

Securing a resilient future:

How insurance can accelerate carbon removal



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Disclaimer: This peer report reflects a collaborative dialogue with contributing organizations. While these organizations are aligned with the report's purpose of exploring the CDR market, the commentary shared does not represent an endorsement of findings or market expectations.



Executive Summary

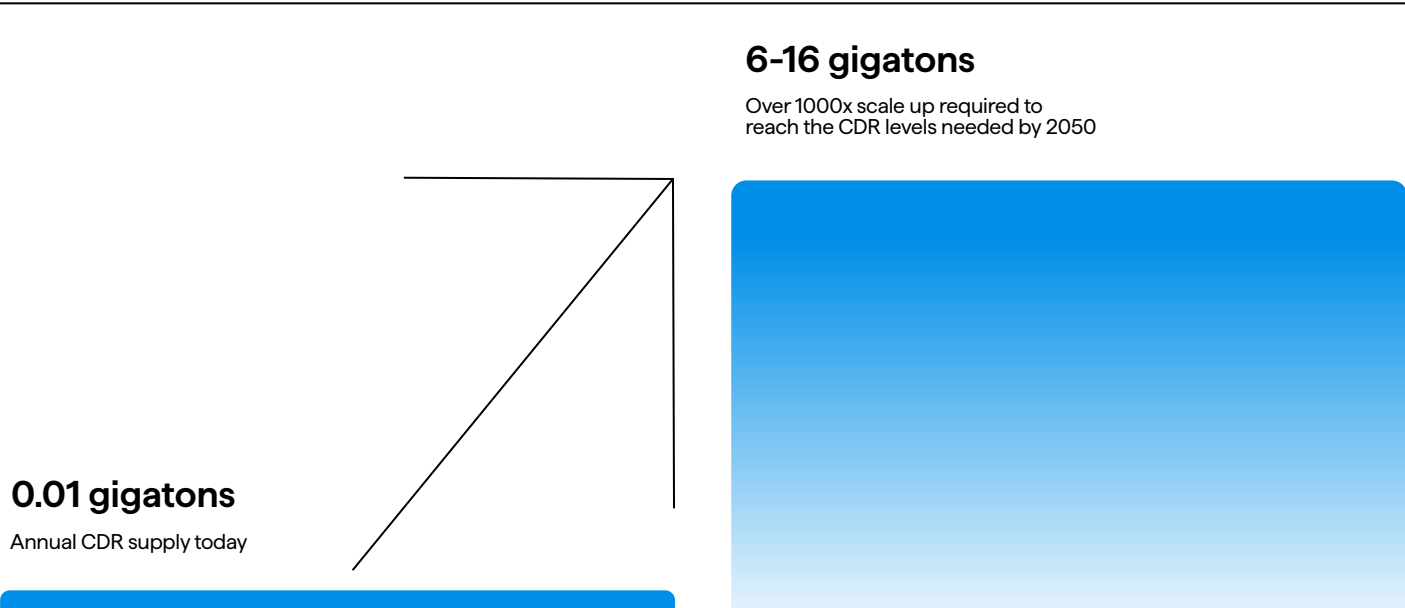
For insurance companies, reducing their current carbon footprint is already a complex challenge. No matter how ambitious their decarbonization efforts, residual emissions will remain that must be removed from the atmosphere. This underscores a key truth: the path to a net-zero future requires a dual approach of aggressive greenhouse gas (GHG) avoidance and removal using a suite of carbon dioxide removal (CDR) technologies – both natural and

engineered. The insurance industry is uniquely positioned to be a crucial catalyst for the deployment of these technologies at scale, using its expertise to de-risk, finance, and accelerate CDR technology adoption. This report synthesizes insights from global insurance leaders, showing how this industry can transform climate responsibility into a strategic advantage and foster a multi-trillion-dollar market opportunity, while securing a livable future for the planet.

