CLIMATE X

Strategic Growth by Financing Resilience

2025

Foreword

The accelerating impacts of climate change are no longer distant projections but daily realities shaping markets, assets, and communities worldwide. As extreme weather events grow in frequency and severity, businesses and financial institutions face mounting exposure to physical risks that directly affect operations, profitability, and long-term resilience. Yet within these risks lies a significant commercial opportunity: the financing of adaptation.

This whitepaper, developed by a consortium of leading financial services Contributors and led by Climate X, explores how adaptation finance can emerge as a scalable, profitable, and urgently needed investment frontier. Released for New York Climate Week 2025, the paper positions adaptation finance not as a distant policy aspiration but as a market-ready opportunity for banks, insurers, investors, and corporates to unlock today.

The chapters that follow map both the risks and the opportunities. In them, you'll learn the growing costs of physical climate impacts, tangible examples of how businesses and assets are already being affected, and the scale of the adaptation investment gap. You'll discover the role commercial banks, insurers, real estate, and private equity can play, as well as the lessons that can be drawn from development banks. We address barriers around awareness, incentives, data, and financing models — and then turn them into practical pathways for action.

This paper is intended as a playbook: concise, practical, and data-driven. It provides decision-makers across financial services and the wider commercial sector with the insights needed to integrate adaptation into strategy, lending, and investment.

Through real-world case studies, including examples of both successful interventions and costly inaction, the whitepaper demonstrates how predictive analytics and innovative financing instruments can make adaptation measures not only viable but also commercially attractive. Supermarkets and logistics chains are used as a core illustration of adaptation in practice, showing how resilience investments can reduce insurance costs, protect revenues, and generate long-term returns for asset owners, lenders, and insurers alike.

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Above all, this paper is intended as a playbook: concise, practical, and data-driven. It provides decision-makers across financial services and the wider commercial sector with the insights needed to integrate adaptation into strategy, lending, and investment. By reframing resilience as an opportunity — rather than an afterthought — adaptation finance can help build stronger businesses, more stable financial systems, and economies that are better equipped for a changing climate.

This whitepaper benefited from extensive discussions and consultations with a broad range of stakeholders, who provided valuable inputs and suggestions. The conclusions and views are those of the authors and do not necessarily represent those of the entities listed below.

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What's Inside?

Executive Summary

Climate change is here. Its impacts are with us. Even if human emissions were to stop tomorrow, and global net-zero targets achieved, certain physical climate risks — from extreme weather events to sea-level rise — are locked in. These risks carry direct and indirect consequences for every sector and geography, and pose a financial threat to corporations and financial institutions alike.

However, organizations are not helpless in the face of these challenges. They can adapt. Climate adaptation is the adjusting of systems, activities, and assets to manage climate hazards. For businesses and financial institutions, adaptation can protect revenues and preserve asset values. It can also open up new, exciting business lines and opportunities to capture value in fast-growing adaptation markets.

All adaptation requires finance. However, right now capital flows for adaptation are meager, and dwarfed by those going towards climate mitigation and decarbonization. Public institutions are the drivers of adaptation finance so far, especially in developing countries, where many high-impact adaptation measures have diffuse benefits that are difficult to monetize.

However, public budgets are finite, and political cycles often limit ambition. Private adaptation finance — from banks, asset managers, insurers, and corporations — is essential to close the gap. While current flows remain small, the potential upside is significant: reducing credit and underwriting losses, sustaining insurability in high-risk markets, and unlocking new revenue streams in existing and emerging sectors.

Climate change is not some distant threat – it is a near and present danger. Even if we manage to cut carbon emissions significantly, we will face a world with rising physical risks for the foreseeable future. That's why adapting to a world with increasing physical risks is becoming an increasing priority. Financial firms have an important role to play in this.

As this paper shows, this might be through insurance companies collaborating with policy holders to implement effective adaptation strategies; or development banks increasing the flow of blended finance solutions to support locally driven adaptation strategies; or banks creating new products that support adaptation. All provide excellent examples of sound risk management.

Jo Paisley,
President of GARP Risk Institute

The market opportunity is substantial. An estimate by consultancy BCG suggests adaptation-related revenues could range between $0.5-$1.3trn a year by 2030[1], while another by Singapore's state investment fund, GIC, suggests these could reach $4trn annually by 2050. Yet seizing this opportunity is not straightforward. Investors require a granular understanding of the climate risks inherent in their portfolios and the risk/return trade-offs associated with different adaptation measures.

In this paper, Climate X provides an overview of adaptation finance, explores how to turn climate risks into adaptation opportunities, and unpacks a series of real-world case studies that demonstrate the value-add of adaptation.

We also highlight a number of industry perspectives that show how some of the world's most important companies are approaching adaptation finance.

Our aim is to illustrate how integrating adaptation into investment strategies and corporate planning today can strengthen portfolio resilience, drive revenue, and position organizations as leaders in the emerging adaptation economy.

1- The Private Equity Opportunity in Climate Adaptation and Resilience', BCG
'Sizing the Inevitable Investment Opportunity: Climate Adaptation', GIC

Background

What is Adaptation?

Climate adaptation is how we adjust to actual or expected climate change in order to reduce risks and take advantage of opportunities.

97% of climate scientists agree: by pumping planet-warming gases into the atmosphere, humanity is causing unprecedented changes to our climate and weather systems, from sea-level rise to more frequent, extreme storms. These consequences have knock-on impacts for the global economy and financial system, and are transforming the context in which businesses, financial institutions, and even entire governments operate.

Adaptation is how we respond.
While every economic actor has their own set of challenges and resources to meet them, their objective should all be the same: to lower their exposure and/or vulnerability to climate risks, and capitalize on the opportunities that a changed physical reality presents. Governments can construct sea walls and roll out extreme weather early warning systems. Businesses can prepare their facilities and suppliers for worsening floods and storms. Homeowners can harden their roofs against hail strikes and clear wildfire-prone vegetation from their properties.

All these adaptations have something in common. They require finance to implement. Hence why banks and other investors are some of the most important drivers of adaptation. Besides governments, only their balance sheets have the heft necessary to bankroll adaptation in the real economy. They are also optimally placed to benefit from the shift to an adaptation-centric paradigm.

Investing early in adaptation could produce outsized returns for institutions. Certain economic sectors and technologies are poised to see their revenues balloon as the world gets warmer and wilder — think industrial cooling, water management, and climate-resilient infrastructure. Those financial institutions that seed and sustain companies in these sectors could reap significant rewards.

Definitions

Climate Physical Risks Impact

For businesses and financial institutions, physical changes to the climate and weather caused by human-induced warming can lead to adverse financial and operational impacts, such as:

Asset loss: Damage to real estate, critical infrastructure, and inventory

Revenue loss: Business interruption leading to lost sales and missed opportunities

Operational impairment: Reduction in worker productivity, disruptions to third-party infrastructure

The climate physical risks that drive these impacts are organized across two categories:

Acute: These risks arise from weather-related events such as storms, floods, drought or heatwaves. These events are increasing in severity and frequency as the climate warms.

Chronic: These risks arise from longer-term shifts in climatic patterns including changes in precipitation and temperature, which could lead to sea-level rise, reduced water availability, biodiversity loss, and changes in soil productivity.

2 - "Quantifying the consensus on anthropogenic global warming in the scientific literature', Environmental Research Letters

What is Adaptation Finance?

Adaptation finance is that which enables organizations and systems to adapt to climate change. In other words, it is finance to prepare, prevent, respond to, and recover from climate physical risks.

This covers a wide range of instruments and use cases, from project finance for climate-resilient infrastructure to disaster insurance for individuals and enterprises. It also comes from multiple sources: public, private, philanthropic, and household investors are all providers of adaptation finance.

Defensive adaptation finance is deployed to prevent or reduce the human, economic, and financial cost of climate risks.

In practice, adaptation finance can serve many purposes, but it may be helpful to organize these into two categories: 'defensive' and 'offensive'.

Defensive adaptation finance is deployed to prevent or reduce the human, economic, and financial toll of climate risks. An example would be New York City's investment in the Lower Manhattan Coastal Resiliency Project, which is designed to protect this part of the city from rising seas over the next 80 years. Typically, these investments are focused on preserving the value of existing assets and activities.

Offensive adaptation finance targets products, services, and business models that meet growing demand created by climate impacts. This bucket covers investments in adaptation technologies, like enhanced HVAC systems to address rising demand for cooling solutions, and in nascent markets likely to expand — such as indoor sports, the nighttime economy, and personal health and wellness.

Definitions

Adaptation vs Resilience

'Adaptation' and 'resilience' are complementary concepts, and often used interchangeably.

For the purpose of this paper, 'adaptation' refers to those actions that adjust systems, activities, and/or assets in response to acute and chronic hazards. These adjustments are made to mitigate risks and capture opportunities.

