CLIMATE CHANGE ADAPTATION AND DISASTER RISK MANAGEMENT:

CURRENT PRACTICES AND FUTURE PERSPECTIVES FOR THE INSURANCE INDUSTRY



This summary presents key findings and highlights from the original report "Adaptation to Climate Change and Disaster Risk Management: Current Practices and Future Perspectives for the Insurance Industry", which was officially released on 12 July 2024 in Shenzhen, Guangdong Province, China.

The original report focuses on how the insurance industry can be integrated into national climate change strategies and contribute to society's climate resilience. It provides a multi-perspective analysis of how the insurance industry can transform climate change challenges into development opportunities.

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The Risk Lighthouse team contributed to the original report. The team provided this English summary for the benefit of an international audience.

Introduction

Climate change has become the most significant risk to our planet and human prosperity. Its impacts are now evident and are profoundly altering our risk environment: rising temperatures and sea levels, more frequent and prolonged heatwaves, increased storms and rainfall, floods, wildfires, and other extreme weather events.

Since the 1980s, the international community and the insurance industry have recognized the threat of climate change and have been analyzing its impacts on society and the insurance sector. The global insurance industry has been collaborating with various sectors including governments, to actively take joint action to mitigate climate risk and to provide insurance solutions for those risks that can not be mitigated.

For the many households and businesses facing potential natural disaster losses (including those caused by climate change), the insurance industry offers solutions to protect them from the financial losses caused by natural disasters, and to help them to recover quickly and adapt to climate change.

The insurance industry is also helping to drive continued growth and investment in the renewable energy sector by minimizing the risks associated with renewable energy and infrastructure projects and providing innovative solutions for the transition to a net-zero economy.

Especially when it comes to the most pressing issues of how to drastically reduce carbon emissions to address the root causes of climate change and how to adapt to the inevitable and destructive consequences, no single industry or region can tackle these challenges alone. Only through public-private collaboration can these challenges be met. In this collaboration, the insurance industry undoubtedly demonstrates its unique value and responsibility.

Just as the insurance industry has played a significant role in mitigating losses from disasters such as fires and earthquakes, the public now expects the industry to be forward-thinking in addressing emerging climate risks. The industry is expected to leverage its vital and irreplaceable roles in risk identification, risk reduction, risk diversification, and loss compensation to innovate solutions that minimize climate risks.

The research report describes the impacts of climate change and the challenges it poses to the insurance industry. It outlines the key practices of the insurance industry, both domestically and internationally in responding to climate change and summarizes the fundamental functions and roles of the insurance industry in helping society manage climate risk. It explores innovative ways for the insurance industry to build resilience to climate risk. We hope that our research, which encapsulates the authors' forward thinking on the future development of the insurance industry in the context of climate change, can provide valuable references for academia, industry, and governments in their research and practice on climate risk and insurance.

1. Progressive Global Climate Change and Its Impact on the Insurance Industry

According to the Sixth Assessment Report of the United Nations Intergovernmental Panel on Climate Change (UN IPCC) (AR6 Synthesis Report: Climate Change 2023), based on projected global greenhouse gas emissions in 2030 from various national contributions, global warming is likely to exceed 1.5 degrees Celsius by the end of the 21st century, and it will be challenging to limit warming to 2 degrees Celsius. The greenhouse effect in the atmosphere is altering the Earth's land, freshwater, and marine ecosystems, leading to increased frequency and severity of extreme weather and climate events in many regions, significantly disrupting economic and social operations.

In the context of climate change, the insurance industry faces significant challenges from increased disaster risks. Frequent disasters mean that insurance companies must bear more responsibility for compensation and corresponding payment pressure. Common responses by insurance companies include raising premiums or withdrawing from high-risk areas, but higher premiums may become unaffordable for policyholders, pushing some risks beyond the insurability threshold, and leading to an insurance market failure (Koo and Yong, 2023). The global insurance protection gap continues to widen as access to insurance becomes more difficult. In 2022, global economic losses from natural disasters amounted to approximately US\$ 313 billion, of which less than half was insured, leaving around 58% of the protection gap.

