



The Adaptation & Resilience Innovation Playbook

DECEMBER 2024 – EXECUTIVE SUMMARY

Tailwind

About Tailwind

Tailwind is an advisory and investment firm focused on accelerating the development and deployment of climate adaptation and resilience (A&R) solutions.

[Emilie Mazzacurati](#) and [Katie MacDonald](#) launched Tailwind because they saw the urgent need for a climate adaptation innovation ecosystem. They have spent their careers building, investing in, and growing companies, products and programs into global successes.

Tailwind is dedicated to addressing **3 market failures**:

- 1. Capital Gap** – Lack of sufficient investor capital available to A&R innovators.
- 2. Demand Gap** – Lack of clear demand from A&R solution buyers.
- 3. Ecosystem Gap** – Lack of adequate support for innovators from academic and innovation support organizations.

OUR WORK

Advisory

We provide consulting services to corporations and investors and conduct philanthropically-funded work to build the field of adaptation innovation.

Investment

We place investments into early-stage climate adaptation startups with technologies and services we have conviction in.

Foreword from the Founders

The impacts of climate change call for rapid investment into and implementation of adaptation and resilience (A&R) solutions to protect communities, ecosystems, and economic assets.

We believe technological innovation, used wisely, can play a critical role in enabling climate resilience. We think innovation can make climate adaptation cheaper, faster, better and enable communities to flourish in the face of mounting climate hazards.

We wrote this Playbook to enable investors, innovators, corporations and governments to navigate the market for A&R solutions, with the goal of identifying key innovation needs, increasing capital into A&R solutions, and accelerating innovation. We hope all actors in the innovation ecosystem see both the opportunity and the responsibility to innovate and tackle this existential challenge. We look forward to working with you.

Emilie Mazzacurati
Co-Founder, Tailwind

Katie MacDonald
Co-Founder, Tailwind

EXECUTIVE SUMMARY

ES: Global Demand for Adaptation Solutions

Governments and consumers drive USD1.4 T worth of spend on A&R solutions and activities globally.

Our team conducted desktop research to assess overall global demand for climate adaptation solutions in three core segments:

1. Government Demand

- We tallied **USD737 B** of annual spend on adaptation in 2023 (51% of total demand).

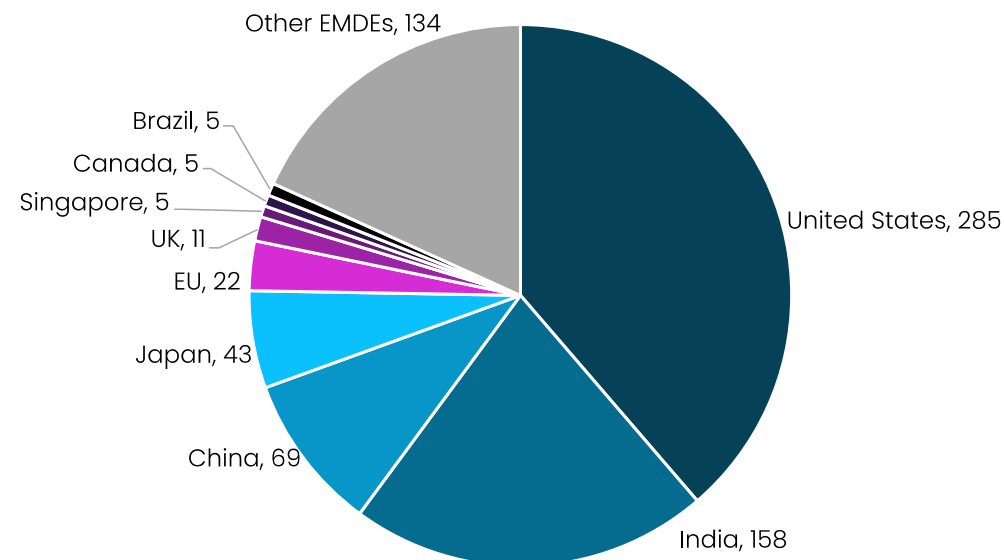
2. Consumer Demand

- We estimate that households spend up to **USD647 B** on adaptation products and services annually (45% of total demand).