'Resilience' is the end-result of successful adaptation. A system, activity, or asset may achieve a climate-resilient state following one or more adaptive actions. This means it is able to survive, and perhaps even thrive, amidst climate physical risks.

It is important to remember that resilience is a moving target. As climate change unfolds and risks evolve, an entity's resilience may deteriorate, and additional adaptations may be required.

There are also limits to adaptation. Beyond a certain intensity and/or frequency of climate risks, a system, activity, or asset may be unable to adapt and achieve resilience.

The boundaries between these categories are blurred. For example, climate change is likely to raise demand for climate-resilient property retrofits. These are both defensive, in that they can mitigate climate physical risk, and offensive, in that they spur demand for specialist construction materials and expertise.

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The financing instruments for both types of adaptation finance can take many forms (see the table below). In the public sector, they may include sovereign or municipal bonds, tax credits, and subsidies. In the private sector, they run the gamut from corporate capital expenditures to bank loans to direct investments in capital markets instruments, like resilience bonds. Philanthropies typically deploy capital as grants or concessional-rate loans to support high-impact projects in vulnerable communities. Household investments, meanwhile, are facilitated by income, savings, or personal loans.

For financial institutions, adaptation finance represents both a necessity and an opportunity. Climate hazards present challenges to their investment portfolios in the here and now, as they can undermine asset values, disrupt credit performance, and reduce (or even eliminate) insurance coverage. Proactively financing adaptation can protect institutions' existing investments. But it can also open new revenue streams in rapidly growing markets, and position institutions as pioneers in the emerging adaptation economy.

Proactively financing adaptation can protect institutions' existing investments. But it can also open new revenue streams in rapidly growing markets...

By deploying their own balance sheets, structuring expertise, and client networks, financial institutions can power the adaptation of the real economy and capture a fraction of the resulting cost savings and revenue increases in the process.

In the following sections, we will explore public and private adaptation finance in more detail.

Public Finance?

The Need For Public Finance

UNEP's 2024 Adaptation Gap report underlines how far current financial flows fall short of meeting climate adaptation needs, especially in developing countries. This analysis shows the supply of adaptation finance undershoots needs by $187-359bn per year [3].

National development banks (NDBs) could be considerable drivers of adaptation flows. With around $20trn in combined assets, they currently provide around 20% of global climate finance.

Much of this gap can only be filled by public finance [4]. This is because many adaptation solutions for climate-vulnerable communities, while having clear macroeconomic benefits that accrue to multiple beneficiaries, do not produce capturable financial returns, and are therefore unattractive to private investors. Development banks can help unlock more private adaptation finance by deploying innovative financial instruments that crowd in commercial entities alongside public capital. This is known as 'blended finance' (See: Industry Perspectives: 'Development Banks').

State of Development Banks' Climate Finance

Multilateral Development Banks (MDBs) continue to scale climate finance year-on-year, but finance for adaptation continues to lag, at 33% of total climate finance in low- and middle-income countries [5].

Bilateral development finance institutions (DFIs) are critical in developing countries, with combined MDBs and bilaterals providing 66% of all tracked adaptation finance [6]. However, DFIs struggle to match most MDBs' levels of adaptation finance: members of the International Development Finance Club, for example, provided 12% of their total climate finance for adaptation and dual objectives [7].

National development banks (NDBs) could be considerable drivers of adaptation flows. With around $20trn in combined assets, they currently provide around 20% of global climate finance [8]. However, only a fraction of their credit portfolios (14%) are allocated to green assets, and they could do more to scale adaptation finance to climate vulnerable sectors such as infrastructure, agriculture, and small- and medium-sized businesses.

3- 'Adaptation Gap Report 2024', UNEP

4- The role of the private sector in financing climate adaptation', Zurich Climate Resilience Alliance

5- '2023 Joint Report on Multilateral Development Banks Climate Finance', IDB

6- 'Multilateral and Bilateral Development Finance Institutions', Climate Policy Initiative

7- 'IDFC Green Finance Mapping 2024', Climate Policy Initiative

8- 'National Development Banks Can Do More to Help Drive Countries' Green Transformations', World Resources Institute

Private Finance?

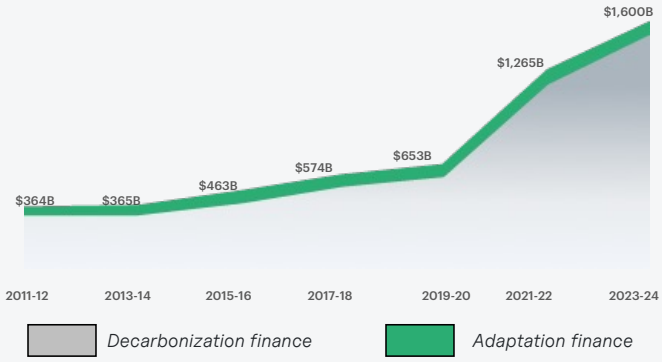
Private adaptation finance refers to the deployment of capital from commercial institutions —such as banks, asset managers, insurers, and corporations.

Today, private finance is falling well short of its potential. The Climate Policy Initiative calculated that just $588mn of adaptation finance for developing countries came from commercial institutions in 2021-2022 [9]. Private adaptation investment in the Global North is also lagging. US spending on climate-related disaster recovery is nearing $1trn a year alone [10], yet finance for adaptation start-ups and early-stage enterprises is a fraction of total climate investment [11].

Unlike public or philanthropic funding, which finances activities and projects that yield adaptation benefits but generally do not produce capturable revenue streams, private adaptation finance is motivated by loss avoidance and return generation.

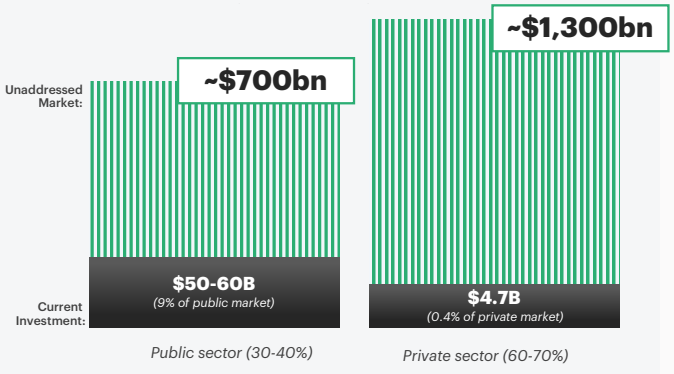
It encompasses investments in infrastructure hardening, new products and services with resilience benefits, risk-transfer mechanisms like insurance, and corporate spending to safeguard supply chains, workforces, and assets. These flows can take the form of loans, bonds, equity stakes, project finance, and direct corporate expenditures. Private finance can be deployed independently, or in tandem with public finance in blended finance structures.

The private market for A&R is significantly under- funded, accounting for <1% of total climate finance volumes



Global climate finance, biennial averages ($ B)

The $2T market opportunity for Adaptation and Resilience finance is largely untapped



Total market size for adaptation finance by 26: $2T (WEF)

9- 'Global Landscape of Climate Finance 2024', CPI

10- 'US Spending on Climate Damage Nears $1 Trillion Per Year', Bloomberg Green

11- 'Adaptation and Resilience Innovation Playbook', Tailwind

For banks, private adaptation finance means expanding lending to projects, companies, and households that are reducing exposure to climate hazards or responding to adaptation-induced demand. Think commercial loans for flood-proofing industrial facilities, or mortgages tied to climate-resilient housing.

The strategic value of adaptation finance to financial institutions is not purely defensive. While adaptation finance can protect existing portfolios, it also has the capacity to enhance deal flow and open new revenue streams.

Asset managers and institutional investors can allocate capital to listed companies, private equity, venture capital, or real assets with clear adaptation benefits. Certain institutions are already building out adaptation-themed funds or calling for adaptation 'screens' to be used when scrutinizing investment strategies.

Insurers play a dual role, both as underwriters of climate risk and as investors in adaptation-centric assets that can lower their long-term claims exposure. Corporations, meanwhile, can use capital and operating expenditures to fortify their own operations and their value chains against climate disruptions, or tap debt and equity markets to do the same.

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By financing adaptation, banks can reduce borrower default risk in hazard-prone regions; insurers can sustain insurability in high-risk markets; asset managers can access growth in adaptation-oriented sectors; and corporates can maintain operational continuity while developing new products for climate-impacted markets.

Adaptation Finance Solutions

Innovation in adaptation finance is accelerating, with a growing range of sophisticated instruments now available to address extreme weather risks. Commercial banks are playing an increasingly pivotal role, structuring and distributing products that channel capital toward climate-resilient projects while offering attractive financial returns.

From resilience bonds and sustainability-linked loans to blended finance vehicles, banks are enabling public and private entities alike to implement and scale adaptation measures more effectively than ever. At the same time, improved products and strategies — such as climate-resilient infrastructure funds, corporate capex financing for resilience, and property-based or on-bill mechanisms — are making it easier for end-users to manage climate risks, creating a more dynamic and investable adaptation finance ecosystem.

