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# Sustainable digital finance

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# Sustainable digital finance



The financial sector is currently undergoing a transformation driven by two key factors: digitalization through advancements in information technologies (IT) and an increasing focus on sustainability. This twin transformation holds great challenges.

Digitalization powered by IT, with advances in artificial intelligence, blockchain, and the Internet of Things, has led to significant changes across finance and other industries, contributing to the rise of the fintech revolution. Over the past three decades, IT has acted as a catalyst for digital innovations in the financial sector, particularly for startups. In 2022, for instance, the fintech sector accounted for \$40.3 billion in venture capital investments in the United States, nearly half of the \$98.2 billion invested in IT-related ventures, [according to a report](#) from the National Venture Capital Association.

Simultaneously, there has been growing interest in sustainability, reflected by the United Nations' 17 Sustainable Development Goals. These goals encompass areas such as poverty alleviation, health and well-being, gender equality, clean energy, and climate action. The risks posed by climate change and environmental degradation highlight the need for industries and communities to adopt long-term sustainability practices. In response, the financial industry has shifted towards sustainable finance, which aligns financial services with long-term value creation rather than a narrow focus on short-term profits.

The convergence of digitalization and sustainability in the financial sector has given rise to the concept of "sustainable digital finance." This emerging field leverages IT to enhance or even redesign payment infrastructures, inform investment decisions, transform financing processes, and create new financial cross-processes such as green digital payments, crowdfunding platforms with a sustainable focus, and green digital investment tools. But sustainable digital finance also has broader implications for the global economy by supporting the development of sustainable infrastructure, promoting equitable and inclusive growth, and enhancing the efficiency of capital allocation.

Amid all this, these efforts are facing new political headwinds, as investors, consumers and lawmakers question their efficacy and broader consequences. According to one recent [report](#), 2024 saw a new low in asset manager support for shareholder resolutions around environmental and social issues. While these conversations can become spirited, interrogation from parties with skin in the game is essential to the market dynamics that make progress possible.

In the long run, we believe those technologies that generate durable value for economies, citizens, and societies will thrive. Sustainable digital finance is poised to play a crucial role – creating benefits for governments by digitizing payments in developing countries, unlocking trillions of dollars in financing for small and medium enterprises, and enabling more sustainable consumption decisions through better information.

This issue of Duckbucks will delve deeper into the emerging field of sustainable digital finance. We hope that we can contribute to the lively discussion in this growing field of importance and that you enjoy reading these perspectives.

## THE PUBLISHERS



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# Harnessing AI to make climate adaptation investable

Linda-Eling Lee & Umar Ashfaq

**Climate finance has so far largely focused on putting money into efforts to cut carbon emissions. The MSCI Sustainability Institute set out to find the businesses needed to respond to the increasingly unavoidable impacts of a hotter world.**

Avoiding the worst impacts from a warming planet will demand both a dramatic reduction in the use of fossil fuels and a massive scaling up of investment in climate adaptation and resilience. But to date, [the overwhelming share](#) of climate finance in capital markets has focused on decarbonization, with investments in adaptation and resilience driven chiefly by government spending on hardening infrastructure against sea level rise and other physical risks from climate change.

Although demand for solutions that can reduce the risks and impacts of climate change is generating opportunities for private investors, few companies self-identify as businesses focused on climate resilience or adaptation. This creates an impediment for investors who might otherwise view technologies and solutions designed to protect society from the physical risks of climate change as prime candidates for investment, given the massive future need for such solutions.

One path for sustainability-minded investors may be to identify firms engaged in the business of climate adaptation and resilience – analytical work that our organization, the MSCI Sustainability Institute, has undertaken along with researchers from the investor-led [Global Adaptation and Resilience Investor](#) (GARI) working group. The joint research project, which is supported by the Bezos Earth Fund and ClimateWorks Foundation, is using artificial intelligence to identify companies that offer technologies or equipment that can help governments, businesses or households prepare for and adapt to the realities of a changing climate.

We have found that products and services from roughly 800 publicly listed companies, or about 11% of [the global equity investment opportunity set](#), contribute to climate adaptation and resilience.