3. Corporate Demand

- We identified **USD58 B** of spend via a limited sample of corporations on (4% of total demand).

Public Spend on Adaptation, 2023 (USD737 B)



Government Demand Highlights

The **US leads** government demand globally with **USD285 B** spent in 2023. The **US plus other industrialized countries drive USD370 B** of demand annually, with **emerging and developing countries driving USD366 B** of demand.

Consumer Demand Highlights

Households in the US invest to harden their houses and keep temperatures cool. Smallholder farmers in developing countries spend **USD368 B** on adaptation solutions equivalent to **20-40% of their own income.**

Corporate Demand Highlights

Sampled corporations that disclosed their A&R budget on average spend **USD200 M annually**. 60% of corporations are already experiencing climate impacts, **35% are already investing in physical risk solutions.**

ES: Global Adaptation Solution Needs

Demand centers around hardening infrastructure, managing water, and protecting agricultural lands.

We found each customer segment had its own priority adaptation needs with some notable overlaps.

1. **Government Demand:**

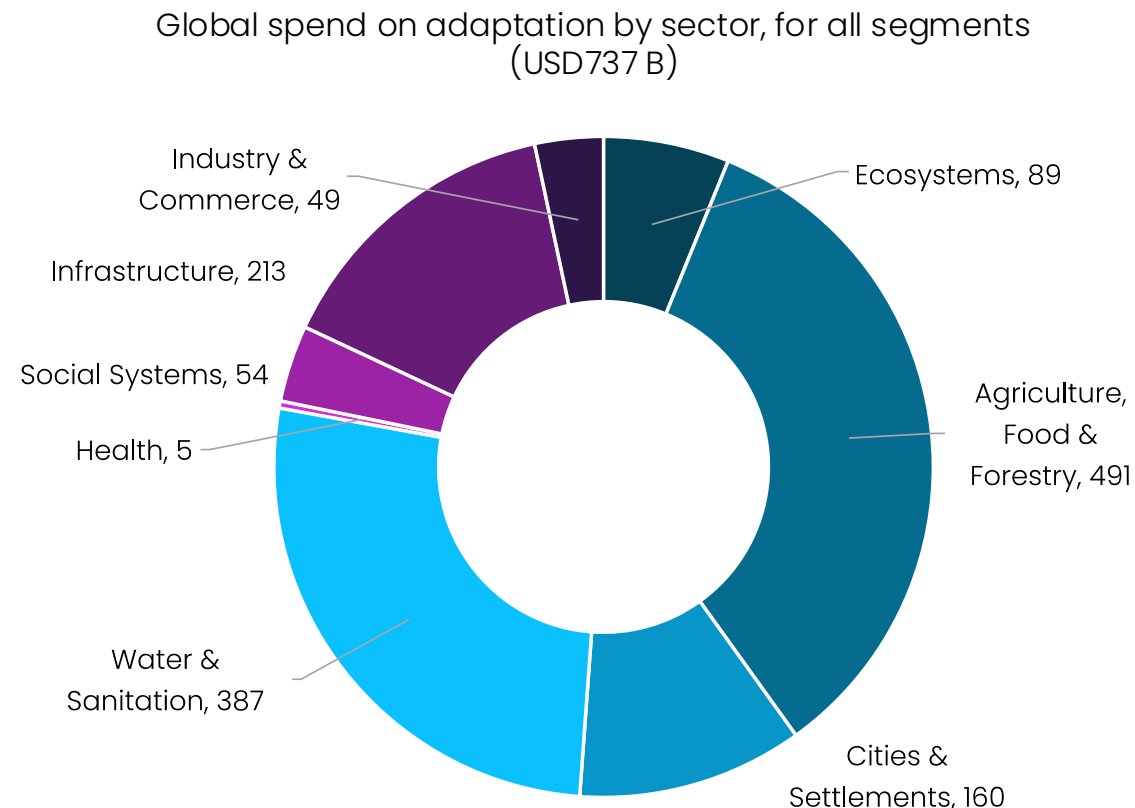
- 60% of funding is focused on **infrastructure** (USD173 B), **Water** (USD160 B), and **Cities & Settlements** (USD69 B), with flood prevention and management as a top priority.
- **Agriculture, Food & Forestry** (USD69 B) and **Ecosystems** (USD54 B) together made up 26% of public spend (30% in Developing Countries and Emerging Economies).