Solution	Explanation
Financiers, structurers and investors	
Resilience Bonds	Use of proceeds bonds that finance corporate/sovereign adaptation
Sustainability-Linked Loans (SLLs)	Loans that offer favorable terms when borrowers meet adaptation-related performance targets (e.g., flood-proofing facilities, upgrading water systems).
Climate-Resilient Infrastructure Funds	Pooled investment vehicles targeting infrastructure projects with resilience benefits
Adaptation-focused Private Equity & VC	Capital directed toward startups or scale-ups offering adaptive technologies (e.g., water tech, heat-resilient materials, agtech, climate intelligence).
Municipal Adaptation Finance	Loans or bonds issued to cities/local governments to fund adaptation projects, often supported by public-private partnerships or blended finance.
Blended Finance Vehicles	Structures that use public or philanthropic capital to de-risk and crowd in private investment in high-impact adaptation sectors or regions.
Climate Adaptation Indices / Benchmarks	Index products that track companies or assets contributing to adaptation, enabling passive investment or benchmarking of resilience performance.
Real Estate and Corporates	
Direct CapEx in Resilience	Direct capital expenditures/balance sheet funded on adaptive infrastructure, measures and technologies, or workforce protection (e.g., cooling warehouses, backup power).
Property Assessed Clean Energy (PACE)	Mechanism that allows property owners to finance energy efficiency, renewable energy, water conservation, and resilience improvements through a voluntary property tax assessment.
On-bill financing (OBF)	Way to fund resilience or climate-proofing upgrades where the repayment is collected directly through the customer's regular utility bill (e.g., electricity, water, gas).
Performance-based contracts (PBC)	Agreement where the financier or contractor is paid based on measurable outcomes of the adaptation investment rather than just delivering the physical project.
Cross-cutting	
Parametric Insurance Products	Insurance that pays out based on pre-defined climate triggers (e.g., rainfall thresholds or wind speeds), enabling faster recovery after climate events.

Turning Climate Risks Into Adaptation Opportunities

There is a clear business case for investing in adaptation. The adaptation market is estimated to grow to $0.5 - $1.3trn in size by 2030 according to consultancy BCG [12,13]. A separate analysis by Singapore's state investment fund – GIC – said adaptation companies are likely to generate $4trn in revenues by 2050. This represents a big opportunity for investors.

Today most adaptation spending is made by public bodies [14]. However, these actors are constrained by institutional mandates and budgetary limits. Political considerations often shape their investment choices, too.

Private investors may have fewer constraints. While their balance sheets have limits, they often have greater freedom to invest how and where they want in line with their risk appetites and strategic priorities.
As mentioned above, they should be incentivized to invest in adaptation for two self-interested reasons: one, to protect their own asset portfolios from climate shocks; and two, to capitalize on the vast opportunity that adaptation entails [15].

Clear value proposition of Adaptation

For Banks

For banks, financing adaptation can yield fresh business opportunities and risk management benefits. Supporting clients in making their assets more climate-resilient, such as through flood protection or heat-resistant upgrades, helps reduce defaults and improve credit quality. This also creates opportunities for new lending products like green loans or resilience-linked financing. By incorporating adaptation into their strategies, banks can strengthen client relationships, expand revenue streams, and improve regulatory metrics, like the Green Asset Ratio required under European Union rules.

For Investors

For commercial real estate investors, adaptation investments help protect the value of physical assets and maintain steady cash flows. Assets that are unprotected against climate hazards — like extreme heat, flooding, or storms — face rising insurance premiums, tenant turnover, and lower valuations. Upgrading buildings with features such as improved drainage, passive

12- 'Adaptation and Resilience Innovation Playbook', Tailwind

13- 'The Private Equity Opportunity in Climate Adaptation and Resilience', BCG

14- 'Global Landscape of Climate Finance 2025', CPI

15-' 'The Private Equity Opportunity in Climate Adaptation and Resilience', BCG

cooling, or elevated infrastructure helps avoid these costs. Resilient properties are also more attractive to investors, lenders, and insurers, which can improve resale value and reduce financing costs.

For Corporates

For corporations, adaptation is essential to protecting operations and supporting long-term profitability. Investing in resilience, through facility upgrades, supply chain diversification, and/or early warning systems – to name just a few examples – helps reduce downtime and financial loss. These measures can also lead to lower insurance premiums, stronger investor confidence, and improved standing with regulators and communities.

Selecting Adaptation Investments

Climate change is a systemic risk. It touches every economic activity and geography. This means adaptation investment opportunities are similarly broad.

While this makes adaptation finance attractive to all kinds of institutions, it can make deciding where to allocate capital challenging — simply because of the wide array of options available. This dynamic explains the recent vogue for adaptation investment taxonomies.

Investors new to adaptation may find these tools a useful starting point. However, it is important to keep in mind that adaptation is sector-specific, location-specific, and often even entity-specific. This puts the onus on the investor to develop a granular understanding of the climate physical risks within their current portfolio — and of the additional investment opportunities they may be considering.

Take the example of a real estate asset manager. In one region, they may conclude that retrofitting a given building with flood gates and stormwater-absorbing green infrastructure offers the greatest adaptation ROI, given its flood risk exposure. In another region where heat stress is the predominant hazard, investments in high-efficiency air conditioning, cooling insulation, and reflective windows may make more sense.

Because understanding physical risks and their corresponding adaptation opportunities is so essential, private entities may find climate intelligence and predictive analytics (see below) to be an essential first investment. These tools help entities understand, quantify, and assess the physical climate risks they face. This knowledge can inform strategies on where and how to adapt, and help evaluate the potential returns of adaptation investments.

Industry Perspectives

Allianz

Insurance:

Allianz

Climate-related impacts are leading insurance companies to reassess the risks associated with their portfolios worldwide.

Notably, extreme weather events are raising the overall level of losses and transforming the insurers' risk/return paradigm for specific hazards in certain regions. For example, in the US, although tropical cyclones/hurricanes have always been a major economic threat, their impacts today are often much more costly and severe than they were in the past (Figure 1).

A key metric for understanding cyclone behavior is the Adjusted Accumulated Cyclone Energy (ACE) Index, which measures the combined strength, duration, and frequency of storms over time.

As shown in Figure 1, the ACE Index has exhibited a notable +35% increase in the 21st century, reflecting a rise in hurricane activity. Figure 1 also highlights a corresponding increase in financial losses, emphasizing how rising cyclone activity and socio-economic factors have jointly amplified disaster costs. The 2010-2019 period recorded the highest economic losses, reaching approximately $731bn, largely due to the devastating impacts of Hurricanes Harvey, Irma, and Maria. Even more concerning, although this decade is not yet halfway through, it has already witnessed $460bn in hurricane damages, an amount that doubles the total losses recorded between 1980 and 1999 ($225bn).

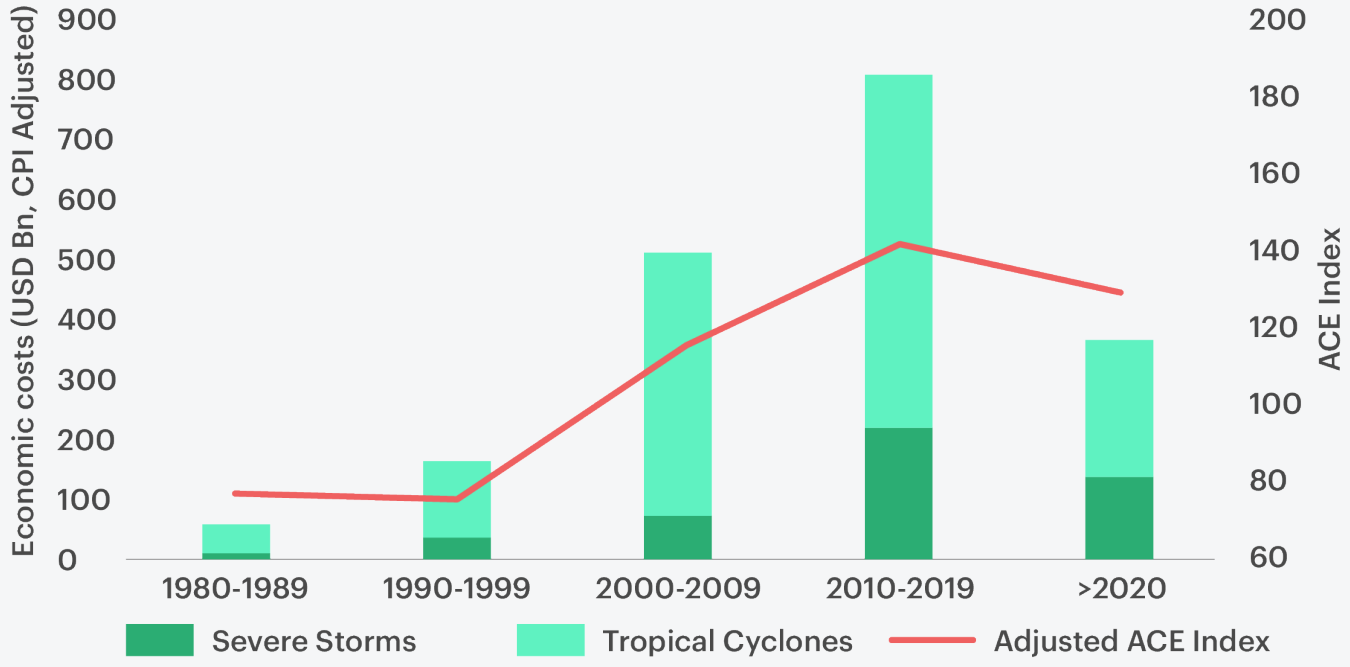


Figure 1: Historical trends in hurricane-related damages in the US since 1980: illustration of the trajectory of economic losses alongside the Adjusted Accumulated Cyclone Energy (ACE) Index