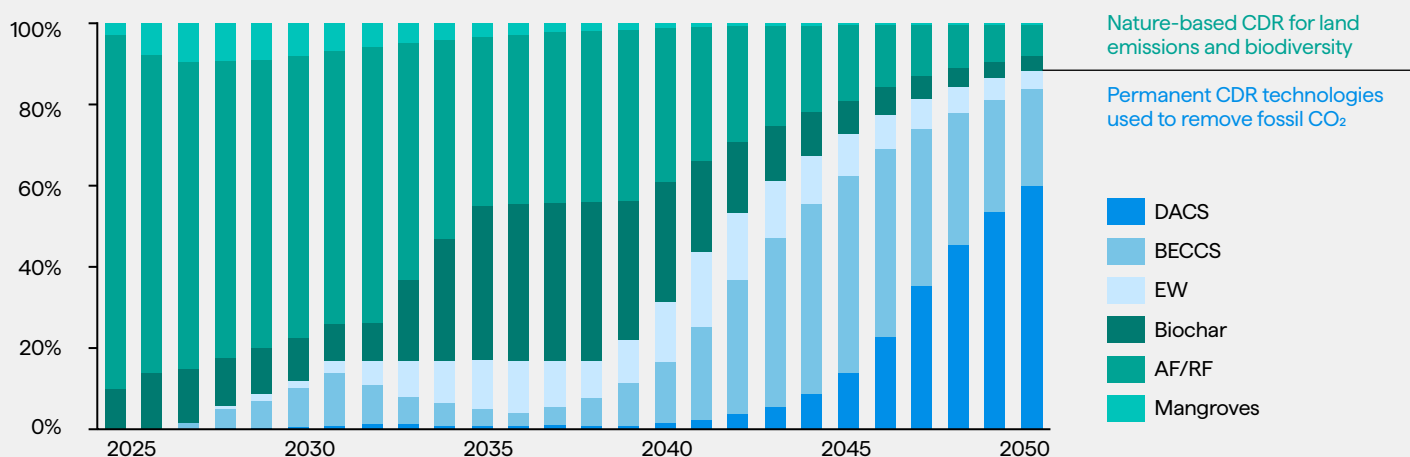
The urgent imperative for carbon dioxide removal

The global imperative to achieve net-zero emissions by mid-century demands unprecedented action. The scientific consensus is clear: rapid emissions reduction is paramount, and CDR technology is a necessity to stabilize our climate and safeguard our planet. Limiting global warming to 2° requires both drastic emissions cuts and the removal of billions of tons of CO₂ annually by 2050. This monumental challenge requires scaling CDR solutions by a factor of over 1000x within the next three decades.

Both nature-based (e.g., afforestation, reforestation) and engineered pathways (e.g., Direct Air Capture, biochar) will be essential. While nature-based solutions offer compelling near-term co-benefits, they face risks like reversal and land-use and biological constraints. Engineered pathways, however, offer higher permanence and scalability, addressing hard-to-abate emissions and legacy CO₂. Each pathway requires significant investment and de-risking to reach its market potential.



Price-minimal relative portfolio composition per year to limit warming to 1.5-2°, subject to constraints



Our advanced CDR modeling and tailored portfolios are designed to maximize cost savings and accelerate the transition to net zero.

[➔ Read the full report to learn more.](#)

Multiple pathways for insurance to shape CDR

For the insurance industry, climate change is an escalating risk, as the rising frequency and severity of weather-related natural catastrophes translate directly into higher claim values and greater volatility. Tropical cyclones, convective storms, floods, and wildfires are translating into surging claims payouts, asset performance, profitability and potentially making insurance unaffordable for many [1], underscoring the direct financial exposure for property and casualty insurers. Beyond claims, the climate crisis also poses a systemic economic risk, as warned by insurers like Allianz, threatening the stability of global financial markets [2]. Recent reports such as the 2025 Ceres progress report on climate risk reporting also highlight the increasing urgency for the U.S. insurance sector to enhance its climate disclosures and risk management strategies [3].

This escalating risk, however, also presents a unique inflection point for the insurance sector. While climate change undoubtedly poses significant threats, it simultaneously opens avenues for innovation and new business opportunities. By participating in the CDR industry, insurers can proactively create a more resilient future, transforming a challenge into a competitive advantage and a new growth frontier. A report from Howden and BCG in 2024 emphasizes insurance as critical to mobilizing trillions in climate transition investment [4].