Our analysis harnessed an AI large language model (LLM) to surface companies whose businesses span activities ranging from weather analytics and water-efficient agriculture to supply-chain resilience and weatherization of power infrastructure and buildings.

The analysis is among the first to test the potential of investing in publicly listed equities to boost climate resilience and adaptation. It may also be the first use of AI to prototype an investable universe of adaptation and resilience companies from among public companies worldwide.

We continue to hone our findings. We are working, for example, with the [Asia Investor Group on Climate Change](#), which comprises institutional owners and managers of assets who manage more than \$28 trillion globally, to zero in on companies domiciled in Asia that provide products and services contributing to climate adaptation and resilience in a region [prone](#) to climate-related physical risk.

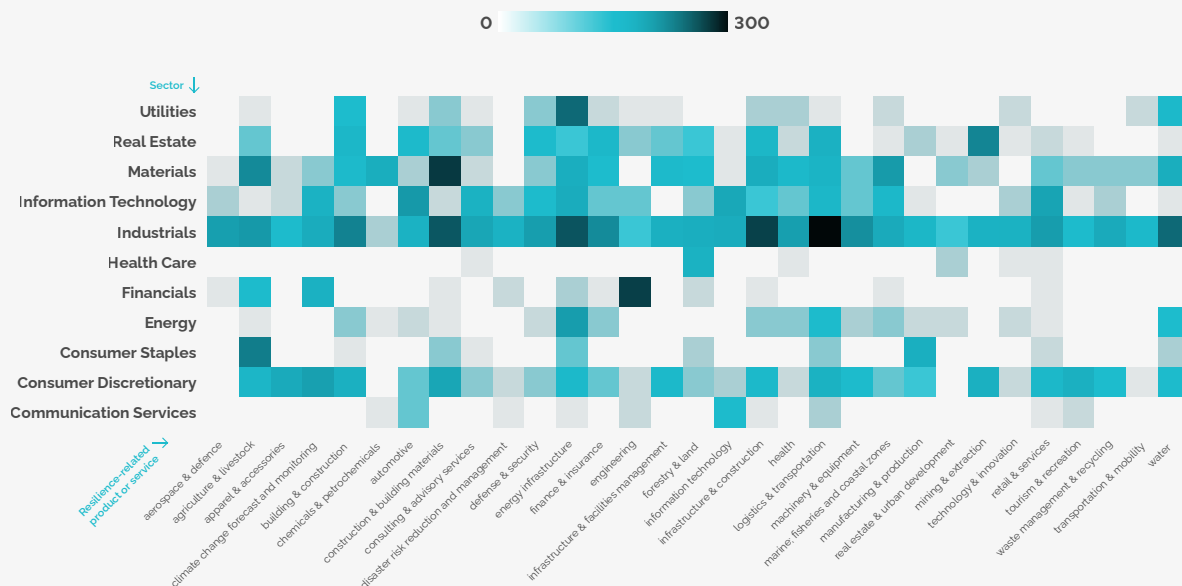
The work reflects the reality of a changing climate, which brings with it both the imperative to drive global greenhouse gas emissions to net-zero and to adapt to extreme heat, sea level rise and climate-driven severe weather events in everyday life. The United Nations Intergovernmental Panel on Climate Change [has observed](#) that the impacts of global warming on society are increasingly unavoidable and irreversible. The United States alone registered 27 billion-dollar disasters [last year](#), which also marked [the hottest year on record](#) globally.

"The impacts of a warming world are now inevitable," Jay Koh, chair of GARI and co-founder and managing director of The Lightsmith Group, a climate-focused private equity firm, told investors at last year's New York Climate Week. "Because of cumulative global warming there is essentially no variation in the range of outcomes between now and 2030. But there is an opportunity to invest in technologies and solutions that help us manage those impacts and even transcend them."



# Which sectors address climate adaptation?

Adaptation and resilience companies by size and sector. Data as of March 2024.



Source: MSCI Sustainability Institute and the GARI working group, 2024.