Source : NOAA, NHC, EPA, Allianz Research

Allianz

To manage the risks posed by natural disasters and climate events, adaptation measures are essential. Climate risks are a function of three main factors: the frequency and intensity of climate hazards, the level of exposure (people, assets, and infrastructure at risk), and the vulnerability of those exposed, whether financial or physical. Adaptation measures can address exposure and vulnerability (Figure 2).

From an insurance perspective, reducing exposure is contingent on smarter land-use planning and stricter regulations to prevent development in high-risk areas. Reducing vulnerability, meanwhile, demands both physical and financial resilience. Investing in climate-resilient infrastructure, such as elevated buildings in flood-prone areas or heat-resistant urban design, can enhance physical resilience.

On the financial side, improving access to insurance and strengthening government support mechanisms are critical. In order to reduce the climate exposure and vulnerability of their underwriting portfolios, insurers often encourage policyholders to embrace adaptation and resilience measures themselves, by informing them of the risks via comprehensive assessments and technical evaluations under various potential loss scenarios.

These strategies can lead to lower risk profiles. In turn, this can affect technical premiums and policy terms, including coverage limits and deductibles. Underwriters may offer lower deductibles or more comprehensive coverage options to policyholders who have implemented adaptation measures and demonstrate such lower risk profiles. For example, Allianz Versicherungs AG's residential building and household insurance rewards the presence of pressure-water-tight windows and doors by reducing the contractually agreed deductible for the extreme weather protection module by 50% in the event of flood damage.

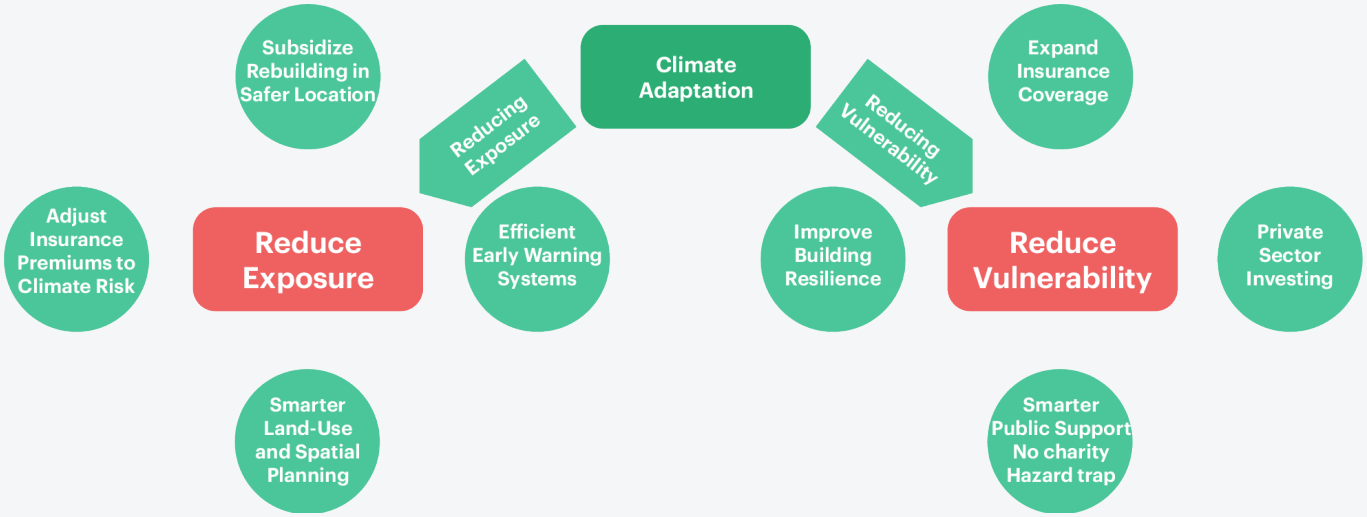


Figure 2 : : Leveraging adaptation finance to reduce exposure and vulnerability

Source : Allianz Research

Allianz

It's important to recognize that while adaptation measures can lower expected losses, the relationship with insurance premiums is complex. Premium calculations consider various factors beyond expected losses, such as reinsurance costs, expenses, market conditions, amongst other factors. In summary, while adaptation measures can reduce losses associated with natural catastrophes and climate-related risks, their impact on insurance premiums involves a complex interplay of several factors. This ensures that premiums are not only fair but also sustainable in the long term.

It's important to recognize that while adaptation measures can lower expected losses, the relationship with insurance premiums is complex. Premium calculations consider various factors beyond expected losses, such as reinsurance costs, expenses, market conditions, amongst other factors.

Decision Outcome

Understanding our climate exposure at Allianz.

To understand and assess natural catastrophe (Nat Cat) risk, we have set up an Allianz Center of Competence for Natural Perils at Allianz Reinsurance. This team models Nat Cat scenarios and assesses exposure. Vendors and in-house applications provide comprehensive risk profiles for any defined location in the present climate, and can also incorporate forward-looking climate change impacts for selected hazards, such as flooding. Models and hazard maps inform risk-based pricing for Nat Cat perils and provide managers with insights into the accumulation of risks [16].

Allianz is supporting community resilience.

Allianz co-led a project to bolster Ghana's climate resilience through a parametric flood insurance product for the capital city of Accra. This solution aims to re-establish economic activity in low-income urban areas following a flood disaster [17].

16- Annual Report 2024 Allianz Group

17- Allianz | Allianz Drives Climate Resilience with Parametric Solutions

savills investment management

Real Estate:

Savills IM

As one of the world's largest real asset managers, Savills IM recognizes that climate risk is investment risk. That is why we focus on building resilience across our portfolios and future-proofing investments with a goal to deliver enduring value for our clients and communities. We have a comprehensive sustainability strategy, which is core to our business model, through which we assess risk, uncover opportunity, and drive operational excellence on a continual basis. We believe this integrated approach positions our assets to better withstand the physical and transition impacts of climate change and aligns with our fiduciary responsibility to deliver long-term, risk-adjusted returns for our clients.

Physical climate risk has the potential to impact asset values, hinder business operations, impede asset financing, and increase the cost of insurance. By building resilience to physical climate risk hazards such as flooding, extreme wind, and heat stress through climate adaptation measures, we can help maintain our assets' usability and long-term value. For example, retrofitting existing buildings with cool roofs, energy-efficient insulation, smart monitoring systems, and impact-resistant windows enhances resilience to extreme heat and storms while lowering operating costs and improving tenant comfort. Similarly, integrating elevated foundations, placing critical electrical equipment above floodplains, and installing stormwater management systems into new developments reduces exposure to climate risks and protects long-term asset value.

For our real estate investment platform, our approach begins with a desk-based screening to identify potential high-risk assets. We then seek to conduct a more thorough analysis on any potentially higher-risk assets to better understand asset performance as it relates to transition risk, physical risk, and resiliency. To screen for physical risk, we use data for various scenarios across local physical risk hazards, including: river flood, surface flood, coastal flood, wildfire, storms, tropical cyclones, subsidence, landslide, extreme heat days, drought and storm surge, leveraging the latest climate models with up-to-date real-world data.

The platform provides a high-level indication of the potential risk exposure for any location globally. If an asset's location is identified as high or critical risk, further investigations are conducted to assess if adaptation measures are already in place or what potential actions could be taken to reduce risk. If the asset does not have resiliency measures in place, we seek to work with building engineers and/or underlying managers to prepare an adaptation plan for the asset and outline required operational and capital expenditures to be considered. Operational concerns and capital expenditures are considered at the time of acquisition and throughout the investment process, informed by the climate scenario outputs produced as a first screen. Investment management firms raise capital primarily from institutional investors such as pension funds, endowments, insurance companies, and sovereign wealth funds.

