasting-as-a-Service. Use artificial intelligence to help energy companies better predict the future, resulting in lower costs, reduced risk and less waste, increased profits, and lower carbon emissions. Myst AI, a startup developing a predictive energy usage platform.

**Funding:** A \$8M from Valo Ventures, Gradient Ventures.

## **Jupiter**

Jupiter builds artificial intelligence-powered tools that enable decision-makers to predict and manage risk associated with climate change.

**Funding** Seed: \$2.8M from NFX, Khosla Ventures, YC, Switch Ventures

## **Sierra Energy.**

Sierra Energy is a technology that turns trash into energy without burning. Sierra Energy is a waste-to-energy gasification company. Its flagship product, its FastOx gasification system, promises to transform nearly any type of trash into clean energy without burning.

**Funding** A: \$33M from Breakthrough Energy Ventures, The March Fund, Twynam Agricultural Group

## **Arnergy.**

Arnergy is a distributed utility leveraging on internet of things (IOT) to providing reliable solar power for businesses in emerging markets.

**Funding:** A \$9M from Breakthrough Energy Ventures, Norfund, Onenergy.

## **Boston Metal**

The company uses electricity, instead of coke, to convert iron ore into iron.

**Funding:** A \$20M from OGCI Climate Investments, The Engine, Prelude Ventures, Breakthrough Energy Ventures.

# Startups Highlight

early stage

## **ClearFlame Engines**

The company offers innovative technology that has the potential to reduce well over 5 gigatons of greenhouse gas emissions by 2050 and to disrupt freight transportation and other hard-to-decarbonize sectors such as construction, mining, agriculture and distributed power generation(rephrase)

**Funding:** Seed \$3M from Clean Energy Ventures, Irish Angels

## **Boston Materials**

The team is working on a carbon fiber composite material that could help lightweight cars and planes.

**Funding:** Seed \$2.5M from Clean Energy Ventures, SABIC Ventures, America's Seed Fund

## **RenoRun**

is building the world's largest single source platform for general contractors to purchase materials.

**Funding:** A \$21M from Obvious Ventures, ScaleUP Ventures, Maple Ventures, SVB, Real Ventures

## **Rebound Technologies**

The company is developing natural refrigerant solutions. It develops a supply chain solution that empowers food and beverage manufacturers to optimize production.

**Funding:** A \$14M from Skyview Ventures, Clean Energy Ventures, National Science Foundation

## **SEEDiA**

Tech company that builds an intelligent infrastructure that allows to realistically optimize city services and reduce costs offering smart solar benches, bus shelters, interactive kiosks, trash cans.

**Funding:** Seed \$265k from bValue Venture Capital



# Startups Highlight

early stage

## **Vertimass**

Is lowering costs of sustainable fuels for aircraft and light and heavy duty vehicles while providing a new route to renewable chemicals.

**Funding:** up to \$1.4M Award from U.S. Department of Energy's Bioenergy Technology Office to Optimize Renewable Jet Fuel.

## **Kobold Metals**

A San Francisco-based startup that uses artificial intelligence to accelerate the search for ethical sources of the metals, like cobalt, needed to make lithium-ion batteries.

**Funding:** A \$20M from Andreessen Horowitz

## **Malta**

A Boston-based startup that has developed a way to store renewable electricity in the form of heat and cold.

**Funding:** A \$26M from Concord New Energy Group, Breakthrough Energy Ventures, Alfa Laval.

## **The Climate Service**

TCS's mission is to embed climate data into global decision making in order to move the world to a lower-carbon economy. Their software blends climatic and econometric models to enable corporations and their investors to understand, in financial terms, company-specific exposure to climate risks such as sea level rise, wildfires, and flooding.

**Funding A:** \$3.8M from Synovia Capital, Persei ventures

## **Omnicarbon**

It is an AI driven software platform to enable cities to better manage climate change. Feature Summary: Real time predictive analytics service for impacts to city assets, Unique AI resiliency methodology, Collect local climate data with IoT sensors, Climate change digital data asset, Simple real time current and predictive climate community information, Local climate AI city digital twin simulation model.

# Startups Highlight

later stage

## Fictiv

It's an on-demand hardware manufacturing startup that offers a manufacturing platform that enables engineers and supply chain managers to design, develop, and deliver fabricate parts at unprecedented speeds.

**Funding:** C \$58M from G2VP, Mitsui & Co, Bill Gates, Accel, Intel Capital

## Carbon

Carbon(a 3D printing company) is reinventing how polymer products are designed, engineered, manufactured, and delivered, towards a digital and sustainable future.

