

WORKING PAPER 1/26 | 06 MAY 2026

Rethinking Insurance in an Era of Climate Change

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Khazanah Research Institute

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Photo of an aerial view of houses surrounded by floodwaters after heavy rain in Tumpat, Malaysia, on 2 December 2024 (AFP via Getty).

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Rethinking Insurance in an Era of Climate Change

Nurul Farhana Abdul Shukor

Summary

- Global disaster costs reached USD2.29 trillion in 2023, exposing a protection gap where most climate-induced losses remain uninsured. Guided by the Sendai Framework, Malaysia's National Disaster Risk Reduction Policy 2030 provides the foundation to use insurance for managing economic losses. This paper evaluates whether insurance can evolve from a reactive payer into a strategic tool to cushion the country from climate impacts and promote fiscal stability.
- Disrupted monsoon patterns and water management gaps have significantly intensified the frequency and severity of pluvial and fluvial flooding. The rise in affected individuals and families between 2015 and 2024 has strained Malaysia's strategic coordination and national disaster resources. This increasing climate volatility necessitates a shift from reactive emergency aid toward integrating insurance into Malaysia's broader adaptation strategy to ensure national resilience.
- Insurers face four critical hurdles, namely limited access to localised data, risk models that do not account for climate acceleration, a reliance on short-term (12-month) policies, and a reinsurance market with a conservative risk appetite. These barriers discourage insurers from long-term risk coverage and influence their capacity in the market; without addressing data gaps and model sophistication, climate insurance will remain reactive rather than a sustainable tool for resilience.
- A significant capacity gap exists across both the public and private sectors, despite shared recognition of insurance as a useful tool for post-disaster recovery. While insurance serves as a secondary complement to broader resilience measures, its effectiveness is currently limited by data gaps and a lack of integration between government policy and market products. Further evolution requires moving beyond compensation toward equitable, cross-sectoral risk sharing that fosters long-term adaptation and national financial stability.

1. Introduction

There is a cost to climate change, which escalates as each successive year over the past decade breaks global temperature records¹. The United Nations Office for Disaster Risk Reduction (UNDRR) reports that direct disaster costs are estimated at USD202 billion a year, which is considered an underestimation². When indirect losses and ecosystem degradation are taken into account, total annual disaster costs reached USD2.29 trillion in 2023³.

These estimates have wide implications for economies and financial landscapes, calling attention to a widening protection gap, the difference between total financial losses and the amount of insurance coverage, driven by climate risks⁴. Additionally, finance-centred articles have explored the insurability of public and private assets in the face of climate-induced events such as floods and wildfires⁵. While the intersection of insurance and climate change is not a new area of study, it remains under-researched. Existing publications tend to treat these subjects in isolation or fluctuate between overgeneralisation and hyper specificity. As a result, a lack of nuance in the field remains, leaving the broader strategic picture unclear.

The insurance industry is part of the broader financial network, serving as a risk management arm that provides a social safety net. This layer of security can foster economic growth and financial stability⁶ by offering protection against uncertainties. This security extends beyond tangible assets protection, as insurance can also positively influence societal behaviour, especially in mitigating current and future climate risks⁷.

Climate risk encompasses the potential impacts of climate change on human life, society, ecological systems, and the economy. It is a multidimensional challenge made worse by climate hazards such as extreme weather events. For instance, flooding is a familiar phenomenon in Malaysia. Issues that were once sporadic have now spread worldwide, driving continuous change across the financial landscape.

In recent years, the insurance industry has sought to position itself as a strategic partner in an increasingly unpredictable world. However, their inadequate approaches to climate risk management often make governments intervene as financial guarantors or backstops⁸. This shift creates a precarious financial burden for countries, particularly those with national debt.

The insurance industry has struggled to manage the complexities of climate risk. As these risks intensify, can the measures adopted by the insurance industry effectively cushion climate impacts and potentially encourage practices that manage present and future climate risks? Hence, this

¹ UN News (2024)

² UNDRR (2025)

³ UNDRR (2025)

⁴ WWF (2026)

⁵ Smith, Mooney, and Williams (2024); Smith and Bryan (2024); Smith (2024)

⁶ Diallo and Al-Mansour (2017)

⁷ Herbstein et al. (2013)

⁸ A backstop refers to a financial arrangement or mechanism that acts as a last resort to prevent potential losses. break

study explores the role of insurance as an instrument against climate risks. To achieve this, the study will discuss the following:

1. To identify the role of insurance in addressing climate change by examining the insurance landscape and the dilemma presented by increasing climate impacts;
2. To examine insurance's potential in promoting adaptation projects across Malaysia; and,
3. To address policy gaps and find practical solutions to utilising insurance strategically to address climate change.

1.1. Policy Anchors and Relevance

At an international level, the UN Climate Action Summit 2019 launched Vision 2025, which integrated climate risk insurance into global strategy. It aimed to track financial protection measures against climate and disaster risks in vulnerable countries under the InsuResilience Global Partnership⁹. Leveraging its technical and analytical network, the Partnership subsequently established the Global Shield against Climate Risks (GS) at the Conference of the Parties in 2022 (COP27)¹⁰. Led by the Group of Seven (G7) and the Vulnerable Twenty Group (V20) of Finance Ministers, the GS incorporates social protection schemes and climate risk insurance to address extreme weather events such as flooding¹¹.

The GS was proposed amidst little to no progress in international finance mechanisms to address climate change; developed countries had failed to meet the 2020 goal of mobilising \$100 billion annually, and negotiations for a dedicated international financial mechanism for natural catastrophes were still ongoing¹². Consequently, while developed countries lauded the GS as a “silver bullet”, developing countries remained more reserved. Nevertheless, it was viewed as progress in providing access to money post-climate impacts. While this global initiative encourages the wider adoption of insurance against climate risk, it does not fully address the systemic challenges within the private insurance market that can make it an ineffective instrument against climate risk.

Several interconnected issues highlight these challenges, which will be explored in a later section.

The current global benchmark for managing disaster risk is the Sendai Framework for Disaster Risk Reduction 2015-2030 (SFDRR)¹³. The SFDRR covers a broad spectrum of disaster risk, ranging from climate to technologically induced disasters¹⁴. The framework aims to reduce disaster risks and losses across global and national scales by encouraging member states to create supportive policy environments¹⁵.

⁹ Global Shield, n.d.