UNEP FI

Development Banks:

UNEP FI

Development banks have an important dual role: supporting national public finance needs, and incentivizing private investment where financial risks are perceived to be too high or rates of return too low or unpredictable. These barriers can be overcome with the use of 'blended finance'.

These are transactions where public funds are offered, often on concessional terms, to mitigate the financial, technical and regulatory risks of an investment project to attract market-rate capital from private providers.

This allows commercial investors to benefit from lower investment risk, while development banks benefit from the private financial institutions' investment expertise. Blended finance has been deployed to support locally driven adaptation solutions, and expand private capital access to a broader range of end beneficiaries — from large corporates to Micro-, Small, and Medium-sized Enterprises and individual households. Members of the Adaptation & Resilience Investors Collaborative, hosted by UNEP FI, have identified financial intermediaries such as banks and microfinance institutions as key vectors for scaling adaptation finance and mobilizing capital to the most climate vulnerable businesses and communities [18].

Blended finance succeeds when it maximizes additionality — meaning when it mobilizes a large amount of private capital at market rates and produces significant on-the-ground impact, without distorting markets [19]. Crowding in private capital can help catalyze and scale nascent adaptation markets, while providing an important signal to investors of the potential returns on these types of investments. This is particularly important where the ROI may lie beyond the time horizon for most forms of financing, and/or where the market cannot price in wider resilience benefits.

Blended finance succeeds when it maximizes additionality — meaning when it mobilizes a large amount of private capital at market rates and produces significant on-the-ground impact, without distorting markets.

Jo Paisley,
President of GARP Risk Institute

Debt instruments such as loans, lines of credit, or bonds can be used in blended finance transactions. MDBs may also combine concessionality with debt structures that enable development banks or philanthropies to finance junior or subordinated tranches that rank lower in repayment priority than other debt.

The European Bank for Reconstruction and Development (EBRD) was the first MDB to launch a Climate Resilience Bond in 2019 in line with the Green Bond Principles and consistent with the Climate Bonds Initiative's Climate Resilience Principles [20]. This is intended to support the

18- 'Adaptation and Resilience Investors Collaborative', UNEP FI

19- 'How can 'blended finance' help fund climate action and development goals?', LSE Grantham Institute

20- 'World's First Climate Resilience-Dedicated Bond Issued by EBRD', Green Policy Platform

UNEP FI

bank's target of increasing green financing to 40% by 2020. With dual mitigation and adaptation objectives, Proparco and DEG's $120mn loan to Mauritius Commercial Bank is an example of debt financing to unlock low-carbon, climate-resilient financing in support of national and regional objectives [21].

Commercial financial institutions may also struggle to identify and pursue adaptation-related business opportunities. One way to address this is through collaboration with policymakers to support country-led financing strategies.

Blended finance can also support equity instruments by tranching risk across public and private participants. The Landscape Resilience Fund, supported by South Pole and WWF, provides loans to farmers in climate vulnerable landscapes in Southeast Asia, and also equity investments in agricultural firms. [22].

Then there are guarantees, which can enable other financial institutions to invest in higher risk investments by covering a portion of potential credit losses. The Asian Development Bank's IF-CAP Facility leverages guarantees from donor governments for existing sovereign debt, thereby freeing up the bank's capital for climate mitigation and adaptation projects [23].

Finally, grants can provide interest-free capital to bring projects to market and build project pipelines. Grants for technical assistance can also help commercial banks develop their own adaptation finance capacities.

Despite the various ways blended finance can be deployed, collaboration between development banks and the private sector is not accelerating at the pace required to meet adaptation needs. There are a number of reasons for this.

Firstly, accessing concessional finance from development banks can be complex, with high transaction costs. This limits access to financial institutions with greater technical capacity.

Secondly, DFIs have varied legal and political mandates, which can increase the complexity of collaboration between institutions. Harmonization and simplification of investment frameworks across development banks would reduce friction in accessing adaptation finance.

Thirdly, many commercial financial institutions – particularly in emerging markets – find assessing and managing physical climate risks challenging. MDBs, policymakers, and regulators can enhance capabilities by coming together at the country level to support risk data platforms and provide access to harmonized climate risk data, models and tools. Such collaborations can also support

21- 'Proparco and DEG strengthen their partnership with MCB, in favour of climate finance in Mauritius', Proparco

22- 'About the LRF', Landscape Resilience Fund

23- 'IF-CAP: Innovative Finance Facility for Climate in Asia and the Pacific', ADB

UNEP FI

businesses and financial institutions with mapping their adaptation needs and rolling out associated plans.

Development banks can also originate or guarantee pre-arranged financing and sponsor parametric insurance products.

Commercial financial institutions may also struggle to identify and pursue adaptation-related business opportunities. One way to address this is through collaboration with policymakers to support country-led financing strategies. This includes helping ensure National Adaptation Plans integrate financial considerations and feed into a country's Integrated National Financing Framework. The Asian Development Bank's Climate Adaptation Investment Planning (CAIP) demonstrates how to engage governments on financial planning for adaptation, including scaling private sector engagement[24].

In addition, DFIs and MDBs can forge a common language on adaptation investment by supporting the development and use of adaptation investment taxonomies. These should enable companies to more easily identify their adaptation needs, and for financial products to be developed that mobilize the capital necessary to fulfill them. Taxonomies should be context-specific and responsive to sectoral adaptation needs, while offering investors practical guidance that supports both physical resilience (adaptation) and financial resilience (risk transfer) solutions.

Innovative financing approaches that move beyond the blended finance approaches are also needed to holistically address climate challenges. Development banks can pioneer approaches like aggregating insurance demand, offering insurance-backed financial products, and working with policymakers and regulators to increase financial literacy and reduce protection guarantee pre-arranged financing and sponsor parametric insurance products [25].

In the medium to long term, physical climate risks must be priced into capital markets and adaptation needs to be integrated into business decisions as a matter of course. In the meantime, as firms build their awareness and capacity of climate impacts, development banks and finance institutions can play a key role in catalyzing climate resilience.

24- 'Climate Adaptation Investment Planning', ADB

25- 'Inventory of Innovative Financial Instruments for Climate Change Adaptation', NAP Global Network

Commercial Banking:

ING

As a global systemically important bank, ING[26] recognizes that climate change is reshaping the economy and the financial services that support it. Physical risks arising from floods, heatwaves, wildfires, and storms are intensifying and could reduce global GDP by up to 8.5% by 2050, even if net-zero targets are met[27]. These risks may affect our clients and their assets in ways difficult to predict due to their complex, non-linear, and systemic nature. This in turn affects our own long-term stability, as the resilience of our clients underpins our own. And yet, financial flows towards adaptation & resilience remains underdeveloped[28]. We see this not just as a challenge, but as a transformational opportunity.

Exploring adaptation opportunities enables us to better understand how we can support our clients in making households, businesses, and communities more resilient to climate impacts. The economic case is compelling: $1.8trn in adaptation investments could yield benefit-cost ratios ranging from 2:1 to 10:1, according to OECD estimates[29]. Despite this, current finance flows are in the tens of billions, far below the estimate needed.

For our bank, this opens up:

- New lending and product innovation in areas like resilient buildings, flood protection, agriculture, and infrastructure.
- Portfolio risk reduction through better climate risk management.

With our Terra approach, we aim to steer the most carbon-intensive parts of our portfolio towards reaching net zero by 2050, and we're exploring ways to better incorporate adaptation and resilience into our global strategy and plans. Nonetheless, we have examples of transactions that are contributing to increased resilience to climate impacts.

In a landmark transaction, ING acted as sole sustainability advisor and hedge provider in a financing package to build the UK's first new water reservoir in a generation, aimed at ensuring water resilience in the region for the next 80 years. The borrower is one of the six water-only companies in England and Wales, providing clean drinking water to about 750,000 people. ING also provided part of the financing.

Beyond its essential role in securing long-term water supply and protecting sensitive chalk streams, the reservoir is expected to deliver a broad range of environmental and community benefits. It will include a leisure area serving over 120,000 residents, featuring newly

26- ING is not a client of Climate X and does not endorse or promote Climate X products or services. Any contributions or references made by ING are for informational purposes only and do not imply any commercial relationship, endorsement, or commitment. This article contains general statements about ING's policies and activities. The climate-related statements and criteria referred to in this article are intended to be applied in accordance with applicable law. Due to the fact that there may be different or even conflicting laws, the criteria or the application thereof could be different. '
27- 'NGFS long-term climate scenarios – Phase V', NGFS
28- 'NGFS Input paper on Integrating Adaptation and Resilience into Transition plans', NGFS
29- 'Climate Adaptation Investment Framework', OECD
30- 'Raad voor de leefomgeving en infrastructuur''

ING

created wetlands to support bird species, as well as walking and cycling paths, bridleways, birdwatching facilities, and picnic and play areas. These enhancements will foster safe, vibrant habitats for diverse wildlife and offer meaningful recreational opportunities for the local population. This multifaceted initiative exemplifies how private sector investment can catalyze infrastructure that not only addresses urgent sustainability challenges but also enriches ecosystems and communities alike.