2. **Consumer Demand:**

- Globally, consumer demand manifests primarily in **Cities & Settlements** (13%), **Water & Sanitation** (29%), and **Agriculture, Food & Forestry** (58%).
- In the US, 43% or 2 in 5 Americans are likely to have invested in home hardening and adaptation landscaping solutions. 37% or 1 in 3 Americans are likely to or have already bought a generator.

3. **Corporate Demand:**

- The most cited risks were **water stress** and acute impacts like **extreme weather events**.
- Primary concerns associated with extreme weather events were damaged infrastructure, harm to human capital, supply chain interruptions, and transportation difficulties.
- Corporations were most likely to invest in **hardening sites, diversified suppliers and locations**, and water efficiency management.



ES: Adaptation Startup Landscape

Pure play adaptation startups make up 12% of all climate tech startups but receive only 3% of the funding, USD4.5 B.

Tailwind partnered with Vibrant Data Labs to train an AI model to identify A&R startups and map them to the Tailwind Taxonomy. This effort allowed us to develop the **first detailed analysis of investment trends and bright spots for A&R in the startup ecosystem** by sector and funding stage over time.

Pure play A&R ('Adaptation') startups make up 12% of all funded climate tech startups, but receive only 3% of total funding, USD4.5 B total.

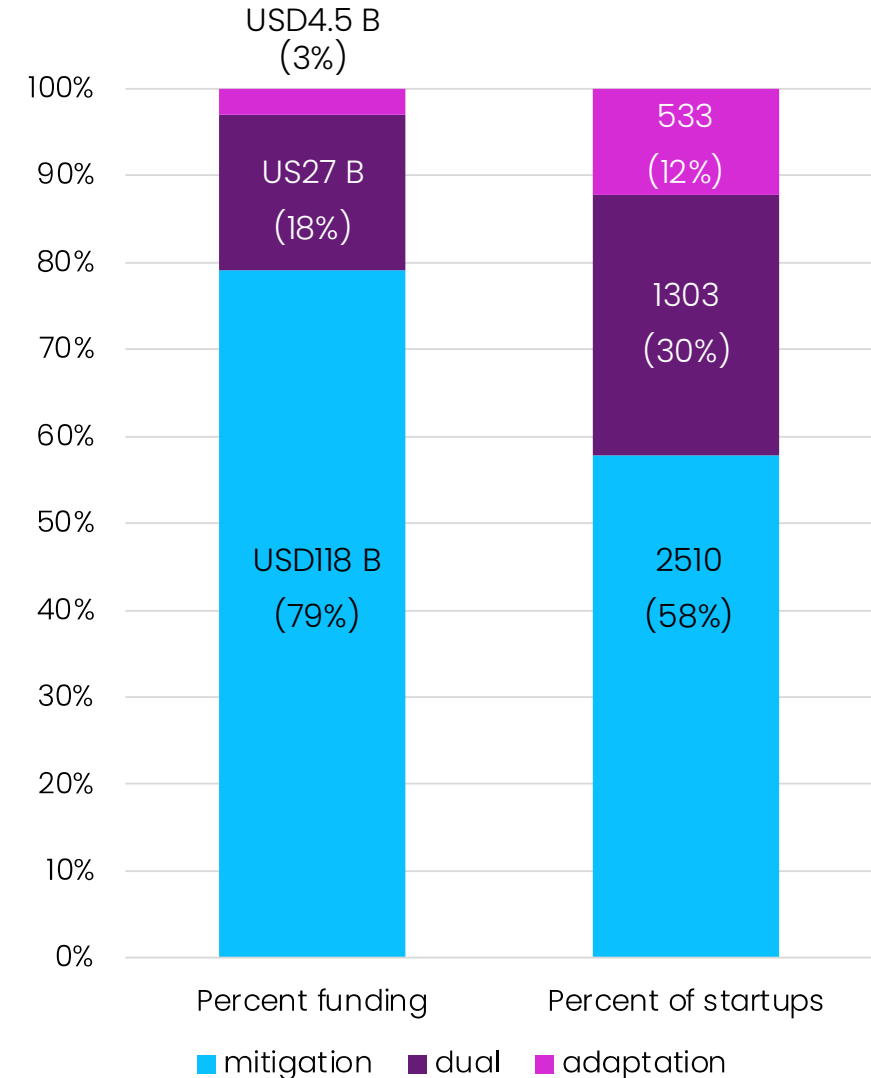
→ Adaptation startups include technologies that support climate risk and resilience activities but have little or no mitigation benefits, like climate risk analytics, insurance, disaster preparedness and recovery, flood prevention and mitigation, human cooling technologies, etc.