## A growth theme

Adaptation and resilience — which has been an important theme for policymakers, public finance and nongovernmental organizations — is now emerging as an investment thesis for investors seeking to capitalize on the demand for climate resilience-related products and services that a warming world will drive.

Identifying such products and services, however, comes with challenges, as evidenced by [the gap](#) between adaptation finance needs and the funding aimed at addressing them. Though financial regulators and industry organizations alike [have adopted](#) (or are in the process of adopting) taxonomies to guide sustainable finance, most focus far more heavily on [climate mitigation](#) than they do on adaptation and resilience.

Still, adaptation and resilience may be more straightforward to address than mitigation. “The unavoidable part of the opportunity is that the need to climate-proof life on Earth is happening,” Paul Bodnar, director of sustainable finance, industry and diplomacy at the Bezos Earth Fund, has observed. “Unlike decarbonization, which is subject to political uncertainty, we are going to see climate impacts increase inexorably, at least in the short term.”

To address this imbalance, GARI, with support from our institute, has developed a model for identifying companies offering products and services that enable climate adaptation and resilience. The

framework for Climate Resilience Investments in Solutions Principles (CRISP) provides a [comprehensive approach](#) for identifying listed companies in the business of adaptation and resilience across regions, sectors, growth stages and asset classes.

The CRISP framework defines an adaptation solutions company as one that has a significant business offering of a technology, product, service or practice that enables others to prepare, prevent, respond to and recover from climate shocks and stresses. That may either be, for example, through technologies (such as climate information services or water-efficient irrigation) that enable people to prepare for or prevent physical climate risks, or by reducing such risks or their associated adverse impacts directly (such as through insurance). Adaptation solutions companies include those that either offer adaptation solutions as a significant part of their business (a climate data company, for example) or as one of their business lines (such as a general insurer that offers climate insurance for agriculture).

As envisioned by the framework, investors can consider both current and potential future value of revenue derived from the resilience product or service business line based on the company’s broader strategy and growth potential. According to CRISP, investors may also consider both a company’s current revenue from adaptation and resilience together with its plans, competitive position, investment in research and development or patent portfolio. The framework further notes that investors can deepen their insight through corporate engagement.

## A novel approach

Researchers from our institute and GARI [applied the CRISP framework](#) to the world's listed equities, using an LLM to identify companies that offer products and services that may help business and consumers prevent, respond to or recover from physical risks associated with the changing climate.

To identify adaptation and resilience companies from the listed universe, the researchers asked Open AI's GPT-3.5 Turbo 11 questions and used Open AI's GPT-4 to assess the answers. The analysis asked the LLM to identify products and services related to adaptation and resilience based on abbreviated business descriptions contained in the latest annual reports from companies in [MSCI's ACWI IMI Index](#). The index comprises more than 8,600 companies in both developed and emerging-market countries and covers 99% of the global investable equity universe.

We designed the questions to be comprehensive, covering various potential impacts and responses. We employed various methods, including question answering, sentiment analysis, LLM-response evaluations, and information extraction, to define economic activities related to adaptation and resilience. To handle the complexity of this task, we used an ensemble of these methods, using a technique called LLM chaining, which breaks down the task into subtasks.

Despite the promise of these approaches, we encountered several challenges, including problems with the LLM generating false or misleading information. To address this, we developed an [LLM evaluation methodology](#) that used a second LLM to score answers based on their relevance, specificity and clarity. We also conducted sentiment analysis on the answers to determine which questions the machine answered affirmatively, negatively or indirectly. That allowed us to gauge a company's alignment with climate adaptation and resilience based on the responses.

## Who is in the business of climate adaptation?

Questions used by the LLM to sift through 8,600-plus companies in developed and emerging markets.