¹⁰ Collins (2022)

¹¹ Collins (2022)

¹² UNFCCC (2023)

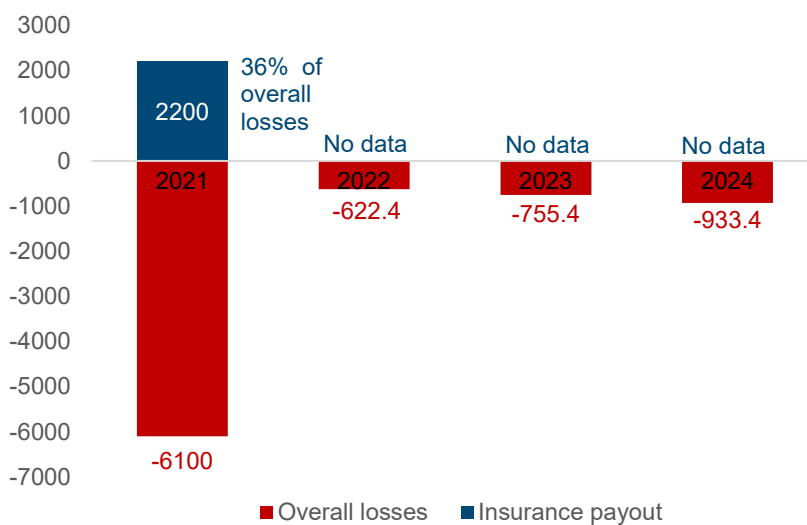
¹³ UNDRR, n.d.

¹⁴ UNECE, n.d.

¹⁵ UN (2015)

In alignment with the SFDRR, Malaysia introduced the National Disaster Risk Reduction (DRR) Policy 2030 in 2024. This policy seeks to mainstream comprehensive and inclusive risk reduction strategies nationwide¹⁶. While the DRR Policy primarily focuses on risk reduction (pre-disaster), some post-disaster recovery is mentioned in the Policy, namely in reducing direct economic losses and minimising damage to critical infrastructure and basic services¹⁷. They are directly relevant to this research, as they provide the policy foundation for using insurance as a mechanism to manage climate-related risks. As is the case at the national level, a significant portion of flood-related losses in 2021 was uninsured. Insurance data from 2022 to 2024 is not publicly available (see Figure 1).

Figure 1: Overall losses due to flood and the subsequent insurance payout, 2021 – 2024 (MYR million).



Source: DOSM (2021-2024) and the author's visualisation

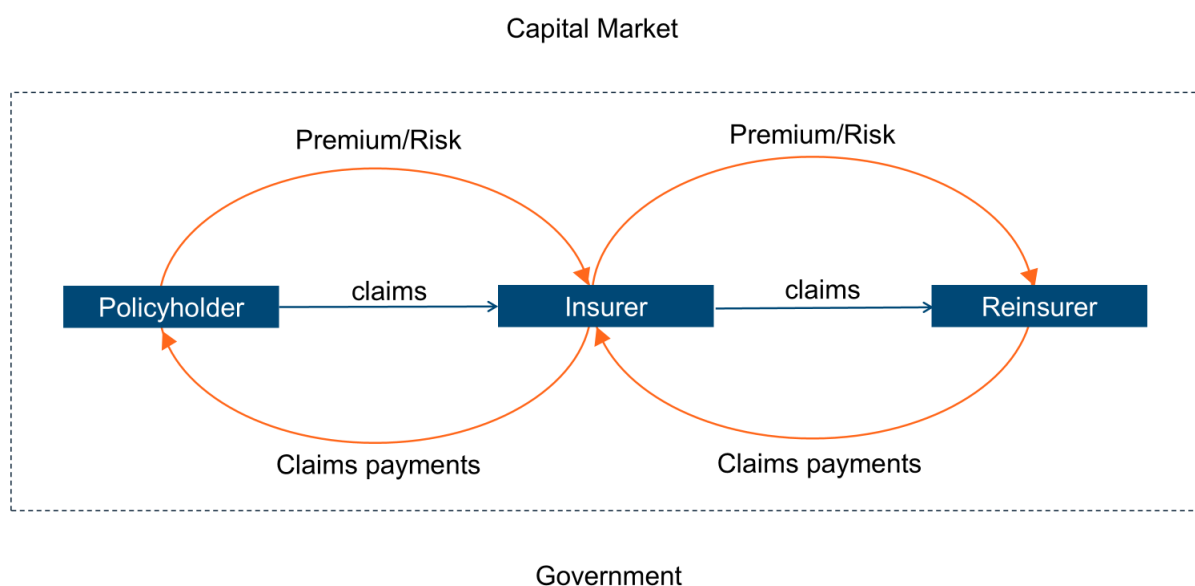
2. What is Insurance?

Insurance generally operates by transferring risk from an individual or business to an insurer through a contract. The insurance contract or policy stipulates that the insurer will pay the insured if and when a specified loss occurs, subject to the policy's terms and conditions. Insurers can also be policyholders by transferring the risks they assume to another party to mitigate their exposure. This process, known as reinsurance, involves a reinsurer acting as an insurer for insurers.

¹⁶ NADMA (2024)

¹⁷ NADMA, n.d.

Figure 2: Insurance-reinsurance system



Source: Adapted from Khisamova (2017)¹⁸ and the author's visualisation.

However, an insurance policy does not usually transfer a risk in its entirety. Contracts are designed with elements that limit full risk transfer, particularly through coinsurance, deductibles, exclusions, and policy limits¹⁹. Elements such as policy limits, coinsurance, and deductibles function as reciprocal safeguards for both policyholders and insurers.

The policy limit caps the insurer's payout and holds the insurer to a level of liability that it is prepared to cover. Deductibles and coinsurance ensure shared risk and mutual accountability. Exclusions prevent full risk transfer and define the scope of the policy by providing clear, specific parameters for what is and is not covered. This clarity is intended to help consumers make informed decisions while protecting insurers from uninsurable events. Ultimately, these elements ensure that the policyholder retains some financial responsibility and remains incentivised to mitigate risk, while enabling the insurer to provide coverage that is accessible and affordable to consumers.

When executed effectively, insurance provides essential liquidity to policyholders during financial emergencies. However, insurers in selected Asian countries have reported a trend of rising premiums for climate-related risks, even as policy coverage narrows²⁰. This growing divergence suggests that the industry has yet to fully and accurately integrate the escalating frequency and severity of climate-driven losses into its pricing and underwriting models.