**Funding:** E \$682M from 40 North Ventures, Next Play Capital, Madrone Capital Partners, Sequoia Capital

## Proterra

Proterra makes zero-emission, battery-electric buses that help eliminate fossil fuel dependency and reduce costs.

**Funding:** H \$680M from Cowen Group, 40 North Ventures, G2VP

## CarbonCure

CarbonCure manufactures a technology that introduces recycled CO<sub>2</sub> into fresh concrete to reduce its carbon footprint without compromising performance.

**Funding:** D CA\$12.4M from Pangaea Ventures, Power Generations, Inc., BDC Venture Capital

# Exits

43 Climate Tech Unicorns  
30 of which Mobility and Transportation

## Bloom Energy

Bloom Energy offers on-site power generation systems that can use a wide variety of inputs to generate electricity.  
IPO: NYSE:BE

## CoaLogix

CoaLogix provides selective catalytic reduction management and catalyst regeneration technologies for SCR systems.  
Energy Capital Partners acquired CoaLogix for \$101,000,000.

## Four Twenty Seven

Four Twenty Seven, Inc. is a California-based climate risk data firm that "measures the physical risks" of climate change. They provide a market intelligence on the impacts of climate change for financial markets.

Moody's Corporation purchased a majority stake in 2019.

## Regency Energy Partners

Regency Energy Partners is a growth-oriented, midstream energy partnership engaged in the gathering, contract compression, processing.

Energy Transfer Partners and Regency Energy Partners merged in an \$18 Billion Unit for Unit Transaction.