Transactions like these illustrate how ING can put its financial expertise into practice to enable climate adaptation measures, including reforestation and biodiversity enhancement — all measures that not only mitigate climate change but also contribute to a more sustainable and climate-resilient future.

Physical climate risks are deeply interconnected, and managing it often requires action across sectors. For example, reducing heat-related mortality may depend not only on building insulation but also on reliable energy infrastructure to prevent power outages during heatwaves. This year in the Netherlands, our biggest market, ING introduced a new feature linking the mortgage interest rate to the energy label of a property. Previously, homeowners could receive a sustainability discount only on mortgages for homes with label A or better. Now, ING has expanded its energy label pricing approach to reward each label improvement-step: incentivising customers to make improvements both big and small, rather than only encouraging the deep renovations that would take a home from label D-G to A(+). Climate mitigation and climate adaptation go hand in hand. For example, a well-insulated building is more energy efficient and also better at protecting inhabitants in times of extreme temperatures.

In the Netherlands, a relevant physical risk is subsidence caused by drought, where the foundations of residential buildings can be damaged by changes in the surrounding soil. It is estimated that around 6% of all homes will require repair related to their foundations within the next 15 years, with costs that easily run up to €120,000+ per building.[30]

For homeowners who cannot borrow the repair costs from their mortgage provider, the Nationaal Funderings Herstelfonds (National Foundation Repair Fund) was expanded in 2025 to help existing homeowners overcome financial hurdles to repair their foundations, and thus improve climate resilience in the housing sector. The Fund is funded by the Dutch government, with banks like ING acting as guarantors.

The Dutch market is also moving toward greater transparency in foundation risk data. For example, now property valuation reports include foundation risk categories, which is a first step in better risk pricing and informed decision-making for buyers and lenders alike.

Climate adaptation is another way that we can support our clients that want to transition and at the same time contribute to the systemic change necessary. In doing so, we also protect our own business and build future resilience.

Jefferies

Investment Banking:

Jefferies

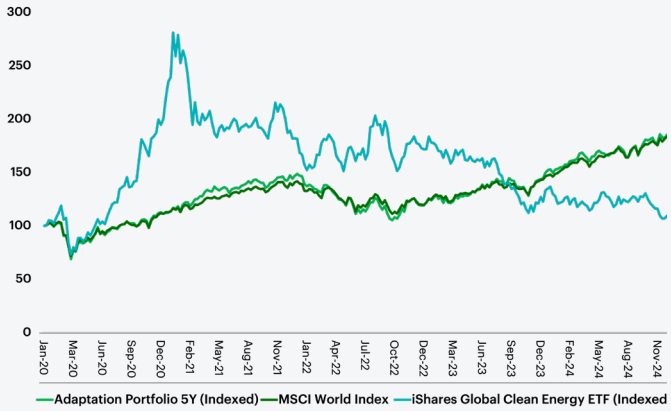
Investor interest in companies whose products and services could support adaptation is surging, driven by:

- A political shift deprioritizing emissions mitigation in developed markets;
- Greater willingness to consider that temperature rise could surpass the limits enshrined in the Paris Agreement; and
- Confidence in adaptation-focused investing to deliver strong long-term returns.

Our analyses over recent years support these arguments. In particular, we have shown that adaptation-focused public equities have consistently outperformed mitigation and energy transition investments.

Our hypothetical index of 282 publicly-listed companies across 25 industries that offer adaptation products and services would have outperformed the iShares Global Clean Energy Index (ICLN) by 78.5%, 63.7%, and 53.2% on a YTD, 3yr and 5yr basis, respectively.

With returns like these, it is easy to see why so many managers of climate- and energy-related portfolios are looking to expand the scope of their products to include adaptation and resilience themes in 2025.



Source : Factset, Jefferies

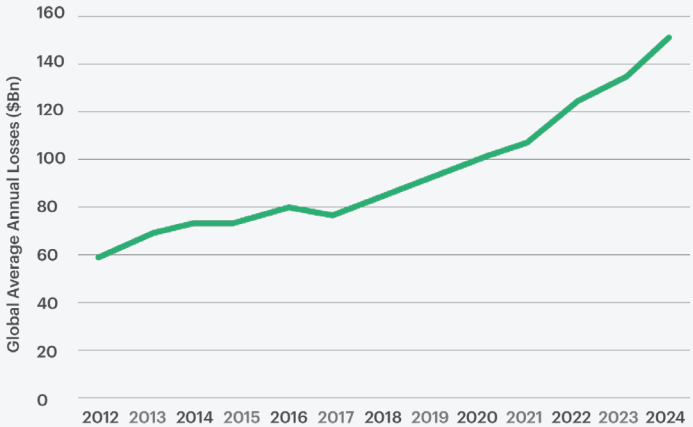
Adaptation sub-sectors in the spotlight

Of the many adaptation solutions offered by publicly listed companies, a number of sub-sectors are of growing interest, including:

- Data & Analytics: Solutions include Smart Buoy Systems, Satellite-Enabled Data Collection and Remote Sensing and Early Warning Systems.
- Flood Defense Systems: Solutions include Design and Engineering Services and Waterproofing Materials.
- Climate-Adapted Agricultural Solutions: Solutions include Livestock Management and Crop Protection Products.
- Water Efficiency Technologies: Solutions include Flood Pumps and Valves and Precision Irrigation.

Real-world impact through the private markets

Adaptation investing in the private markets is gaining traction among investors looking for greater control over the strategic direction of companies, and/or those looking to make a demonstrable, positive impact in the real world.



Source: Verisk Analytics

Jefferies

Some firms are spearheading investments in private companies developing climate adaptation and resilience (A&R) technologies. Our conversations with private investors suggest that two pure play adaptation trends make up the majority of A&R investments in startups so far, based on data from Crunchbase.

1. **Industry and Commerce:** This includes climate risk analytics, earth observation, sensors and AI/digital solutions, as well as industrial tech and Insurtech.
2. **Ecosystems:** This includes fire-tech, water management, and ocean-tech.

The importance of climate resilience in M&A activities

Financial losses due to climate change have been increasing over time. Verisk Analytics estimates that global average annual losses (AAL) from natural catastrophes have increased from $70bn/pa (2012-16) to $123bn/pa (2020-24). This upward trend is expected to continue as global warming continues.

In response, buyers are increasingly adding climate resilience to M&A due diligence processes. Our experience suggests that these assessments focus on the:

- Location of the target company's assets relative to projected climate impact/perils;
- Nature of the company's economic activities and possible vulnerabilities;
- Stage of the company's value chain in question; and
- Quality of the company's climate adaptation strategy.

Sectors and regions at risk

Our analyses find that companies with hard assets are more exposed to physical climate risks than those with more intangible assets. As such, climate resilience is most material to companies in the utilities, agriculture, real estate and infrastructure sectors.

We also find that companies in supply-chain-intensive industries are more exposed to disruptions and value destruction from natural catastrophes, while companies in sectors including tourism, hospitality, and accommodation and hotels have revenues that are highly sensitive to extreme weather events.

When it comes to regional differences, companies with operations in North America are most likely to be exposed to storm, hurricane, and wildfire risks in the future. In Europe, the most prevalent climate risks are flooding and wildfires.

High-risk companies need robust adaptation plans

As the physical impacts of climate change increase, companies with assets located in high-risk locations may be less attractive to potential buyers. As part of M&A due diligence, potential acquirers are now seeking asset-level location data to gauge buyers' future natural catastrophe risk exposures and vulnerabilities. High-risk companies are expected to have robust and comprehensive adaptation plans in place for vulnerable assets.

Adaptation Investment In Practice

The Role Of Predictive Analytics

Closing the climate risk data gap is necessary to closing the adaptation finance gap. Incomplete, inaccurate, and insufficiently granular data prevents public and private investors alike from knowing where adaptation capital could be deployed to have the most impact — and yield the most attractive return. Asset-level predictive analytics are emerging as a solution to this data problem. These tools can produce the forward-looking data investors need to identify the climate-vulnerable portions of their portfolios and spot underappreciated opportunities.

How Asset-Level Predictive Analytics Work

What do these tools look like? They are composed of multiple layers, each building on the last.

Providers typically start with a foundational data layer, which includes granular locational information and insights into local-level climate hazards, exposures, and vulnerabilities. These data come from a variety of public and private sources.

On top of this foundation, providers layer on forward-looking climate scenarios. These are used to show how the initial data could change under various plausible future climate states, from 1.5°C of warming to 3°C and higher. AI-powered capabilities are used to project how the climate risk profile of a given location could change under these different scenarios, and how the exposure and vulnerability of associated assets could alter, too. For example, these may show an asset in a particular location — say a 1-in-100 year floodplain — could become more exposed and/or vulnerable to flood risk in 2030, 2040, and 2050.