¹⁸ Khisamova (2017)

¹⁹ Terms and conditions are considered a policy limit. One of the

²⁰ Yong and Khoo (2023)

2.1. Insurance and Climate Risk

Climate risk is not new; reinsurers like Munich Re began investigating climate hazards as early as the 1970s, recognising that asset losses from natural catastrophes were reaching billions of dollars²¹. This realisation prompted the adoption of scientific risk evaluations to improve management strategies²². Despite this long-standing awareness, climate risk remains an anomaly within the insurance industry due to a theoretical disconnect from current realities. Historically, climate-related events have been categorised as ‘Act of God’, which refers to events caused by natural forces, at no one’s fault²³. As a result, this clause may exempt insurers from policy liability because the event is deemed beyond the control of all contracting parties²⁴.

The inherent protections offered by insurance make it an appealing instrument for addressing climate change, and this is reflected in its integration into international initiatives such as the Global Shield against Climate Risks.

However, significant barriers persist at the market level. Oxford Policy Management identifies unaffordability and low levels of financial literacy as the primary factors stunting market entry and growth²⁵. These barriers restrict the competitiveness of private insurance markets, ultimately deterring the product innovation required to address evolving climate threats²⁶.

2.2. A Domino Effect

The first challenge concerns **limited data access** during the risk assessment and pricing stage, known as underwriting. This stage is inherently data-driven, as it evaluates both the insurability of a risk and the corresponding cost of coverage. Currently, one of the methods to access data is through subscriptions to databases provided by global reinsurers. However, these databases tend to be costly and broad in scope, which limits their applicability to the local context.

Consequently, insurers across the Asia-Pacific region have identified a need for accurate and localised climate data²⁷, specifically regarding region-specific hazards and comprehensive claims histories. Such specified data is essential for loss analysis via experience ratings²⁸, which directly informs the terms of coverage pricing structures and premiums levied on policyholders. In short, high-fidelity, local data is a prerequisite for determining the technical insurability of climate-related risks.

²¹ Munich Re (2024)

²² Munich Re, n.d.

²³ Zurich Malaysia, n.d.

²⁴ BNM (2017)

²⁵ Global Shield (2024)

²⁶ Global Shield (2024)

²⁷ Romann (2024)

²⁸ Loss experience ratings refer to a method of comparing the insured party’s historical claims to others in the industry to determine the party’s future premium. It tends to reward those with fewer claims by lowering their rates and vice versa. The ratings adjust premiums based on the actual loss experience as opposed to the expected average loss for similar risks.

Secondly, current **risk models** generally rely on historical data, yet many fail to account for the accelerating effects of climate change²⁹. These models use mathematical and statistical methods to determine the probability of climate events and their projected financial impacts. However, real-world risk dynamics are in a state of constant flux. The most relevant example is that changing weather patterns have altered the frequency and severity of natural hazards, resulting in areas that were not traditionally considered flood-prone experiencing flooding.

To strengthen the foundations of underwriting and strategic planning, risk models must reflect a continuum of past, present, and potential future conditions. This approach requires removing existing biases from historical datasets, simultaneously accounting for established trends and incorporating variables likely to shape future outcomes. When executed properly, refined risk models enable insurers to anticipate and price risk more accurately, thereby reducing uncertainty and minimising errors in underwriting performance.

Thirdly, the quality of climate data and the sophistication of risk models influence the **types of insurance policies available**, specifically the **duration of coverage**. This serves as an indicator of an insurer's willingness to assume the risk. A reliance on short-term policy designs suggests that insurers are less incentivised to adopt a long-term position. A short-term position typically manifests as 12-month policies that can be renegotiated or cancelled every year. The disadvantages include a lack of guaranteed coverage beyond the one-year mark and the risk of premium volatility, whereby insurers raise rates based on recent climate events to recoup claims-related losses.

While a short-term position may temporarily shield insurers by masking the true cost of escalating risks, it allows these liabilities to accumulate and snowball into larger financial burdens in the future. Thus, adopting a longer view of climate risks can encourage longer policy terms, ensuring that future liabilities are accounted for and managed in the present.

Building on the challenges within primary insurance, risk dynamics overflow into the **reinsurance market**, where primary insurers mitigate potential losses by transferring a portion of their risk to secondary insurers, known as reinsurers. The availability and pricing of this coverage signal a reinsurer's willingness to accept exposure from primary insurers. Although industry reports indicate that the reinsurance market remains well-capitalised³⁰, its capacity to absorb high insured losses is increasingly contingent upon a rigorous adjustment of its risk appetite.

This adjustment is typically implemented through increased premiums, more stringent terms and conditions, and higher attachment points³¹. While such strategies promote resilience of the reinsurance industry, they risk exacerbating the protection gap for primary insurers and consumers in vulnerable regions.

²⁹ Smith and Bryan (2024); Yang, Lemański, and Watters (2025)

³⁰ Aon (2025); Gallagher Re (2025)

³¹ An attachment point in reinsurance refers to the threshold amount that a primary insurer must pay before the reinsurer begins to cover any excess losses.

If the strategies are insufficient for reinsurers to absorb insured losses, private insurers may withdraw capacity from the market, leaving a gap in who is responsible for providing coverage. Governments can often act as the backstop for gaps left by the private insurance market, stepping in to prevent systemic financial hardship for both insurers and the public. This involvement may include paying substantial premiums on behalf of the public or directly subsidising coverage, effectively transferring the financial burden onto taxpayers.