As an important economic sector, the insurance industry reflects the level of social and economic development, and risk management capabilities of a nation. As economies develop and societies progress, insurance becomes increasingly important. Traditionally, insurance has played a role mainly through financial risk transfer and risk-sharing mechanisms. As the demand for risk management increases, the insurance industry, as a specialized risk management expert, must innovate and integrate into the broader disaster risk management system, taking on new and broader responsibilities in the context of climate change.

The Chinese government has explicitly listed tackling climate change as a national strategy and announced a timeline for achieving carbon peak and neutrality targets: carbon dioxide emissions will peak by 2030, and efforts will be made to achieve carbon neutrality by 2060. In June 2022, China's Ministry of Ecology and Environment, the National Development and Reform Commission, and 17 other departments jointly issued the "National Climate Change Adaptation Strategy 2035," to guide enterprises to better adapt to climate change.

The Chinese insurance market is one of the fastest growing in the world, becoming the second-largest insurance market in the world since 2017. By 2034, the Chinese insurance market size is expected to more than double from 2024. As the world's second-largest economy, China offers ample opportunities for the development of the insurance industry. However, compared to mature international insurance markets, China still has relatively low insurance penetration and density, with a higher insurance protection gap for economic losses caused by natural disasters. These gaps indicate significant growth potential for the Chinese insurance industry as the country responds to climate change (Chen, 2019).

2. International Financial Regulators' and the Insurance Industry's Response to Climate Change

To guide and regulate climate change responses, international financial regulators have established specialized bodies and issued guidelines to encourage the insurance industry's active participation in global climate change efforts. The International Association of Insurance Supervisors (IAIS, 2023) has identified major areas of supervisory activity in addressing climate change and rising disasters. European Insurance and Occupational Pensions Authority (EIOPA, 2023) compiled climate-related adaptation measures taken in non-life insurance underwriting.

Over the past 20 years, the international insurance industry has been actively engaged in global climate change governance actions include: conducting scientific research on the vulnerability of the climate system, incorporating climate change factors into existing catastrophe models, introducing catastrophe risk insurance, enhancing disaster mitigation efforts, designing insurance terms and conditions to incentivize climate risk reduction behaviour, innovating insurance products and services, providing services on carbon risk management and emissions reduction services, investing in green infrastructure and climate change solutions, promoting climate change awareness, participating in public policy formulation, and strengthening international cooperation. These actions highlight the unique value and responsibility of the insurance industry in the global response to climate change.

3. China's Financial Regulator's and Insurance Industry's Climate Change Risk Management Practices

To integrate the insurance industry into the national climate change response strategy, the National Administration of Financial Regulation (NAFR, former China Banking and Insurance Regulatory Commission) issued the "Green Finance Guidelines for the Banking and Insurance Industry" in June 2022, setting clear requirements for banking and insurance institutions' green finance management. In November 2022, it introduced the "Green Insurance Business Statistics System," which defined "green insurance" and "climate change risk insurance" for the first time. In April 2024, the NAFR issued the "Guidance on Promoting High-Quality Development of Green Insurance," outlining specific tasks for insurance companies and basic research and support work for industry association platforms in the development of green insurance.

Some Chinese insurance companies have actively participated in the national climate change response and initiated measures to address climate change risks. They have explored the establishment of climate change strategies and governance, the innovation of green insurance products, the provision of risk reduction services, the management of green investments and the implementation of low-carbon operations, demonstrating the insurance industry's critical role in the national climate change strategy and its responsibility in addressing climate change risks.

Our research team worked with Ping An, China's largest insurance company in terms of market capitalization and revenue, to provide further evidence of Chinese companies' active participation of the national climate change strategy in recent years. Ping An is committed to a sustainable growth strategy and ESG management, increasing investment in risk reduction services to address climate change risks, innovating green insurance to support the achievement of the "dual carbon" targets, exploring forward-looking participation in the national climate change strategy and climate risk management system, accumulated valuable experience.



Box 1. Case Study: Ping An's Sustainable Development and Green Insurance Practices

Introduction

Ping An is proactively addressing the challenges and opportunities presented by climate change. The company has implemented strong measures to practice sustainable growth principles and was the first in the industry to propose a 2030 operational carbon neutrality target. They have detailed a carbon neutrality roadmap, improved their sustainable growth governance framework, enhanced green operations management, increased investment in green finance, and continuously strengthened information disclosure. In addition, Ping An is sharing its management experience with the industry to support the green transition of the insurance sector, making a significant contribution to the broader green finance agenda.