The penultimate layer is where the magic happens. This is where a user can explore how a library of asset-specific adaptation measures could mitigate the potential future physical risks identified in the previous layer. For example, an investor could examine how the installation of flood barriers, levees, and bioswales could reduce the vulnerability of that flood-prone asset, and calculate this value in avoided losses and/or increased revenues.

In the final layer, this information is translated into decision-useful formats for users. This could be via a proprietary user interface, API — perhaps even as a spreadsheet.

Using Asset-Level Predictive Analytics For Adaptation

Let's now consider how asset-level predictive analytics could be used to identify adaptation opportunities.

Say an investor is searching for adaptation investment opportunities across a commercial real estate portfolio. First, they would identify the current climate hazards, exposures, and vulnerabilities in this portfolio. This analysis would incorporate datapoints like each building's location, replacement cost, and surrounding infrastructure. It would likely also include items like each building's elevation above sea level, number of floors, and the make-up of their walls and roofs: all of which have implications for their existing climate resiliency.

Next, they would extrapolate how exposure and vulnerability could change under multiple scenarios and unpack the feasible adaptation measures available. It would be important at this stage for the investor to consider not only the direct climate shocks that could affect the portfolio — but also the second-order impacts: like how each tenant's business could be disrupted, and how the surrounding infrastructure could be knocked out of commission.

Now the investor has a menu of adaptation opportunities to choose from. Perhaps they identify a subset of commercial properties in a coastal region that the analytics show could rise in value dramatically over a 10-year period if they installed flood defenses and back-up power generators. Maybe they prefer to preserve the value of properties in wildfire-prone areas by investing in defensible space and fire-resistant cladding. Whatever their decision, the insights offered by asset-level predictive analytics ensures they are well informed.

It's not just real-asset investors that can benefit.
Banks can use these analytics to inform their loan growth strategies and position themselves as adaptation leaders among their corporate clients.
Corporates can use the insights to draft future-proof opEx and capEx plans.
And insurers can grow their underwriting portfolios.

And it's not just real-asset investors that can benefit. Banks can use these analytics to inform their loan growth strategies and position themselves as adaptation leaders among their corporate clients. Corporates can use the insights to draft future-proof opEx and capEx plans. And insurers can grow their underwriting portfolios and improve their combined ratios by using asset-level analytics to identify attractive risks in areas affected by multiple climate hazards.

Case Study: Multinational retailer and food company

Here, we offer real-world examples of how adaptation investments could catalyze opportunities for two major corporations using Climate X data and analytics.

First, we will examine a multinational retailer, and how it could financially benefit from investing in and implementing adaptation measures. We will then repeat the exercise for a major food processor and marketer.

For both corporations, we analyze how their climate risk profile could evolve over a 10-year time horizon (2025-2035) under SSP5, a high-emissions scenario.

10-year impacts (cumulative)		Act		Don't Act
($B)		Scenario 1: Invest in Adaptation	Scenario 2: Divest	Scenario 3: Status-quo (do nothing)
Revenue				
		Network, asset and recovery disruption minimised through asset-level and regional adaptations	Assets relocated to locations with minimal disruption	Negative impact on revenue due to disruption caused by power, rail/road or asset down and recovery days
		(0.0)	(0.0)	(9.66)
Costs				
	CapEx	Upfront investment for adaptation measures (not amortised)	Upfront investment to replace assets that are at high risk (not amortised)	No investment
		(2.9)	(41.08)	(0.0)
	OpEx	Residual losses of expected physical damages post adaptation	Residual losses of expected physical damages post divestment	Total losses of expected physical damages
		(50.79)	(50.79)	(169.30)
		Technical insurance premium for residual physical risk post adaptation	Technical insurance premium for residual physical risk post divestment	Technical insurance premium for residual physical risk
		(28.03) - (112.14)	(28.03) - (112.14)	(93.45) - (373.80)
Net Impact		**(80.91) - (165.02)**	**(119.90) - (204.01)**	**(-272.41) - (-552.76)**

Multinational retailer

For the multinational retailer, Climate X identified 7.5k physical assets associated with the company globally. While the majority of those assets (5.7k) are located in the US, the retailer has also a significant physical real estate footprint in Mexico (1k), Japan (0.2k), China (0.2k) and India. 87% of all its assets are stores and 10% are warehouses. The most common climate hazard facing these physical assets is flooding, followed by storm surge and wildfire.

For the food company, Climate X identified a sample of 0.6k physical assets. While the vast majority of these are located in the US, the company also has a material physical real estate footprint in Brazil. Roughly half of the company's

10-year impacts (cumulative)		Act		Don't Act
($B)		Scenario 1: Invest in Adaptation	Scenario 2: Divest	Scenario 3: Status-quo (do nothing)
Revenue				
		Network, asset and recovery disruption minimised through asset-level and regional adaptations	Assets relocated to locations with minimal disruption	Negative impact on revenue due to disruption caused by power, rail/road or asset down and recovery days
		(0.0)	(0.0)	(0.11)
Costs				
	CapEx	Upfront investment for adaptation measures (not amortised)	Upfront investment to replace assets that are at high risk (not amortised)	No investment
		(0.04)	(0.73)	(0.0)
	OpEx	Residual losses of expected physical damages post adaptation	Residual losses of expected physical damages post divestment	Total losses of expected physical damages
		(3.30)	(3.30)	(11.00)
		Technical insurance premium for residual physical risk post adaptation	Technical insurance premium for residual physical risk post divestment	Technical insurance premium for residual physical risk
		(0.90) - (3.61)	(0.90) - (3.61)	(3.00) - (12.02)
Net Impact		**(4.24) - (6.95)**	**(4.93) - (7.64)**	**(14.11) - (23.13)**

Food company

assets are manufacturing sites. The others are a mix of industrial sites, offices, or warehouses. These are most commonly exposed to flooding, followed by storm surges and wildfires.

When faced with exposures to physical risks of assets, companies can choose whether they want to act to minimize their exposure. At a high level, companies are faced with three options. They can: invest in implementing adaptation measures, adapt, divest from high risk assets, or do nothing. We compare the P&L impact of these three options below.

What do these climate hazard exposures mean in terms of potential financial losses? The estimated cumulative damages due to physical risk across all hazards over a 10 year period are approximately $169bn for the multinational retailer and $11bn for the food company, if no adaptive actions are taken.

The multinational retailer is also projected to see 0.15% more days per year where business is disrupted because of climate impacts, and the food company 0.20% more.
The estimated revenue loss is $9.66bn for the multinational retailer and $0.11bn for the food company.

The multinational retailer is also projected to see 0.15% more days per year where business is disrupted because of climate impacts, and the food company 0.20% more. The estimated revenue loss is $9.66bn for the multinational retailer and $0.11bn for the food company.
In addition, the former is projected to pay $93-$374bn in insurance premium (to cover flood risk) and the latter $3-12bn. We present insurance premium impacts as a range rather than a single value, recognizing the many moving parts in commercial insurance pricing. While adaptation measures reduce expected losses, actual premiums are also shaped by reinsurance markets, regulatory frameworks, tax treatment, and underwriting judgment, making precise forecasts inherently uncertain.

To mitigate these losses, we estimate that the multinational retailer would have to invest $2.09bn and the food company $40mn in adaptation measures. Potential adaptation solutions identified for both companies include: free-standing flood barriers, storm shutters, ember resistant defensible space, soil nailing, and retaining walls.

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Let’s take a manufacturing site from the food company as an example. In Illinois, the company has a large meat processing and packaging plant with an estimated building replacement cost of $29mn. The site is susceptible to a number of hazards, including flooding, landslide, subsistence, wildfire, and storms.

We assessed the cost of potential adaptation measures against the potential financial losses that could be incurred should these measures not be implemented. We found that mitigating against flood risk has a positive ROI under our calculations — meaning investing in adaptation is a net positive from a financial standpoint. We estimate it would cost around $122k to invest in free-standing flood barriers around this facility, which could prevent potential losses of $16.74mn over 10 years. That's an ROI of 13x.

We estimate it would cost around $122k to invest in free-standing flood barriers around this facility, which could prevent potential losses of $16.74mn over 10 years. That's an ROI of 13x.

This analysis suggests that investing in adaptation would financially benefit the food company over the given time horizon. In other words, that adaptation is an opportunity — not a burden.

This may not be the case in all situations, however. An analysis may show that the financially prudent choice would be to do nothing in the face of a given climate risk, if the costs of adaptation outweigh the potential loss offsets. In another setting, it may make most sense for a company to divest from an asset entirely, if the projected losses are expected to spiral even if adaptation actions are taken.