Box 1: Parametric Insurance and Malawi's Drought Crisis

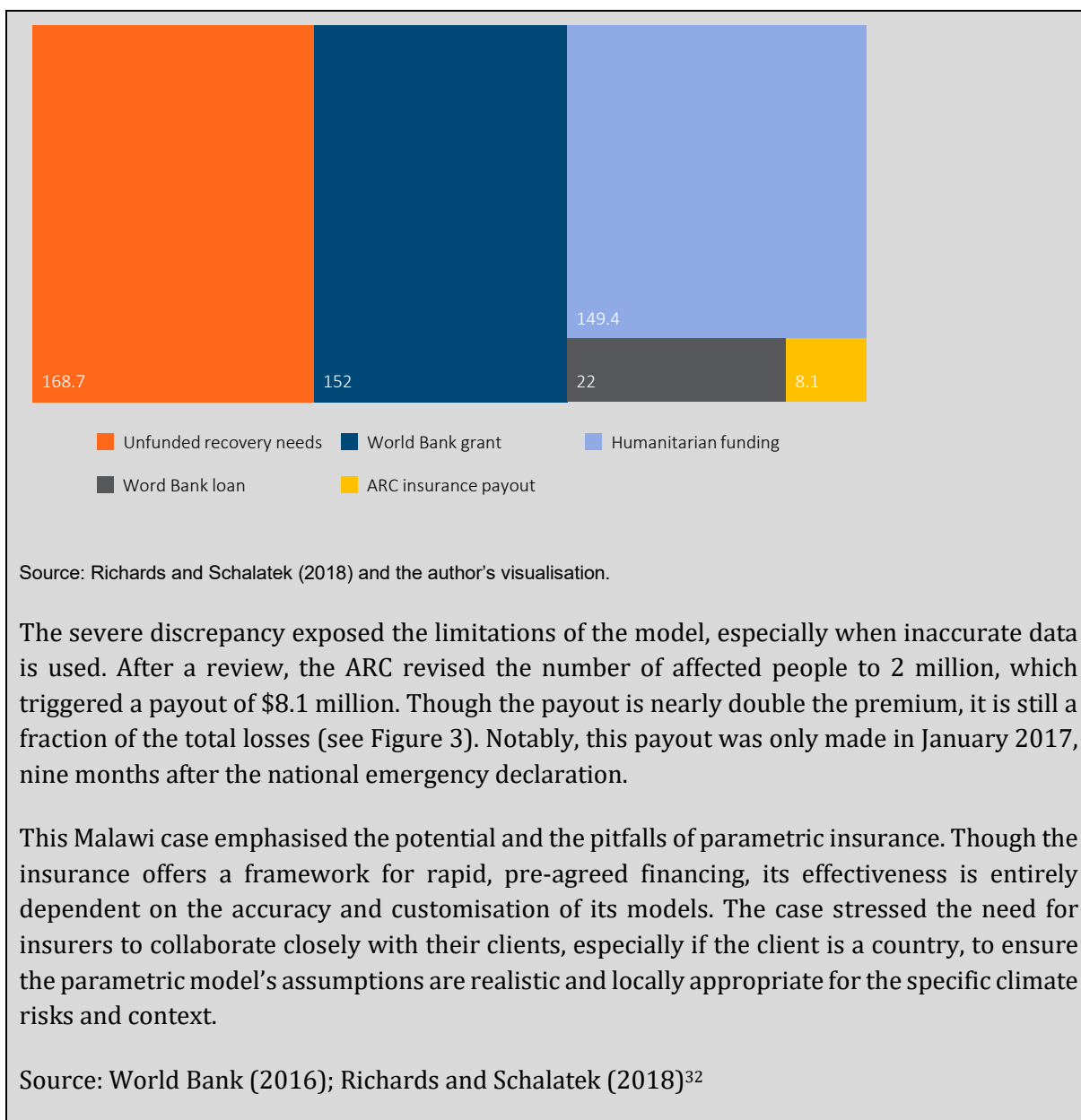
Parametric insurance is a type of coverage that pays out a pre-agreed amount when a specific and measurable event occurs and exceeds a pre-agreed threshold. An automatic payout is triggered based on an objective index such as rainfall levels or estimated crop loss. For context, a traditional insurance relies on a loss assessment process that can be lengthy.

In 2015, the Malawi government purchased drought insurance from the African Risk Capacity (ARC), a specialised African Union agency that offers African governments assistance to manage natural disaster risks and secure rapid response financing. The ARC was financed with 20-year interest-free loans by the United Kingdom and Germany, granting African governments access to discounted insurance. Malawi is a least developed country (LDC) with an economy heavily reliant on agriculture. They paid a \$4.7 million premium for security on their maize harvest in the 2015/2016 agricultural season.

The country experienced El Niño thereafter, and the government declared a national emergency in April 2016. The ensuing drought crisis caused widespread crop failure, with the World Bank later estimating combined damages, losses, and needs excluding food security at over \$366 million.

However, ARC's initial claims assessment determined the payout threshold had not been met. The key issue was a significant discrepancy between their model's calculation and the actual impact. The ARC's model for calculating crop failure was based on the more drought-resilient long-cycle maize crops instead of the widely planted short-cycle maize. Additionally, the model estimated that only 20,594 people were affected by the drought. However, the World Food Programme estimated that 6.5 million Malawians (39% of the population) were facing hunger.

Figure 3: Malawi's drought recovery needs and sources of funding, 2015-2016 (USD million).



3. Shifting the Focus to Adaptation Efforts

Despite limitations in insuring climate risk, insurance offers possible merits when leveraged effectively. A paper commissioned by the Global Commission on Adaptation advocates for insurance as an instrument to promote both physical and financial resilience³³, suggesting that insurance mechanisms can be strategically deployed to incentivise adaptation efforts.

In this context, promoting adaptation requires shifting the application of insurance from a reactive model, namely paying for damage, to a proactive model, such as reducing potential

³² World Bank (2016); Richards and Schalatek (2018)

³³ Jarzabkowski et al. (2019)

damage. Thus, the integration of adaptation measures is viewed as a means to lessen potential climate-related exposure and subsequent payouts³⁴.

However, the efficacy of this approach is increasingly shaped by the Environmental, Social, and Governance (ESG) framework. The ESG agenda is largely driven by market forces and geopolitical decisions, influencing the sustainability landscape. ESG application is subject to shifting global trends and regulatory pressures, which inform the availability of and access to insurance.

3.1. The Win-Win Proposition

Endorsed by prominent financial firms in 2004, the ESG framework is based on the idea that environmental and social performance are drivers of financial success³⁵. However, this premise often competes with the prevailing mandate to maximise shareholder value. These competing beliefs can be seen played out in the contemporary market.

Over time and practice, the focus of the ESG narrative shifted from business responsibilities to investors' financial relevance. ESG evolved into a tool identifying risks, reducing costs, and promoting innovation, all while enhancing brand reputation. This narrative has spread to the corporate sector, where sustainability and growth are now framed as concurrent objectives. This win-win proposition has propelled the ESG movement. It was reported that assets managed under the ESG, or sustainable mandate, reached an estimated \$30.3 trillion in 2022³⁶.

In the insurance industry, the ESG agenda is aligned with global greenhouse gas (GHG) emission targets. ESG compliance requires insurers to reevaluate their underwriting and investment strategies³⁷, indicating that sustainability has transitioned from a peripheral concern to a core operational requirement. This alignment often results in the penalisation of high-emitting industries, known as 'dirty' or hard-to-abate industries, by restricting their access to financial support³⁸ including products and services offered by the insurance industry.