1. Establishing a Comprehensive Sustainable Development Management System

Sustainable growth is central to Ping An's growth strategy and is fundamental to maximizing the company's long-term value. Ping An Group has established a comprehensive management framework to drive and oversee ESG management:

- The Board of Directors oversees ESG matters and takes full responsibility for the Group's ESG strategy and information disclosure.
- The Executive Committee's Sustainability Committee guides the practical management of key ESG issues such as green finance, climate change, and carbon neutrality, and manages the external communication and dissemination of the company's sustainable growth efforts.
- The Group's ESG Office, as the coordinating function, leads the implementation of management's directives.
- At the subsidiary level, the Group has defined an ESG implementation matrix that integrates ESG risk factors into the Group's investment risk management and embeds ESG risk control into all investment business units. This supports the Group's investment portfolio risk assessment, product design, and statistical reporting.

It is worth noting that Ping An focuses on four key areas:

- Enhancing green operations and low carbon management.
- Increasing investment in green finance to combat climate change.
- Improve management of climate-related risks and opportunities.
- · Actively participating in industry capacity building.



2. Increasing Investment in Risk Reduction to Address Climate Change Risks

In the context of global warming and more frequent extreme disasters, insurance companies face higher demands and challenges in disaster prevention, reduction, and relief. In 2023, Ping An Property & Casualty Insurance (P&C) implemented risk reduction services through expanding service content, broadening service scope, diversifying service forms, increasing service supply, improving institutional construction, strengthening talent development, and innovating technology applications. The company invested over 500 million yuan (US\$ 70m) in disaster prevention and mitigation, issued 572,000 major disaster alerts (e.g., typhoons, heavy rain), and sent 8.57 billion warning messages, covering 87.04 million individual and corporate clients. It also provided on-site hazard inspection services to more than 127,000 enterprises and conducted 829 safety training sessions, covering 72,000 enterprises and 169,000 participants.

Ping An's risk reduction efforts focus on four key areas:

- Providing resources for risk reduction and strengthening institution and capacity building.
- Strengthening disaster prevention and reduction education and providing hazard inspection services.
- Using technology to improve risk reduction effectiveness.
- · Quantifying the results of risk reduction and investing in disaster reduction to minimize losses.



3. Seizing New Opportunities in Green Insurance to Achieve Dual Carbon Goals

In 2023, Ping An Property and Casualty Insurance achieved green insurance premiums of 37.296 billion yuan (US\$ 5.2b), providing green insurance coverage of over 48 trillion yuan (US\$, with claims payments exceeding 19.098 billion yuan (US\$ 2.7m)), representing a year-on-year premium growth rate of over 40% from 2022. The company has significantly developed green insurance through expanding insurance coverage to support the green transition of the socio-economic development, actively participating in catastrophe insurance pilots to address climate risks, and innovating carbon-inclusive projects to support green and low-carbon initiatives.

Ping An focuses on three key areas in green insurance development:

- Expanding insurance coverage to support the green transition of socio-economic development.
- Actively participating in catastrophe insurance pilots to address climate risks.
- Innovative carbon-inclusive projects to support green and low-carbon actions for all.

4. Insurance Innovation and Exploration in Response to Climate Change

In the context of climate change, traditional actuarial theory based on the law of large numbers does not apply as well as in the past; as the global weather system changes, the mathematical underpinnings of insurance - the law of large numbers - are being challenged. Effective responses should aim to reduce the uncertainty and severity of climate change losses, with appropriate strategies for implementation. Loss reduction investments are an effective option, along with index-based insurance, multi-trigger insurance, and financial insurance, which can help mitigate the financial impact on insurance companies and policyholders.

As the role of insurance in disaster response has grown, so has public understanding of its role in building resilience. Insurance is a critical tool for building a resilient society, which has three fundamental elements: (1) the ability to mitigate the impact of disasters; (2) the improvement of the adaptability to disasters; and (3) the efficient recovery from disasters.

The research report makes a case for quantifying the risk reduction effect of risk mitigation measures, and their impact on insurance risk pricing, reserving and risk management. The research report also drew attention to the impact of climate change on human longevity and health.