However, it will often be true that investing in adaptation allows businesses to continue generating revenues from at-risk assets, benefiting their bottom lines and putting them at an advantage over their peers.

Case Study: An automotive supply chain

Now let's explore how a failure to implement adaptation measures can lead to adverse financial consequences using the example of a European automotive company.

In June-July 2024, the company was indirectly affected by extreme flooding in Germany and Switzerland due to the unaddressed vulnerability of a key supplier. The disruption to the supply chain resulted in the company issuing a profit warning, which in turn caused its stock to drop.

A supplier of rolled aluminium was the weak point in the supply chain in this instance. The supplier's facility in Switzerland was overwhelmed by flood waters and forced to shut down for several weeks. As a result, it declared force majeure, legally excusing itself from fulfilling contractual obligations, including the supply of aluminium components to the automotive company.

This caused immediate issues for the company, which was unable to complete manufacturing of thousands of vehicles. As a result, the company downgraded its full-year sales forecast from €40-42bn ($46-49bn) to €39-40bn ($45-46bn), a reduction of 3.7%. Even more

consequential was the revision to projected operating return on sales (EBIT margin) from an earlier range of 15-17% down to 14-15%, reflecting a shrunken profit margin directly linked to the production delays and supply bottlenecks. All this dented investor confidence — as reflected in the drop in the company's stock price.

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Even more consequential was the revision to projected operating return on sales (EBIT margin) from an earlier range of 15-17% down to 14-15%, reflecting a shrunken profit margin directly linked to the production delays and supply bottlenecks.

The incident highlights how climate risk impacts in a company's value chain can cascade down to hobble even the most prestigious of firms.

It also underscores the importance of supplier resilience. The aluminum producer's inability to continue operations amid extreme weather — exacerbated by the apparent absence of adequate adaptation strategies — ultimately exposed the automotive company to operational and financial setbacks.

In an era of increasing climate volatility, companies must reassess not only their own adaptation strategies, but those of their suppliers, too. The 2024 floods serve as a cautionary tale: failure to adapt to climate risks across the value chain can lead to measurable financial harm. Ensuring supplier resilience is now not just a matter of operational risk management but a strategic imperative — and essential to companies' success.

Climate Disclosures & Adaptation Investment Taxonomies

Adaptation finance has a deceptively simple goal. However, translating this goal into an investment thesis that dovetails with how financial institutions operate has been challenging. Hence the years-long effort to categorize and understand how climate risks may affect the economy and financial system, and the many attempts to develop a classification system for adaptation investments.

To this end, governments, financial regulators, and even private entities have produced disclosure standards and investment taxonomies to help entities assess and report their climate-related risks and opportunities.

Disclosure Standards & Requirements

Climate-related financial disclosures have gained traction in multiple jurisdictions, and in many parts of the world producing annual climate reports has become standard business practice. These are intended to provide investors with decision-useful information on organizations' climate risks and opportunities. At the aggregate level, they could provide an atlas of corporate climate risks — and, in turn, of the adaptation opportunities for mitigating them.

At the global level, disclosure requirements have been institutionalized by the International Sustainability Standards Board (ISSB), the sister organization to worldwide financial reporting standard-setter the International Accounting Standards Board (IASB). Their climate-related standards, known as IFRS S2, require companies to assess their exposure to physical climate risks, explain how they are preparing to manage these risks, evaluate how resilient their business models are to a changing climate, and describe how climate risk and adaptation issues are governed internally [31].

These global standards are being transposed into jurisdictional-level reporting mandates. For example, the European Union is integrating IFRS S2 into the Corporate Sustainability Reporting Directive (CSRD). In Australia, the standards serve as the template for AASB S2 mandatory climate disclosure rules.

Other jurisdictions have defined their own standards, which nonetheless reflect aspects of IFRS S2. In California, the legislature passed SB 261 in 2023, introducing climate-related disclosure requirements for entities that perform business activities within the state. These include disclosures on the physical risks they face and any "measures adopted to reduce and adapt" to these risks .

31- 'IFRS S2 Climate-related Disclosures', IFRS

Investment Taxonomies

While disclosure mandates compel organizations to look inwards at their own climate physical risks, investment taxonomies are supposed to make companies and investors look outwards and engage with adaptation opportunities. These taxonomies help define what 'counts' as an adaptation investment, outline processes for identifying opportunities, and provide a common language for classifying adaptation activities across sectors, geographies, and financial instruments [32].

The non-profit Climate Bonds Initiative (CBI), Standard Chartered bank, and the venture capital firm Tailwind have all developed adaptation investment taxonomies in recent years. The CBI taxonomy is geared toward bond issuers. It describes what financing activities 'count' as adaptation across select themes, including agrifood systems and infrastructure. The idea is that this taxonomy is used by corporations and sovereigns to structure 'resilience bonds' that dedicate their use-of-proceeds to adaptation activities[33]. Bonds labeled this way may be attractive to adaptation-oriented investors.

The Standard Chartered Guide for Adaptation and Resilience Finance is aimed at commercial banks, and offers a process for screening and assessing activities for their alignment with adaptation objectives.

For investment screening, this taxonomy starts by asking investors to evaluate the use-of-proceeds of a given financing instrument. It then tells them to assess their alignment with one of eight distinct adaptation and resilience themes. Investments must then be checked to see they do no significant harm to other sustainability objectives or cause maladaptation to occur. Standard Chartered says it has closed two adaptation finance transactions since issuing the guidance [34].

The Tailwind Taxonomy for Adaptation and Resilience Investments is designed to assist early-stage investors to identify and support adaptation projects and companies. It divides such opportunities across eight overarching themes and 35 sectors, and across multiple dimensions too: 'Products & Services', 'Intelligence', 'Enabling Interventions', and 'Finance and Insurance' [35].

32- 'The (in)coherence of adaptation taxonomies', Spacey Martín, Roberto and Ranger, Nicola and England, Kit (June 24, 2024). Available at SSRN

33- 'CWNYC: A New Blueprint for Building Climate Resilience Bonds', Climate Proof

34- 'Guide for Adaptation and Resilience Finance', Standard Chartered

35- 'Tailwind Taxonomy for Adaptation and Resilience Investments', Tailwind

While each taxonomy is built for a different audience, they all serve a similar purpose: to bring clarity and structure to what has often been a vague and underdeveloped area of climate finance. Their ultimate aim is to incentivize private capital towards adaptation opportunities and, in consequence, build out the adaptive capacity of the real economy as a whole.

Practical Next Steps

Through the above examples, we have illustrated the financial benefits of investing in adaptation — and the adverse consequences of ignoring physical climate risks. It is clearly in companies' own interests to invest in resilience and monitor the adaptation efforts of the suppliers in their value chains.

This calls for an upgrade to risk management practices. High-level, 30,000ft risk analyses are insufficient. Companies and investors have to embrace asset-level predictive analytics to create effective adaptation investment strategies. The reason is simple: climate hazards vary from place to place, and the exposure and vulnerability of different assets can be wildly different — even when they are geographically close. Granular data and insights are what's needed.

By leveraging AI and a rich mix of public and proprietary data, firms can simulate the physical and financial impacts of climate hazards on specific fixed assets, factoring in not only structural damages, but also business disruption, inventory losses, and insurance implications.

These analyses allow corporations, banks, and insurers to make ROI-optimized investment decisions, turning adaptation into an opportunity, and a source of strategic advantage.

Here are some practical next steps for corporations and financial institutions to get started with asset-level predictive analytics:

1. Deploy analytics to inform a Resilience Strategy against physical climate risks, and embed this as a core component of your overall business continuity planning.

2. Conduct a Physical Climate Risk Assessment (PCRA) across the entire portfolio to identify exposure and vulnerability 'hot spots' and use asset-level predictive analytics to explore capex and opex options for adaptation.

3. Engage internal treasury teams and external financial partners to craft and implement financing strategies for adaptation.

Conclusion

Adapting to climate change is a business imperative. Without adaptation, corporations and financial institutions are risking massive disruptions to their assets, supply chains, revenues, and more. Those organizations that understand this can take steps to shield their bottom lines from encroaching climate hazards — and also capitalize on emerging opportunities in the adaptation economy.

From resilient infrastructure and water systems to commercial real estate retrofits and climate intelligence, the ecosystem of adaptation solutions is growing rapidly. Firms that mobilize capital into these sectors stand to benefit from enhanced revenues and early access to new markets. Those that delay risk being left exposed, both to the direct effects of climate disruption and the competitive disadvantages of inaction.

But in order to seize this opportunity, financial practitioners must evolve how they assess, price, and structure their investments. This means taking a granular, forward-looking approach to due diligence, one that embraces asset-level analytics and better informed measurement of ROI.

Ultimately, adaptation finance is not only about protecting assets. It is about retooling the financial system for a climate-adjusted world. This will require a shift in mindsets as much as a shift in markets.

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Strategic Growth by Financing Resilience

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