Instead, capital is diverted toward 'green' alternatives. This shift makes it more difficult and costly for hard-to-abate industries to manage long-term risks or secure the coverage necessary for protecting their assets and operations.

In Malaysia, insurers are increasingly mandated to integrate ESG practices into their operations and reporting frameworks³⁹. However, this transition requires a level of understanding of climate risks, an area in which the insurance industry faces expertise gaps. This lack of technical proficiency often results in cautious and blanket exclusions of heavy industries.

The lack of insurance creates a vicious cycle for hard-to-abate industries attempting to move toward climate adaptation. Firstly, it **compromises the resilience** of these industries. As

³⁴ Smith, Mooney, and Williams (2024); Faull (2024)

³⁵ UNEP and Swiss Federal Department of Foreign Affairs (2004)

³⁶ GSIA (2023)

³⁷ PwC (2022)

³⁸ Standard Chartered (2019)

³⁹ Bursa Sustain (2023)

insurance becomes either unavailable or expensive, firms are compelled to self-insure. This ties up working capital that could otherwise be allocated to physical adaptation, leaving them more vulnerable to the very climate impacts the ESG framework seeks to mitigate. Secondly, the lack of coverage **stifles innovation** in industries that require emerging technologies to build resilience. Without insurance to underwrite the risks associated with these new technologies, lenders are often unwilling to provide the necessary financing.

Ultimately, this **reinforces the uninsurability trap** by exposing firms to greater risk from significant climate-related losses. Such exposure can halt transition efforts, making the industry's broader decarbonisation goals more difficult to achieve. To bridge this protection gap, insurers are beginning to develop solutions that incentivise and reward industries for implementing climate adaptation measures.

To incentivise adaptation, some of the innovative efforts explored by insurers include offering premium discounts for policyholders who invest in resilience measures to lessen potential losses⁴⁰ and parametric insurance tied to specific adaptation outcomes⁴¹ that enables automated payouts triggered by predefined climate events. Despite the availability of these products, a significant gap in adaptation funding persists⁴², primarily due to the global prioritisation of mitigation over adaptation (see Figure 4).

This challenge is compounded by the recent trend of major financial institutions in developed countries exiting global climate alliances, such as the Net-Zero Banking Alliance⁴³, often citing geopolitical considerations. Such withdrawals signal a regressive shift in climate leadership and hinder the mobilisation of essential financial resources. The confluence of limited funding and inconsistent commitment translates to an unpredictable risk landscape. Thus, increasing pressure on the insurance industry to devise more resourceful and robust solutions.

These global paradigm shifts directly impact the Malaysian insurance industry⁴⁴. By providing crucial risk-cushioning mechanisms, insurance can facilitate and unlock the necessary investments required for adaptation projects that are vital to the realisation of Malaysia's broader climate ambitions.

⁴⁰ Cusick, Canaan, and Sharma (2024)

⁴¹ Aon (2023)

⁴² Naran et al. (2025)

⁴³ Kishan and White (2025); Srivastava and Kaye (2025)

⁴⁴ Bursa Malaysia (2023)

Figure 4: Types of activities financed by climate finance, 2023 (USD billion).

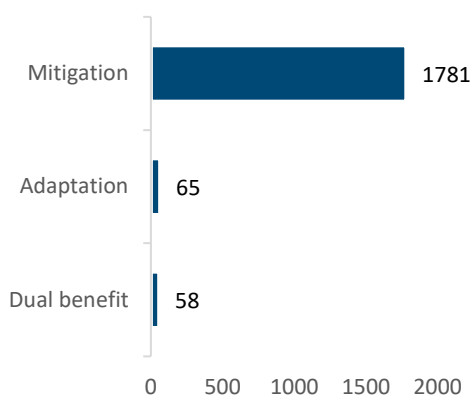
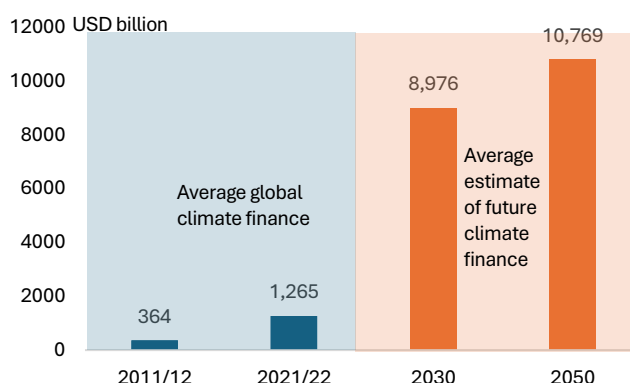


Figure 5: Global tracked climate finance and average estimated annual needs through 2050 (USD billion).



Source: Naran et al. (2025) and the author's visualisation.

Source: Adapted from Buchner et al. (2023)⁴⁵ and the author's visualisation.

Box 2: A Hong Kong Blueprint of Sustainability-linked Insurance

Sustainability-Linked Insurance (SLI) is a property insurance product developed in Hong Kong that integrates climate risk mitigation efforts into the policy structure. Unlike traditional insurance, SLI rewards companies for proactive investments in climate adaptation and resilience measures.

The product was developed in a partnership between real estate Link Asset Management, insurer AXA Hong Kong & Macau, and insurance broker Marsh Hong Kong. The involvement of Link Asset Management was crucial because they were asset owners at risk of insured losses, thus becoming the first adopter of the SLI product. The product received further support from the Hong Kong Green Finance Association (HKGFA), which advocated it as an essential new financial solution to bridge the financing gap for climate change adaptation.

Hong Kong's increasing exposure to extreme weather events, particularly the Super Typhoon Mangkhut in 2018, resulted in growing insured losses that prompted insurers to raise premiums and tighten terms. This created a risk of rising costs and potentially 'uninsurable' assets. The SLI product was created to break this cycle and reframe resilience as a value creator that merits financial incentives.

The SLI structure works by requiring the insured to conduct a comprehensive climate risk assessment and define Sustainability-Linked Key Performance Indicators (KPIs). Based on the KPIs that are resilience investments, the insurer offers favourable premiums and coverage terms. This process has demonstrated some financial benefits, with the first pilot achieving an 11.7% reduction in property insurance premiums for the asset owner. Overall, the SLI

⁴⁵ Buchner et al. (2023)

leverages the policyholder’s adaptation actions to reduce the insurer’s risk. It is arguably a win-win situation where both the policyholder and the insurer are covered.