Loss mitigation is an effective way to containment of the widening protection gap

Increasing investment in risk reduction is crucial to address the widening protection gap. Based on insurance industry statistics (e.g., Swiss Re, 2023) the research report estimates that the annual growth rate of global natural disaster losses is around 4%, while the annual growth rate of premiums for natural disaster insurance is only 2%,

lagging behind the growth rate of losses by 2%age points. If this trend continues, the global net premium growth rate (excluding operating expenses) will not keep pace with the 4% annual increase in disaster losses, which will gradually erode future insurance profitability and underwriting capacity, further widening the insurance protection gap.

The National Institute of Building Sciences (US) found that every US\$1 invested in risk mitigation returns an average of US\$6 in loss reduction benefits. Our research estimates that if insurers invest 1%-2% of premiums in risk reduction over five years, and gradually increase disaster reduction investments to 2%-4% of premiums over the following 5-10 years, they will effectively manage the widening of the protection gap. This means that insurers will need to adopt their business models from a traditional narrow focus on "loss compensation" to a composite model of "loss compensation + risk reduction services + risk transfer."

Quantifying and Incorporating the effects of risk mitigation into risk pricing

To counter the rising frequency and severity of natural disasters brought by climate change, the industry is advised to embrace "climate de-risk insurance" approach (Wang and Bollmann, 2024). In order to promote the use of "climate de-risk insurance," the insurance pricing model needs to explicitly incorporate loss reduction elements into pricing. The basic idea is to shift the loss curve downwards and reduce expected losses through loss reduction investments. The approach optimizes that the expected loss after the loss reduction investments is lower than the originally expected loss before loss reduction, thereby achieving greater protection for policyholders and lower costs for insurers without increasing or even reducing the overall premium. Similarly, primary insurers' investments in risk mitigation can reduce reinsurance costs.

Risk layering and multi-year unearned premium reserve

Given the high degree of uncertainty about future climate change, it is essential for primary insurers to further diversify their natural disaster exposure. The establishment of a multi-level risk diversification mechanism is crucial. Primary insurers, reinsurers, capital markets, catastrophe co-insurance pools, special catastrophe funds, and governments should all participate and play their respective roles.

Given the long-term nature of climate events, insurance companies, especially property casualty insurers directly exposed to climate risk insurance, may need to establish a longer-term (multi-year) unearned premium reserve similar to life insurance and pension companies, to allow insurers to spread insurance liabilities over time.

The impact of climate change on life and health insurers

The impact of climate change on human longevity and health is beginning to become apparent, but has not received sufficient attention from some life and health insurers. Our research identifies the main pathways through which climate risk affects human health, briefly analyzes the impact of climate change on life and health insurance products, and highlights the need to strengthen scientific research on the impact of climate risk on mortality and health. (details in Box 2 below)



Box 2: Strengthening Research on the Impact of Climate Risks to Human Health and Longevity

The effects of climate change on health and mortality are complex. Predicting future health outcomes and mortality rates are challenging.

Climate risks exhibit both compound effects (one risk leads to one or more other risks) and non-linearity (under extreme conditions, damages can increase exponentially). For example, heat, drought, and strong winds can lead to wildfires or drought; fires and drought can reduce agricultural yields, threaten food security and lead to malnutrition, which in turn can lead to more acute and chronic illnesses and deaths. The table below lists the primary climate risk factors and their direct or indirect impacts.

Direct Effect	Indirect Effect
Temperature extremes (heat stress)	Threat to livelihoods and human rights
Floods and Droughts	Displacements and migration
Windstorms	Weakened health systems and infrastructures
Wilf fires	Impacts on food and water systems
Air pollution	Infectious and vector borne diseases
Sea level rise and salinisation	Exacerbation of social determinants and inequalities

Time is particularly important in assessing the impact of climate-related factors on health, morbidity and mortality. For example, the impact of a prolonged drought over several years is far more severe than a two-week drought.

In many cases, however, it is difficult to accurately account for deaths and health impacts caused by climate change due to the presence of other potential conditions. For instance, the number of deaths caused indirectly by storms or floods may be significantly underestimated. Mortality data are often recorded by hospitals, which may only record deaths directly resulting from such events within days of their occurrence. However, the impact of these climate events on mortality rates is more long-term, such as deaths caused by post-disaster infectious diseases. Another example is the long-term effect of haze on cardiovascular, pulmonary, and cancer incidence and mortality rates. People typically do not require immediate hospitalization due to increased air pollution. Doctors are unlikely to mention climate hazards as the cause on the death certificates. As a result, statistical data often underestimate the number of deaths related to climate factors.