- 1 Does this company contribute to improving the ability of clients or customers to understand and manage climate-related risks and disasters better?
- 2 Does this company provide products/services to assist clients or customers in preparing for or responding to potential climate disruptions?
- 3 Does this company enhance the ability of clients or customers to respond effectively to physical climate threats such as extreme weather events?
- 4 Does this company provide products or services supporting clients or customers in coping and adapting to adverse climate conditions in the future?
- 5 Does this company contribute to the recovery process from adverse physical climate impacts?
- 6 Does this company provide specialized solutions or services to help alleviate the adverse impacts of climate change and facilitate a "climate-proofed" better approach?
- 7 Does this company provide products/services to support adaptation or resilience against chronic climate-related risks, such as extreme heat, extreme cold, wildfires, heavy rain, and heavy snow?
- 8 Does this company provide product or service contribution to adaptation or resilience against acute climate-related disruptions, including hurricanes, flooding, drought or pollution, low river flow, and wildfires?
- 9 Is this company actively involved in evaluating potential or existing flood solutions or low river-flow resilience infrastructure, including challenges related to water management, coastal issues, and urban planning?
- 10 Is the primary focus of this company's products or services centered on reducing greenhouse gas emissions or preventing further climate change?
- 11 Do the products or services of this company primarily focus on reducing greenhouse gas emissions or preventing further climate change?

*Source: MSCI Sustainability Institute and the GARI working group*



We later used the LLM to extract the products and activities mentioned in the affirmative answers. This allowed us to identify which specific product or services are used to explain the affirmative answer, providing us with a clear picture of how the company contributes to climate adaptation and resilience. This proved to be a crucial step in the analysis because it allowed us to compare the final set of companies with current taxonomies.

We brought human intelligence to the task as well. Analysts from MSCI ESG Research reviewed and validated the companies that our AI-based analysis had identified. Their review, which included manually checking answers for accuracy, relevance, specificity, consistency and clarity, deepened insights into the LLMs' shortcomings and allowed us to adjust our prompts accordingly.

Though the analysis anonymizes the companies identified, the results include firms whose revenues reflect varying levels of resilience-related products and services. Companies surfaced by our analysis range from traditional engineering firms to businesses developing new tools for climate risk analysis. Others include manufacturers of industrial products such as steel and cement that emit high levels of emissions but provide critical inputs for the kinds of infrastructure that resiliency demands.

Roughly one-third of the companies we identified are domiciled in emerging markets, highlighting the global opportunity that adaptation and resilience represents. While the analysis focused on publicly listed equities, it can be replicated within the universe of private markets.

## Risks and opportunities

The universe of companies doing business in adaptation and resilience that we surfaced presents areas ripe for refinement. Notably, a comprehensive validation of the dataset remains to be completed, a reflection of the project's current proof-of-concept stage. This limitation underscores the exploratory nature of our work and the necessity for further verification of our findings.

There is a specific challenge related to how the LLMs handle modal verbs (such as when a company's products "can" be used to mitigate physical climate risks) when it comes to justifying potential adaptation and resilience activities. Though the LLM can in some cases predict a company's involvement in such activities based on its abbreviated business description, the model can still struggle with such ambiguity.

We've had to decide whether to exclude such companies from our dataset or to seek additional information for validation, such

as by analyzing the full annual regulatory filings of each company. Whether to undertake that kind of validation work entails striking a balance between the risk of including false positives in our sample compared with the risk of overlooking companies that may be contributing to climate adaptation and resilience.

The collaboration between the MSCI Sustainability Institute and the GARI working group has yielded a first cut at compiling an investable universe for adaptation and resilience. Central to this achievement is the novel use of AI to parse vast amounts of textual data automatically. Pairing the output of the machine with insights of MSCI analysts has enhanced both the precision and relevance of our findings.

As our work suggests, the CRISP framework can play a key role in helping investors differentiate companies as they build out their investment theses geared toward adaptation and resilience. By combining AI's computational efficiency with human expertise, we're advancing what may be an unmissable opportunity for investors in the transition to a more resilient economy.



**Linda-Eling Lee**

Linda-Eling Lee is the founding director and head of the MSCI Sustainability Institute. She previously led global ESG and climate research at MSCI, where she built one of the world's top teams of analysts dedicated to understanding long-term drivers of sustainable value. Ms. Lee joined MSCI in 2010 following its acquisition of RiskMetrics Group. She received a doctorate in organizational behavior from Harvard, holds a master's degree from the University of Oxford, and has a bachelor's from Harvard College.



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