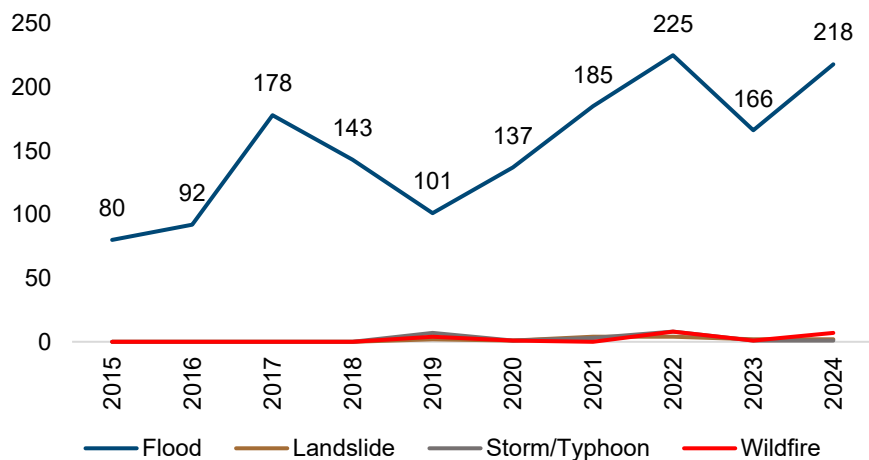
The launch of this white paper has garnered support for the product by other real estate players and increasing the pressure on the insurance industry to come up with more products. For now, the success of the SLI provides a replicable blueprint for other real estate leaders in the region.

Source: Link Asset Management, AXA, and Marsh (2025)⁴⁶

4. The Malaysian Context

Malaysia has high temperatures and humidity because it is located on the equator. While heavy rainfall is a defining feature of its climate, the seasonal predictability of monsoons and El Niño weather patterns has been disrupted. Compounded by systemic challenges in water resource management⁴⁷, these factors have led to a noticeable increase in the frequency and severity of pluvial and fluvial flooding⁴⁸.

Figure 6: Reported disaster events in Malaysia, 2015 – 2024.



Source: NADMA (2015 to 2024)⁴⁹ and the author's visualisation.

⁴⁶ Link Asset Management, AXA Hong Kong & Macau, and Marsh (2025)

⁴⁷ Abdullah (2017): Bad water management includes rapid development within river catchments, increasing runoff, and deteriorating river capacity.

⁴⁸ Pluvial flooding occurs when heavy rainfall overwhelms drainage systems or the ground’s ability to absorb water, resulting in surface water accumulation. Fluvial flooding occurs when rivers overflow their banks due to excessive rain, causing water to spill into adjacent areas.

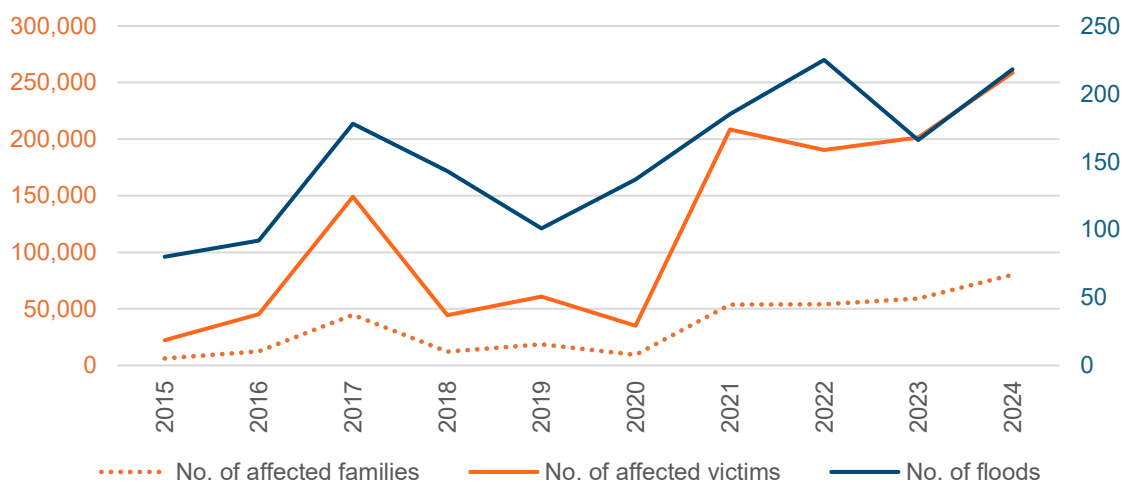
⁴⁹ NADMA, n.d.

4.1. Malaysia's Disaster Response

The National Disaster Management Agency (NADMA) is the lead agency for emergency and disaster management in Malaysia, which is under the purview of the Prime Minister's Office. NADMA is tasked with the strategic coordination of relevant government ministries and agencies throughout the disaster lifecycle. Under its mandate, the agency oversees the operations of the armed forces and first responders, while maintaining a record of disaster occurrences and their subsequent impacts across Malaysia.

From 2015 to 2024, the number of individuals and families affected by flooding increased significantly (see Figure 7). These impacts underscore the need for comprehensive national resilience and highlight the role of insurance within Malaysia's climate adaptation and response strategy.

Figure 7: Reported number of victims and families affected by flooding, 2015 – 2024.



Source: NADMA (2015 to 2024)⁵⁰ and the author's visualisation.