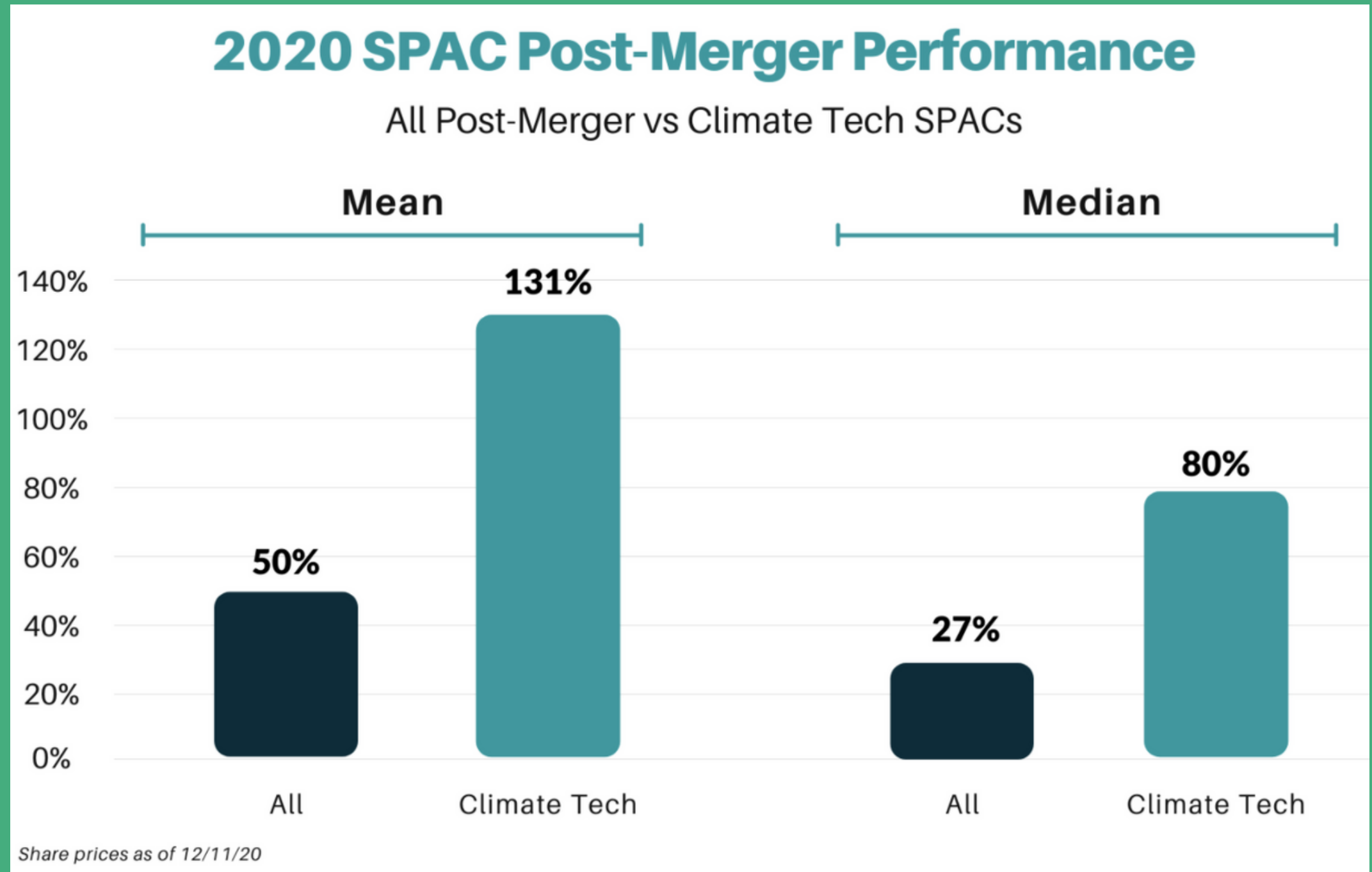
## ENBALA Power Networks

Enbala Power Networks, a smart grid network, pays electricity users who create a more robust and reliable electric power grid.  
Generac Acquired Enbala Power Networks.

# Exits

## Climate tech SPACs outperform across 2020

The climate tech SPACs that completed mergers in 2020 significantly overperformed the overall SPAC [results](#).



# Contact me

**Paulina Szyzdek**



SIGNAL

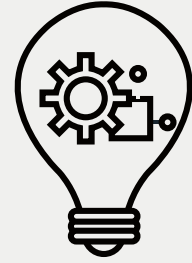


# Appendix

## Additional Resources



[ClimateTechWiki](#)



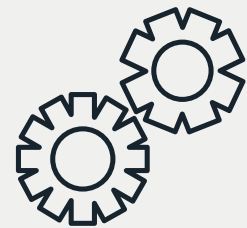
[AI in Climate Tech](#)



[List of VC in Climate Tech](#)



[The State of Climate Tech 2020](#)



[Startups Are Looking To Capitalize On The \\$1T Opportunity In Carbon Recycling](#)



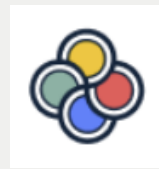
[Utility Investments in Distributed Energy.](#)

# Appendix

## Communities & Initiatives



[The Breez](#)  
climate tech newsletter



**Climatebase** - The platform for climate action. Explore jobs, events, and the organizations shaping our climate-positive future



**The Collider** - A collaborative network focused on solutions for climate change

**CRANE** 

**CRANE Tool** - platform created specifically to assess the impact of climate technologies



**Infodev** - work with incubators, accelerators, and green institutions around the world

**GreenBiz**

**GreenBiz** advances the opportunities at the intersection of business, technology and sustainability



**Travalyst** promotes sustainable travels & address conservation, environmental protection and expanding local community economic development by encouraging sustainable tourism practices across the travel industry

**THE  
EARTHSHOT  
PRIZE**

**Earthshot Prize** - Five, one million-pound prizes to be awarded each year for the next 10 years, providing 50+ solns to the world's greatest environmental problems by 2030 Council includes Prince William, Sir David Attenborough, Jack Ma, Indra Nooyi

  
**HULT  
PRIZE**

**The Hult Prize** is an annual, year-long competition that crowd-sources ideas from MBA and college students after challenging them to solve a pressing social issue around topics such as food security, water access, energy, and education. \$1M prize

# Appendix

\$60B

VC invested in climate tech  
between 2013-19

84%

compound annual growth rate  
(approx. 3750% increase  
between 2013-19)

1200+

climate tech startups identified

In 2019  
\$16B

of VC was invested in  
**590** climate tech deals  
(representing 6¢ of every VC  
dollar in 2019)



## Regional findings

### Top 3 Regions



1. North  
America:

\$29B



3. Europe:

\$7B



2. China:

\$20B<sup>13</sup>

### Top investment hubs

1. San Francisco Bay
  2. Shanghai
  3. Beijing  
(including mobility)
1. San Francisco Bay
  2. Boston
  3. Berlin  
(excluding mobility)



# Appendix



Area with the most funding:  
Mobility and Transport

63%

...of total climate tech investment

\$37<sub>B</sub>

Total invested in this area

151%

Compound annual growth rate (CAGR)