However, many mitigation startups also have adaptation co-benefits.

→ These include very active sectors within the climate tech ecosystems, such as food and ag tech, grid resilience and microgrids, and energy and water efficiency.

Dual benefit startups constitute 30% of all climate tech startups, and receive 18% of total funding, USD27 B.

All in all, we found that **42% of climate tech startups have A&R benefits**, even if adaptation is not their primary focus.

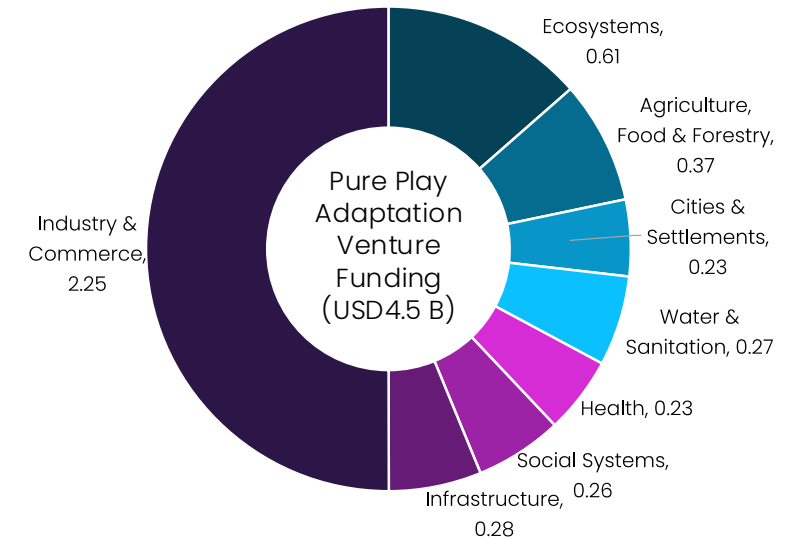


ES: Startup Growth Trends

Water infrastructure and IT dominate pure play. Agriculture, forestry, and food dominate dual.

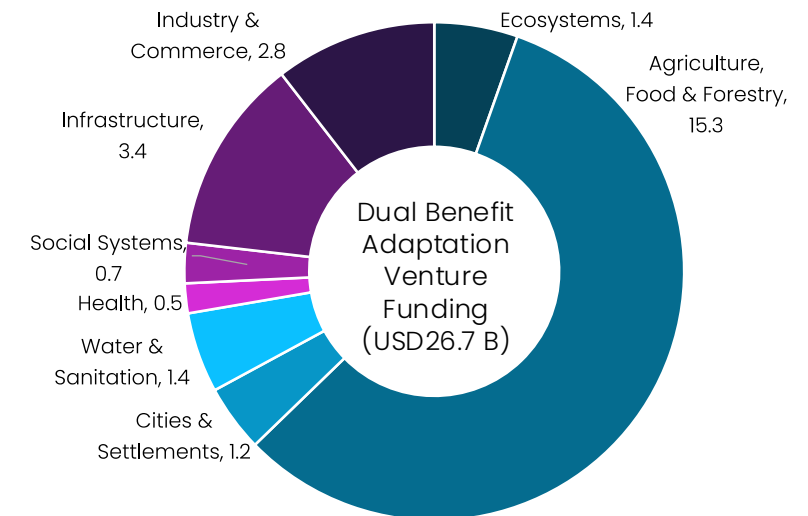
Pure Play Adaptation Trends

- **Industry & Commerce** makes up 50% of investments in pure play A&R startups (USD2.25 B). This includes climate risk analytics, earth observation, sensors and AI/digital solutions, as well as industrial tech, insurtech, fintech and construction tech.
- **Ecosystems** is the second most active sector, with USD610 M of investments in firetech, water management and oceantech.
- 71% of venture investments into adaptation companies go into digital solutions, AI and earth observation solutions, with less than 16% in physical risk reductions.