As we spoke to leading insurance voices, we gained more insight into how insurers have a unique business opportunity to shape this industry, materialized via 3 primary pathways:

- 1 Providing insurance to accelerate CDR scale up**
 CDR project developers require conventional property & casualty, commercial, and liability insurance products as they scale up projects with property, plants & equipment.
- 2 Creating innovative new risk transfer products**
 Delivery risk continues to pose a challenge as the global CDR market matures. However, this dynamic presents an opportunity for insurers to innovate their product suite (e.g., performance guarantees) to address the financial and non-financial aspects of delivery outputs – whether negative emissions, carbon credits, clean energy, or sustainable materials. The nascence of this vertical and its growing market offer new sources of repeatable revenue for direct insurers, lenders and risk transfer specialists.
- 3 Advancing towards net zero**
 CDR is an important part of the transition suite for insurers' own emissions as well as those of their clients. Buyers today can also benefit from compelling co-benefits such as supporting biodiversity, renewable energy generation, and revitalizing local economies through investing in a diversified portfolio of CDR pathways.

Across the insurance leaders interviewed, we heard a unanimous call to action for collaboration, innovation, and strategic engagement to ensure a thriving, insurable carbon removal economy. We assembled key perspectives across insurance leaders and synthesized their insights into this report, which explores the multifaceted opportunities and responsibilities of the insurance industry in accelerating the CDR market. **Insurers, with their unique expertise in risk assessment, capital deployment, and long-term investment, are well positioned to transform climate ambition into medium-term profitability.**

The current state of CDR insurance

Carbon removal developers face numerous challenges as they scale their operations around the world – risks which in some cases are already insured. Today, the insurance industry differentiates between various types of risks when it comes to CDR, such as the physical risks of building and operating CDR facilities, reversal risk with nature-based CDR, and the more elusive "non-delivery" or "monetization" risks associated with carbon credit project performance.

Physical risks associated with constructing and operating engineered CDR plants, such as Direct Air Capture or biochar facilities, are reasonably well known and generally insurable using existing property and casualty insurance products. This is because insurers can leverage their extensive experience with similar industrial facilities in other sectors. The core engineering, construction, and operational risks of building a DAC plant, for example, closely resemble those found in other large-scale industrial operations that insurers already cover, such as a chemical processing plant, a power generation facility, or a major manufacturing complex. Insurers have decades of experience and data on how to assess risks like equipment breakdown, structural damage, or operational accidents in these comparable environments. This allows them to apply established frameworks for engineering, property, business interruption, and general liability insurance to the physical aspects of CDR projects.

Liability and reversal risk is a less explored CDR insurance product to date, largely attributed to the long-term nature of insuring that carbon sequestered stays sequestered. Many carbon developers provide credits with a very long duration of permanence, which can extend to 50+ or even 100+ years. This timeframe is uncharted territory for the insurance sector, and the challenge is particularly acute for geological storage solutions, where the permanence of sequestration is crucial. While challenging in its shape, new solutions and products are already being explored by insurers to bridge this gap. For example, the risk of leakage is highest straight after injection and dramatically reduces over time – it's therefore possible that a leakage insurance product be aligned to a time scale familiar and comfortable to industry convention.

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We tend to underestimate the pace at which progress materializes. I would expect a functioning marketplace to be in place within the next two to five years.
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Lesley Harding,
Global Head of Strategic Partnerships,
Energy Transition at Liberty Mutual

Driving product innovation through collaboration & education

Optimistically, the insurance industry sees significant opportunities for growth, product innovation, and new sources of revenue in the CDR space. The path forward is not one of individual effort but of collective action – insurance companies have a powerful opportunity to engage with clients and other stakeholders to build the foundational risk management frameworks that the industry needs to scale.