Survivors of climate events may suffer severe psychological impacts, leading to mental health problems such as depression, anxiety, or post-traumatic stress disorder (PTSD); reduced life expectancy due to suicide, substance abuse, or cardiovascular disease, among others.

Displacement caused by climate events can also lead to physical and mental health problems; and when displacement is accompanied by conflict, stress, or poor living conditions, it can further increase morbidity and mortality rates.

Climate change therefore has implications for life and health insurance, with specific impacts depending on a number of factors, as shown in the table below.

Insurance
product type

The relevance depends on the type of insurance product.

Vector-borne infectious diseases (such as malaria and dengue fever) are expected to become more frequent and more widespread as a result of climate change.

They are generally less fatal, so their impact on mortality is limited. However, they are highly relevant to disability and health insurance.

Geographic locations

Weather extremes vary greatly from place to place. Certain local or regional areas are exposed to particularly dangerous hazards. For example, people living in highly concentrated urban areas may be affected by urban heat islands, nearby rivers or coastal areas subject to storm surges or flooding, in areas or conditions in which limited adaptation or healthcare/disaster infrastructure measures are accessible, or they may be located in areas vulnerable to sources of infectious diseases or subject to drought risks. This means that the geographical location of an insurer's presence plays a role in risk exposure.

Age profiles of insureds

The very young, the very old, and pregnant women are particularly vulnerable to morbidity and mortality risks. For example, the organs of the very young may not be sufficiently developed to withstand hazards such as poor air quality, extreme temperatures, or infectious diseases. The very old may not be sufficiently mobile or have weak immune, cardiovascular, or pulmonary systems, or may have pre-existing diseases that can be aggravated by environmental hazards.

World Health Organization (WHO) predicts that climate change will cause approximately 250,000 additional deaths annually from 2030 and 2050. These additional deaths will be caused mainly by malnutrition, malaria, diarrhoea and heat stress. Young and old people are disproportionately affected by these conditions, making them more vulnerable to climate change.



Socioeconomic status of insureds

The impact of climate change impact varies for people of different socio-economic status. In many cases, those with higher incomes may be able to allocate more resources to adaptation, such as storm-resilient buildings, air conditioning, or better access to healthcare infrastructure. Another example is that those who cannot afford resilient housing may be more likely to live in areas subject to higher flooding or other hazards.

The resilience of insured people is likely to be higher than for the general population, as people who can afford life and health insurance are of higher socioeconomic status than average, and generally have better housing, taking into account selection through medical underwriting.

The above analysis demonstrates the impact of climate change on life and health insurance products. However, research into the impact of climate change on mortality and health risks is still ongoing.

5. Policy Recommendations for Climate Change Response

In line with the Chinese National Strategy for Adaptation to Climate Change 2035 and the preceding analysis, this report makes the following recommendations for the development of climate risk insurance.

A. The role of government

Recognize the Insurance Industry's Role in Climate Risk Management

Governments at all levels are suggested to move away from the traditional reliance on government alone to manage climate disasters. It is essential to integrate climate risk-related insurance into the national climate change strategies, strengthen research at the strategic level, integrate climate risk-related insurance into the overall national response to climate change, and formulate policies and systems to support its development.

02 Improve the Regulatory Framework for Climate Risk Insurance

The regulatory framework is suggested to be improved to meet the needs of the insurance industry in developing climate risk insurance; the supervision of climate risk insurance to be forward-looking, scientific, guided, targeted, and effective.

O3 Develop a Catastrophe Risk Insurance System

With urbanisation progressing rapidly, urban risk management shall be prioritised. Governments at all levels are suggested to recognize the importance of insurance in building resilient cities and support insurance solutions through a range of measures. Establishing catastrophe risk pools, with government participation or guidance, and the exploration of financing mechanisms such as catastrophe bonds in the capital markets is recommended.

04 Leverage Public-Private Partnerships for Disaster Mitigation Projects

The government are suggested to direct social capital, including insurance funds, to support major disaster prevention and mitigation projects through public-private partnerships (PPPs). Leveraging the professional capabilities of insurance institutions in disaster prevention and mitigation, infrastructure, and engineering design, operation supervision, and loss control is essential.