Dual Adaptation + Mitigation Trends

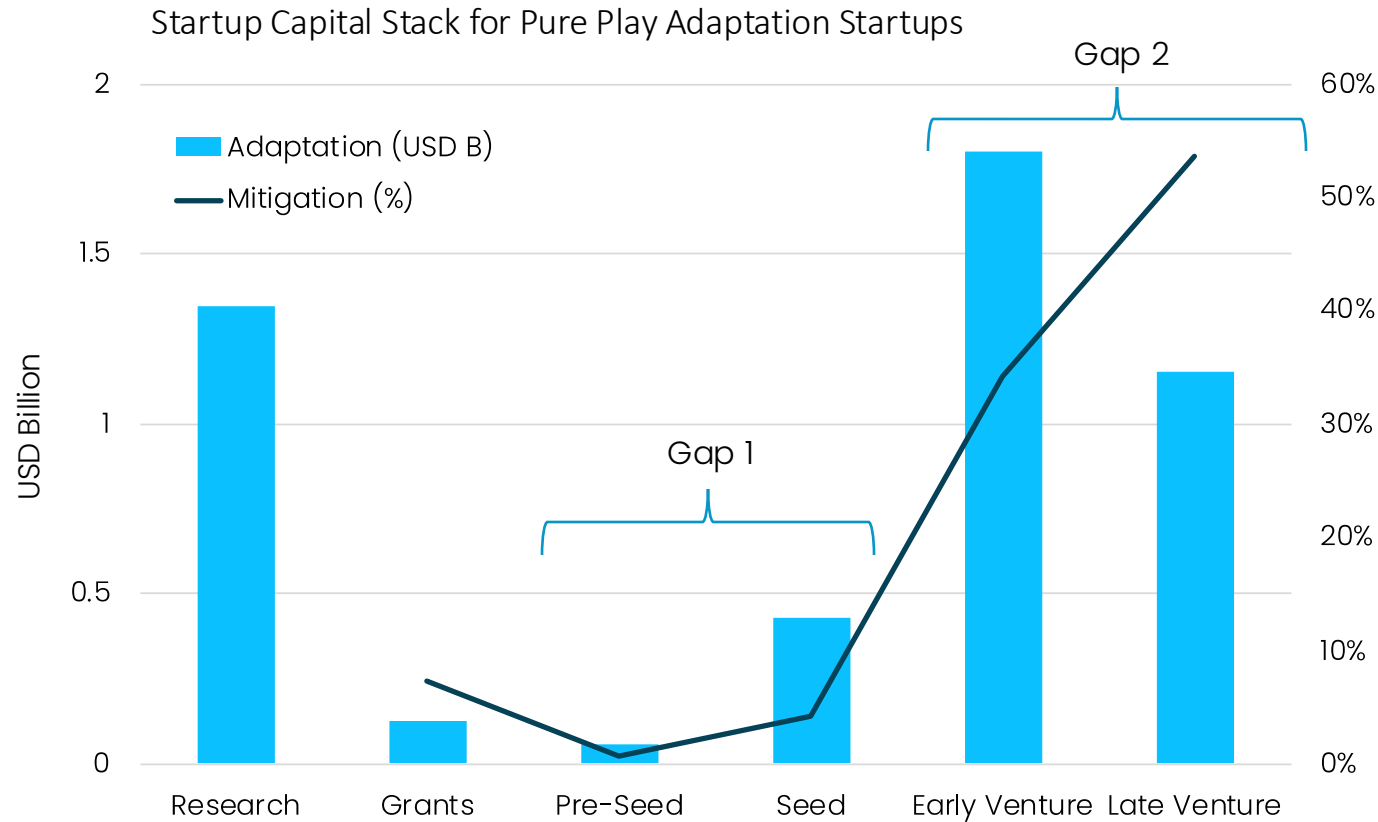
- Dual benefit startups received USD26.7 B in funding over 2019–2023, almost 6 times more than pure play adaptation companies.
- **Agriculture, Food and Forestry** dominate this category, due to a very active ecosystem in ag and food tech. Here we include regenerative ag, indoor farming, alternative proteins and smart irrigation.
- **Grid resilience** (Infrastructure), manufacturing (which includes **industrial energy and water efficiency**), and Water & Sanitation also received substantial funding.