This cross-industry, collaborative approach is essential for creating a shared understanding of risk, which in turn influences practices around site selection, engineering rigor, and long-term monitoring systems. Insurers are already working to design new insurance and surety solutions to address identified gaps across the entire CDR value chain (capture, transportation, storage). Talent and knowledge from existing industries such as the oil and gas sector are directly applicable to CDR projects, particularly regarding injection¹, and can be leveraged for risk assessment and underwriting.

¹ Injection is the process of transporting captured CO₂ and injecting it deep underground into geological formations for permanent storage, a practice that draws on decades of expertise in subsurface engineering and well management.

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Leveraging deep experience with established green technologies, the industry is developing tailored coverage – potentially including warranty solutions and, where appropriate, performance-related protections – to meet the evolving needs of CDR project operators.

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Julian Richardson,
Chief Underwriting Officer for Green
Solutions at Munich Re Specialty –
Global Markets

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From an underwriting perspective, there's a period of transition and education for those with expertise to underwrite this risk.

In the same way cybersecurity coverage was hard to find, but is now found everywhere – this process is similar for CDR. Underwriters have to be educated and be given ample resources to analyze the technology at hand.

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Sheri Wilbanks,
Head of Sustainability Metrics
& Solutions at AXA GUO

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The energy transition presents an immense challenge, and it requires robust collaboration across the entire ecosystem—between companies, insurers, bankers, technology providers, universities, governments, etc.

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Michel Krenzer,
Global Head of Energy at SCOR

Building a clear policy framework for CDR

Achieving the necessary scale for CDR requires strong policy support. Governments and policymakers must collaborate with industry leaders to create a clear and stable environment that enables the market to grow. This includes public-private risk sharing, especially for unquantifiable long-term CO₂ storage risks, and continued government grants and incentives to fuel early adopter projects. Strategic purchasing of carbon removal certificates, even at higher initial prices for engineered solutions, is also crucial to drive down costs in the long run by signaling long-term demand and helping the market mature.

A critical need exists for clear, harmonized policy across regions and countries to facilitate cross-border carbon sequestration and scale CDR initiatives.

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At this stage, what's missing is a regulatory push. Integrating CDR into the compliance market in Europe would totally change the picture, alongside regulations that oblige actors to use or incorporate these solutions.
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Yun Wai-Song,
Head of Sustainable Investment
at SCOR

A pressing challenge: insuring against delivery risk

The most pressing and complex challenge facing the carbon removal (CDR) industry today is how to insure against delivery risk—the risk that a project ultimately fails to capture and store the promised volume of CO₂. Unlike more mature markets where risks are well-defined and actuarial tables have been refined over decades, CDR as a sector remains relatively new. The knowledge base is still being built, project track records are short, and the data underwriters rely on to develop accurate pricing models is in its early stages of accumulation. This presents a unique paradox: CDR is urgently needed at scale, yet its nascency

creates uncertainties that inhibit the confidence of insurers, investors, and financiers. The question becomes not whether projects have potential, but whether they can consistently, verifiably, and durably deliver on their carbon removal promises.

This challenge, while significant, also represents a meaningful opportunity set for large insurers and financiers to catalyze growth. By providing confidence that risks are recognized, understood, and mitigated, insurers can serve as a crucial bridge between technological ambition and financial reality.

While the market awaits comprehensive solutions, some key stakeholders are already moving quickly to address this gap with innovative, albeit limited, approaches. Emerging platforms such as CarbonPool and Kita are pioneering specialized products designed to insure delivery risk. These entities, structured as bespoke insurance pools or platforms, offer buyers of carbon credits a safeguard against underperformance by compensating them if a CDR provider fails to deliver the contracted amount of CO₂ removals. This demonstrates how early-stage delivery risk insurance can evolve, showing that credible coverage is possible, especially when providers collaborate closely with project developers.

CDR providers themselves are also developing internal mechanisms to mitigate delivery risk. For instance, Clime-works offers buyers a contractual commitment that if projects within their Solutions portfolio cannot deliver the full volume of removals purchased, they will replace undelivered credits with other viable removals from the same technology type within their broader portfolio. This approach builds trust by ensuring corporate buyers' obligations are met, even if a specific project underperforms.