O5 Guide Insurance Companies to Conduct Climate Risk Stress Tests

Based on international and domestic practices, it is important to develop climate risk stress testing guidelines suitable for China's insurance companies. These guidelines should cover the stress testing process, climate change scenarios, testing scope, reporting content, and disclosure requirements to provide sufficient guidance for the sustainable growth of insurance companies.

O6 Establish a Data Sharing Mechanism

Sharing disaster-related data held by various government departments with the insurance industry can improve disaster risk assessment, insurance product pricing, loss prevention, and post-disaster claims efficiency. Coordination among relevant government departments to facilitate this data sharing is crucial.

07 Develop an Early Warning System for Disaster Risks

With government support and guidance, the insurance industry, in collaboration with universities and research institutions, should develop a medium- and long-term climate risk early warning system. This system should not only focus on climate risks but should also include other major disaster risks, providing valuable references for government decision-making and the sustainability of the insurance industry.

OB Promote International Cooperation in Climate Risk Insurance

Tackling climate change through insurance is a global challenge. The establishment of the Asian Climate Insurance Alliance to promote international cooperation among governments, industry, academia, and research institutes is recommended. This alliance can explore innovative models for climate risk insurance, promote international reinsurance cooperation, and create a robust reinsurance market.

B. Actively Promote the Innovative Development of Climate Risk-Related Insurance



Advance Agricultural Insurance Amid Climate Change

- Improve Disaster Risk Diversification Mechanisms: Improve reinsurance arrangements and catastrophe risk reserves to ensure the sustainability of agricultural insurance operations.
- Strengthen the Financial Support System: Increase fiscal support for agricultural insurance and expand the scope of central financial subsidies to include innovative products such as index insurance. Encourage local governments to provide stable and long-term subsidies for these products.
- Encourage Innovation in Agricultural Insurance Products and Models: Promote the innovation of business models such as "insurance + futures" and pilot financial insurance projects. Innovate agricultural insurance products related to climate risks to balance individual supply and demand.

02

Improve Weather Index Insurance

- Encourage Innovative Practices: Promote a conducive market environment and establish a weather index release mechanism. Create new channels for insurance institutions to diversify risks through the capital market.
- **Simplify Terms:** Improve the transparency and comprehensibility of weather index insurance terms and conditions to increase awareness and participation.
- Strengthen Scientific and Technical Research: Utilize advanced technologies such as Unmanned Aerial Vehicles (UAVs) and satellite remote sensing to reduce basis risk and improve the accuracy of assessing climate risk events.

03

Develop Green Insurance Products and Services

- Government Support: Formulate relevant regulations, and provide tax incentives or financial subsidies to support the development of green insurance products such as environmental liability insurance, carbon insurance, and green project loan guarantee insurance.
- **Insurance Company Innovation:** Actively develop green insurance products that address climate change risks and support green development. Implement green development in operations and management, and seek investment opportunities in green industries.

04

Promote Climate Risk Reduction Insurance

- Integrate Risk Mitigation Investments into Pricing: Link investments in risk mitigation and disaster reduction effects to insurance and reinsurance pricing. Establish financial rules and regulatory requirements for risk mitigation services for insurance companies.
- Enhance Risk Mitigation Service Capabilities: Insurance companies should develop teams capable of providing effective risk assessment and mitigation services in relevant industries. When organizing insurance project tenders, consider the risk mitigation service capacity and implementation efficiency as selection criteria.

Summary and Outlook

This study focuses on the impact of climate change on the insurance industry and analyzes how the industry can transform climate change challenges into growth opportunities. It summarizes international and domestic best practices and innovations and provides policy recommendations. The insurance industry needs to improve its risk governance and product innovation capabilities, actively develop green insurance and climate risk mitigation insurance, and participate in the implementation of the national climate change strategy. Strengthening cooperation with the public sector and research institutions is essential to improve societal resilience and natural disaster risk management.

In the long-term battle against climate change, the insurance industry can play a crucial role in building a resilient society through its expertise in climate risk management. Insurance funds will also need to invest significantly in high-tech solutions related to climate risk, promoting large-scale green infrastructure, disaster early warning systems and rapid post-disaster recovery. This transformation will enable the insurance industry to turn climate change challenges into new growth opportunities.

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