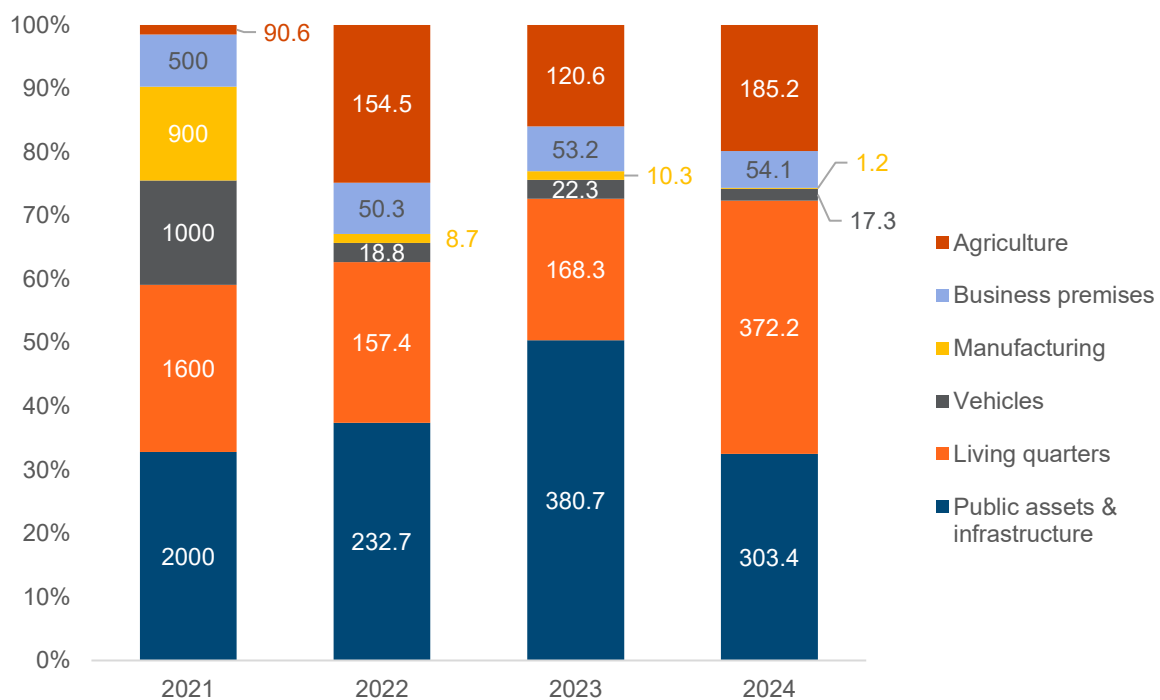
4.2. Flood-related Losses in Malaysia

The Department of Statistics of Malaysia (DOSM) began publishing an annual special report detailing flood losses by sector following the 2021/2022 floods⁵¹ (see Figure 8). The losses recorded from 2021 to 2024 underscore the widespread impact of flooding and highlight areas that need greater attention.

⁵⁰ NADMA, n.d.

⁵¹ DOSM (2022); (2023); (2024); (2025)

Figure 8: Overall losses due to flooding, 2021 – 2024 (MYR million).



Source: DOSM (2021-2024) and the author's visualisation.

Quantifying losses to public assets and infrastructure is generally easier due to their centralised **ownership and management**, which provides a straightforward basis for assessing direct financial impacts. This contrasts with privately owned assets, where inconsistent, incomplete, or non-existent records of purchases, improvements, and insurance coverage complicate loss assessment.

Furthermore, **valuation methods** differ significantly between public and private assets. Public assets typically adhere to standardised accounting practices and valuation methods, whereas private assets' valuation, such as homes and vehicles, is influenced by factors like age, condition, market conditions, and modifications, making standardisation difficult.

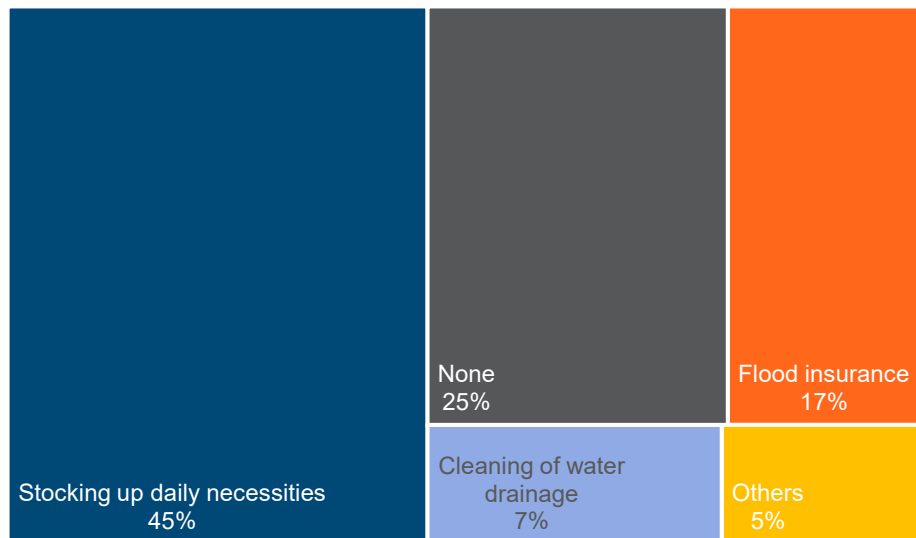
These differences in ownership and valuation methods directly affect **data collection and reporting on losses**. Governments usually have centralised and systematic processes for collecting loss data for public assets. However, data on private property and vehicle losses often rely on individual reporting to insurance companies or government aid programmes, which can be inconsistent and may not capture the full extent of losses, especially for those without insurance or who do not seek assistance. Accordingly, insurance coverage would also vary between public and private assets.

Public infrastructures tend to have **insurance coverage or dedicated funds** for repair and reconstruction. While insurance for privately owned homes and vehicles is common, coverage is subject to deductibles, the extent of the policy, and the claims process.

DOSM's flood impact special report finally addressed flood prevention and preparedness methods (see Figure 9), providing an overview of the current flood risk management landscape.

The findings indicate a significant preference for immediate and tangible measures, such as stocking up on daily necessities (45%), whereas only 17% of respondents utilised flood insurance. The data also showed a percentage of respondents who do not adopt any formal or informal mitigation measures (25%).

Figure 9: Malaysian flood prevention and preparedness by percentage, 2024.



Source: DOSM (2025)⁵² and the author's visualisation.

Box 3: Malaysia's 2021/2022 Floods

The catastrophic floods that struck Malaysia from December 2021 to January 2022 devastated 11 states. It served as a wake-up call regarding the nation's financial exposure to climate risk. The event caused unprecedented losses and tested the resilience of the local insurance industry.

The floods resulted in around RM6.1 billion in total economic losses. It triggered a record-breaking claims payout by local insurers of RM2.2 billion, the highest for a single flood event in the previous decade. Despite the record sum, the coverage only managed to address approximately 36% of the total economic losses. The remaining two-thirds of losses were uninsured, thus falling directly on the government, businesses, and households.

Nonetheless, the insurance industry remained relatively stable overall, primarily due to its historically conservative investment portfolios. However, the event exposed a vulnerability: insurers expressed concern that the escalating flood-related claims are making such coverage unprofitable. The increased risk is driving up the demand and pricing for climate-related insurance, yet the underlying economics of flood coverage are being strained.