These different approaches reflect a growing recognition of delivery risk as an important market opportunity. However, they also highlight the patchwork nature of current solutions—innovative, yet limited in scale and reach. To move beyond this early stage and unlock gigaton-scale deployment, large insurers must step in. With stronger balance sheets, extensive regulatory experience, and deep technical expertise, mainstream insurers can standardize products, normalize risk-sharing, and enable capital flows at the level required. The trajectory is similar to the early days of renewable energy finance, when niche risk structures opened the door but established players ultimately unlocked true scale and new revenue streams. For carbon removal to become core climate infrastructure, delivery risk must be embraced not as a barrier, but as a central opportunity for major insurers.

In practice, this means that insurers must adapt their methodologies to account for a higher degree of technological variance, evolving policy frameworks, and uncertainties around long-term performance. This challenge is not just theoretical; it has real-world implications for the flow of capital into the sector. By providing confidence that risks are recognized, understood, and mitigated, insurers can serve as a crucial bridge to scale up multiple CDR pathways.

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What investors are looking for is a way to ensure investments in CDR will deliver their positive impact. They know how to assess and to hedge financial risks; they now need solutions to ensure the delivery of the positive impact they expect through their investment.

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Michele Lacroix,
Group Head of Sustainability
at SCOR

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To begin underwriting delivery risk, we would want to look at more historical data on past projects and how they’ve performed.

Even projects that have not gone well are important for us to ingest, because this data helps us to understand the highs and lows - and then we know what to look for and how to price it. It’s hard to underwrite a risk if there’s never been a loss.

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Sheri Wilbanks,
Head of Sustainability Metrics
& Solutions at AXA GUO

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De-risking CDR goes beyond traditional physical assets; it involves understanding and underwriting the performance of the technology itself, alongside the physical damage and third-party liabilities inherent in these projects on a case-by-case basis.

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Julian Richardson,
Chief Underwriting Officer for Green
Solutions at Munich Re Specialty –
Global Markets

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Liberty Mutual is systematically mapping out the risks of CDR and carbon storage projects - from design and construction to operation and integration - to identify gaps in current insurance and surety product suites, and is actively designing new solutions.

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Lesley Harding,
Global Head of Strategic
Partnerships, Energy Transition
at Liberty Mutual

Insurers as key investors in and buyers of CDR solutions

As significant asset owners with substantial premium income, insurance companies possess unique leverage in long-term investments for the energy transition. Traditionally, insurance companies deploy capital into financial assets such as stocks, bonds, and real estate. The climate crisis, however, introduces both heightened risks – such as increased natural disaster claims – and new opportunities for investment. One emerging avenue is carbon dioxide removal, which many now view as a credible, scalable and investible asset class.

“Without insurance, there's no loan, there's no capital. That's the fundamental part we play.”



Michel Krenzer,
Global Head of Energy at SCOR

In parallel, natural capital – healthy ecosystems such as forests, wetlands, and biodiverse habitats – provides essential services like carbon sequestration, water purification, and biodiversity support. By investing in the preservation and restoration of these resources, insurers effectively treat them as a distinct and valuable asset class that generates both financial returns and climate mitigation benefits.

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Natural capital is a unique asset class. It can provide a number of potential benefits for diversified investor portfolios, such as low correlation with other asset classes, inflation hedging potential, and attractive risk-adjusted returns with lower volatility compared to other asset classes.

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Eric Cooperström,
Managing Director, Impact Investing
and Natural Climate Solutions,
at Manulife Investment Management
Timberland and Agriculture

By directing capital toward both nature-based and engineered CDR solutions, insurers diversify their portfolios while financing solutions that actively reduce their own climate-related risks. Insurance also plays a catalytic role by underwriting risks across the CDR lifecycle, enabling the flow of capital into projects that would otherwise struggle to scale.