Capital Stack: Startup Capital Needs

A&R innovation investment remains glaringly low for innovators at all stages, with a huge gap for startup formation (pre-seed) and product development (seed) and insufficient capital for all venture rounds.

Our findings on capital availability between 2019 and 2023 reveal that there is very little capital for innovators translating research into new businesses. Once products have been tested, venture funding can be hard to come by.



Investment Trend Lines:

- Capital Gap 1:** Like the initial capital gap in climate tech 1.0, we see a **dire need for more funds at the pre-seed and seed stages. This represents the most serious capital gap for A&R companies.**
- Capital Gap 2:** While the early **venture and late venture** funds available trend upward from the pre-seed and seed funding gap, **they are relatively much smaller** compared to a 'healthy' capital stack, illustrated by the mitigation percent funding. Late-stage rounds are particularly limited.

**Research dollars are for 2023 only, while funding stages numbers are cumulative for 2019-2023
Percentages apply to the sum of equity rounds and grants, excluding debt.*

ES: Innovation Roadmap

Across the adaptation space, there are many opportunities for innovators to develop solutions to meet existing and mounting customer demand.

Bright Spots

Water Infrastructure: Solutions enabling efficient water sourcing, distribution, utilization, and enabling resilient sanitation infrastructure.

Agriculture, Forestry & Food: Solutions driving the resilience of crop production, livestock production, forest products, and food systems.

Infrastructure (Electric): Solutions enabling grid resilience and reliability as well as solutions enabling power reliability.

Infrastructure (ICT), Industry: Solutions such as risk analytics, modeling and insurtech startups dominate these categories.

Cities & Settlements: Solutions enabling building cooling and thermal efficiency.

Dimension	Rating
Demand	High
# Active Startups	High
\$ VC Invested	High
# Acquisitions / Exits	High

Hidden Gems

Cities & Settlements: Flood tech solutions for buildings, coastal resilience solutions, and other building hardening solutions.

Infrastructure (Transportation): Solutions that can enable the resilience of ground, maritime, and air transportation assets and systems.

Industry: Insurtech and climate risk intelligence solutions for real estate and corporations with at-risk physical assets.

Agriculture, Forestry & Food: Solutions that improve soil and microenvironmental health.

Ecosystems: Solutions for wildfire prevention, detection and suppression. Nature-based solutions for flood management and shorelines.

Dimension	Rating
Demand	High
# Active Startups	Med
\$ VC Invested	Low
# Acquisitions / Exits	Low

Blind Spots

Health:

- Solutions to predict, prevent and treat respiratory, cardiovascular, and other negative health-related outcomes to heat, fire, and other climate hazards.
- Solutions to predict, alert, and track disease transmission of vector and waterborne illnesses.
- Solutions for body cooling (such as wearables and cool patches).

Social Systems: Early warning systems and solutions for post-disaster recovery. Temporary shelters and pre-fabricated / resilient housing.

Water Infrastructure: Solutions to enable air water capture and water access in areas of drought.

Dimension	Rating
Demand	High (Latent)
# Active Startups	Low
\$ VC Invested	Low
# Acquisitions / Exits	Low

ES: Enablers of Change

There are a few enablers of change we think are important for A&R companies to consider as they grow. These elements can play a big role in whether companies achieve the impact they seek.