Unicorns

43

Climate tech startups valued at \$1B+

30

...of which Mobility and Transport startups

(Figures have been rounded for brevity)



Investors

2700

(approx)

Unique investors identified

10

Investors with 3+ deals per year on average

78%

Investors with 2 or fewer climate tech deals in total

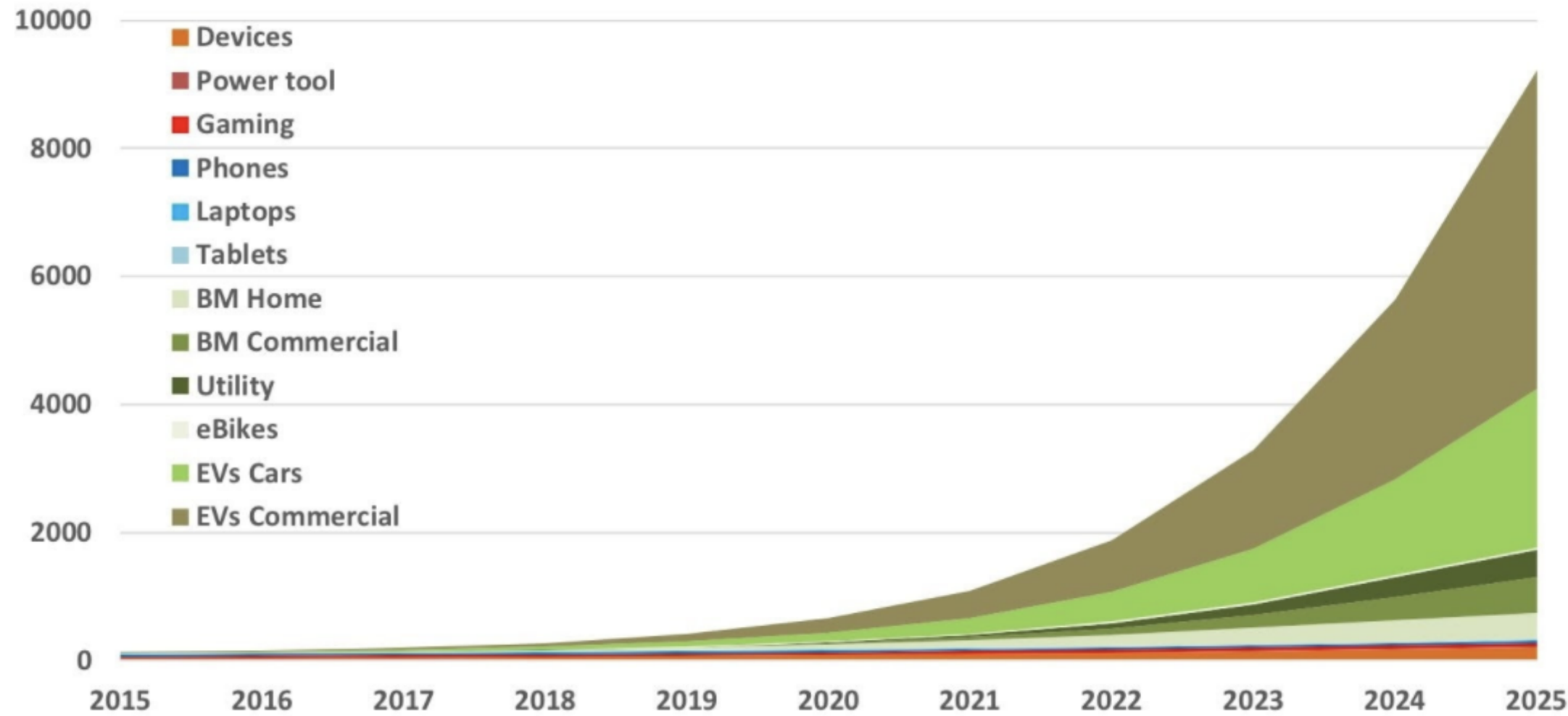
<sup>13</sup> Our data coverage is stronger in European and North American markets, and this analysis may therefore be a conservative estimate of the relative levels of Chinese investment and of overall investment.

Source: *pwc-the-state-of-climate-tech-2020.pdf*

# Appendix

**Global Annual Lithium battery GWh demand to 2025**

Data 2015-2017 USGS; Chart and Projection @FSS\_Au @ProfRayWills 30Jun18



## A drop of the price of electricity from solar sources from solar sources