Direct purchasing of CDR for corporate emissions

Insurers are stepping up as crucial early adopters in the carbon removal (CDR) market. By purchasing high-quality CDR certificates to offset their own operational emissions, insurers not only demonstrate commitment to their corporate net zero goals but also help to provide essential revenue streams for CDR project developers, enabling them to finance infrastructure, attract co-investors, and ultimately scale. In doing so, insurers act as both market participants and market makers – catalyzing broader adoption across the financial sector.

The most direct benefit in CDR procurement lies in advancing their own transition to net zero. While insurers typically have smaller operational footprints compared to carbon-intensive industries, their leadership role is significant. By integrating CDR into their decarbonization toolkit, insurers can credibly address residual emissions that cannot be abated through efficiency measures or renewable energy alone.

Beyond compliance or reputation, however, lies deeper opportunity. CDR procurement enables insurers to move away from a narrow view of carbon as a cost center and towards co-benefit capitalization – through various CDR pathways, additional value such as renewable energy generation (BECCs), supporting biodiversity (reforestation, mangroves), and creating circular economies (biochar) can be unlocked. Purchasing removals can also signal to clients

that insurers are innovating within the climate transition, creating alignment across insurance products, investment strategies, and corporate sustainability commitments.

Participation in early CDR markets also offers insurers a forward-looking hedge against transition risk. As regulatory frameworks evolve and carbon accounting standards normalize, insurance companies that have already integrated removals into their strategy will be better positioned than peers who delay. Early engagement allows them to shape standards, test procurement models, and influence how CDR is treated across both financial reporting and regulatory disclosure regimes.

Finally, there is a reputational and competitive dimension. Clients and counterparties are increasingly looking to financial institutions for leadership on climate action. By stepping in early, insurance companies can differentiate themselves as climate-aligned partners while also unlocking new avenues for growth – including offering innovative risk management products tailored to CDR developers and investors.

A shared future, secured by insurance

The insurance industry recognizes the urgent need for CDR and is actively exploring its role as a de-risker, investor, and buyer. While challenges remain, particularly around long-term liability and data availability, there is a clear commitment to developing tailored solutions and influencing industry standardization to facilitate the rapid scaling of this critical climate solution.

The opportunity for insurance companies is not just financial. It's a chance to leverage their core expertise to build a more resilient and sustainable global economy and transform a global responsibility into an economic amplifier.

Charting the path forward

We invite global insurance leaders to engage in a deeper dialogue on how we can collectively accelerate the deployment of high-quality CDR solutions. Let's collaborate to:



Deploy existing insurance products to project developers

Supporting new CDR entrants that have similar operations to more other industrial clients.



Innovate products

Co-develop insurance solutions that address the unique and evolving risks of CDR technologies, both as a need and as a market opportunity.



Drive investment

Explore strategic financing opportunities that align with long-term net-zero commitments and procure high quality removals to address corporate emissions.

Together, we can build the confidence and infrastructure necessary to scale carbon removal to gigaton levels, securing a sustainable future for all.

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The future of any business is intrinsically tied to climate resilience and mitigation. By enabling CDR, we're not just mitigating risk for our clients; we're actively building the new infrastructure and markets needed to secure a livable future for everyone. This is a chance for our industry to lead, not just to follow.

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Charlie Pool, Head of Carbon Advisory at Howden

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Recognizing the growing relevance of climate solutions such as CDR, the insurance industry is exploring how its solutions and expertise could support innovation and long-term resilience.

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Julian Richardson, Chief Underwriting Officer for Green Solutions at Munich Re Specialty - Global Markets

References

- [1] [Swiss Re Institute. \(2025\). Natural catastrophes in 2025: The climate change factor. Swiss Re.](#)
- [2] [Ambrose, J. \(2025, April 3\). Climate crisis on track to destroy capitalism, warns Allianz insurer. The Guardian.](#)
- [3] [Ceres. \(2025\). 2025 Progress Report on Climate Risk Reporting in the U.S. Insurance Sector.](#)
- [4] [Howden Group. \(2024\). Howden and BCG research identifies insurance as critical to mobilising \\$10 trillion of committed climate transition investment.](#)
- [5] [Swiss Re Institute. \(2025\). Coastal and flood protection with natural habitats. Swiss Re.](#)