Ecosystem programs remain few and far between for climate adaptation companies. There are only a handful of A&R-focused accelerator and incubator programs (11) in contrast with 150+ mitigation/decarbonization-focused programs. **The ecosystem needs more programs supporting A&R entrepreneurs to scale.**



Measuring the impact of adaptation companies remains a challenge. There is no “one-size-fits-all” adaptation measurement framework or metric (akin to net zero), but numerous metrics already exist for measuring the success of an A&R solution. **Consensus on which metrics matter most and how best to measure success locally is critical to driving impact.**



Policies and regulatory frameworks are missing to incentivize adaptation solutions. We need more explicit incentives, financing programs, and adaptation mandates from subnational and national governments if we want to see a robust climate adaptation innovation sector that equips governments with the solutions needed to protect society and the economy. **Work must be done to define adaptation and adaptation spending as a priority across governments.**



Preventing maladaptation is essential so solutions do not unintentionally increase vulnerability to climate change or make a system more susceptible to climate-related risks. These risks include increased emissions, social vulnerability, ecosystem damage, and financial inequality. **Investors and solutions providers need tools and best practices to manage maladaptation risks and engage communities where these risks are most pronounced.**



ES: Recommendations

The Playbook outlines a set of recommendations for funders, entrepreneurs, corporations and policymakers interested in growing climate adaptation innovation to meet humanity's growing demands.

For Entrepreneurs

- We know many solutions are needed to make society and the economy resilient to climate change. Investors will do good business with Bright Spots and Hidden Gems. Our advice for entrepreneurs? Focus on **Hidden Gems** and **Blind Spots**.

For Funders

- **Philanthropic and Public Funders** – Focus on filling capital gap #1 and making sure grants and catalytic capital exist for adaptation solution providers at the pre-seed and seed stages.
- **Private Investors** – Focus on developing an investment thesis that includes climate adaptation and directing more capital into early and late venture rounds for adaptation companies.

For Policymakers

- **Pass Resilience Focused Policies** – Whether it's at the national, state, provincial, or city level(s), ensure that we have robust legislation that ties adaptation and resilience goals to regulation and public investment.
- **Fund Innovation Programs** – Fund research, incubators, accelerators, and direct funding programs for climate adaptation startups and innovators.
- **Guide Standards Development** – Drive the development of definitions, metrics, and standards that can be used to ensure the performance and impact of adaptation and resilience solutions.

For Corporations

- **Protect Your Business** – Make sure your company has robust climate risk monitoring and invest in physical risk solutions to protect your business and the communities which you operate in from the impacts of climate change.
- **Remain Competitive** – Engage in external and internal innovation to build and acquire new adaptation solutions that can help your business meet the growing demands of governments, consumers and the private sector.

Thank You

Funders

We are grateful to the groundbreaking funders who supported our vision to publish this report as both a foundation and catalyst to drive innovation and investments into adaptation & resilience.

- **Autodesk Foundation** – Jean Shia, Beth Foster-Chao
- **Battelle** – Melinda Sych
- **Breakthrough Energy Fellows** – Ashley Grosh, Meghan Bader, Taylor Carvalho
- **Lyda Hill Philanthropies** – Matt Crommett, Olivia Strader
- **Shockwave Foundation** – Paul Traina, Jeny Wegbreit

Partners

Vibrant Data Labs was a central partner for the research underlying the startup and investor data. Special thanks to Eric Berlow, Jay Hirschtou, and Lara Reichmann for all your time and collaboration.

The **Center for Climate and Energy Solutions (C2ES)** generously contributed their insights and network to inform the corporate section. Thank you to Verena Radulovic, Amy Bailey, Caroline Linne and the entire team for your time and support!

We are also grateful to the **Climate Policy Initiative (CPI)**, **Resilient Cities Network (RCN)**, **CleanTech Group** and **Fors Marsh** for sharing access to their data and rich discussions. Thank you!

Team

This project was supported by two exceptional individuals who were critical contributors to this report: **David Babikian** and **Brooke Zhang**. We thank them for their extensive contributions.

Thank you to the **Urban Future Lab at NYU** for being Tailwind's headquarters for this project!



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Building
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