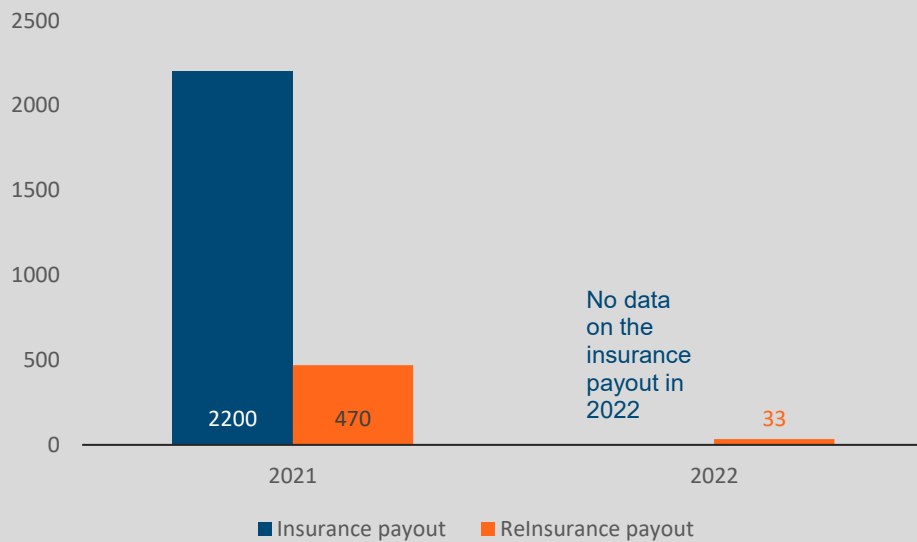
It is worth noting that the RM 6.1 billion in economic losses did not account for the non-economic impacts of the floods. The true toll included the loss of over 50 lives and the

⁵² DOSM (2025)

displacement of 40,000 people. The difficulty in quantifying deaths and displacement in monetary terms means Malaysia’s climate risks and their compounding long-term economic and social ramifications are severely underestimated. This spotlights the pressing need for better models that capture the holistic impact of climate events on national economic and non-economic well-being.

Source: Bank Negara Malaysia’s Financial Stability Reviews (2022b, 2023)⁵³

Figure 10: Insurance and reinsurance payouts in Malaysia due to flooding, 2021 – 2022 (MYR million).



Source: MalaysiaRe (2026)⁵⁴, DOSM (2021) and the author’s visualisation

4.3. The Limitations of Insurance in Malaysia

Insurance adoption remains suboptimal in Malaysia, with coverage reaching only 23% of individuals and 67% of small and medium-sized enterprises (SMEs)⁵⁵. This low uptake may be partly due to lower levels of insurance literacy in Malaysia compared with Singapore, even though both countries have gaps in insurance literacy⁵⁶. Despite these challenges, awareness of the value

⁵³ BNM (2022b); (2023a)

⁵⁴ MalaysianRe (2026)

⁵⁵ BNM (2023b)

⁵⁶ Ganesan (2024); SunLife Malaysia (2024): Sun Life Malaysia conducted the “Insure or Unsure: Sun Life Insurance Literacy Survey”. It found that only 23% out of 1,107 Malaysians surveyed are confident in their knowledge of insurance and takaful products, while almost one-third (32%) have no insurance protection. 22% of the respondents indicate low to no insurance knowledge, while 55% are uncertain about their insurance knowledge and are dependent upon others for assistance.

of insurance is growing, particularly following the pandemic⁵⁷, which highlighted the need for financial protection in uncertain times⁵⁸.

According to Bank Negara Malaysia's Financial Inclusion Framework 2023-2026 Strategy Paper, low-income households represent another underinsured segment in Malaysia⁵⁹. To improve access to affordable protection for these households and other recipients of government assistance, the Perlindungan Tenang Voucher (PTV) Programme was introduced in 2021⁶⁰.

However, even with the introduction of varied product offerings such as micro-insurance to promote affordability, the industry's growth remains slow. Thus, more needs to be done to achieve the national insurance and takaful penetration target of 75% by 2026⁶¹, with a projected growth rate of 4.8% to 5% relative to the country's GDP by 2026⁶².

4.3.1. Outcomes from the Project's Roundtable Discussions

To complement the desk research in the study, inputs from stakeholders were gathered at a roundtable discussion held in August 2025. Stakeholders include government bodies, private insurers, a financial institution, and an NGO. The research questions guided the discussion, whereby the following responses were noted.

Government

The Malaysian government, represented by entities like the Ministry of Natural Resources and Environmental Sustainability (NRES), NADMA, Bank Negara Malaysia (BNM), and DOSM, views climate risk as a pressing national security issue with significant financial implications. The government recognises that relying solely on public funds is unsustainable and that instruments such as insurance are becoming more important.

The government's approach is centred on a multi-pronged strategy. The upcoming Malaysian National Adaptation Plan (MyNAP) will include a nationwide climate risk and vulnerability assessment to identify high-risk areas and communities. BNM has collaborated with the World Bank on research to build the financial sector's capability to address climate risk. NADMA is also developing a system for climate disaster victims to register for financial assistance through an app to enable quicker payouts.

⁵⁷ Ganesan (2024)

⁵⁸ BNM (2023b)

⁵⁹ BNM (2023b)

⁶⁰ Perlindungan Tenang Voucher (PTV) Programme (2025); MOF (2021): The Perlindungan Tenang Voucher (PTV) Programme is a government initiative supported by Malaysian Takaful Association (MTA), Life Insurance Association of Malaysia (LIAM), and General Insurance Association of Malaysia (PIAM). The PTV is in its third cycle and currently provides RM30 vouchers to 2 million eligible Sumbangan Tunai Rahmah (STR) recipients. The voucher can be used to purchase or renew microinsurance and microtakaful products through participating providers under the Perlindungan Tenang framework.

⁶¹ BNM (2022a)

⁶² BNM (2023b)

Despite the efforts, challenges remain.

First is the **lack of a systematic approach for real-time verification** of affected households during a disaster. This forces NADMA to rely on a manual registration process where victims must apply for cash assistance at temporary shelters.

Second is the **limited accessibility of granular data needed for risk modelling**. Although data exists like that from the Department of Meteorology, its public release can be restricted by acts like the Official Secrets Act, and pushback by industries with opposing interests. This also compounds a capacity challenge, as national modelling agencies are constantly falling behind the latest scientific reports from bodies like the IPCC.

Third is the **potential issue of double payment**, as the government must both pay cash assistance to the public and potentially pay premiums for a large-scale insurance scheme. Finally, a **nationwide Climate Risk and Vulnerability Assessment (CRVA)** could lead to high-risk areas facing unaffordable premiums or being denied insurance entirely, impacting B40 and M40 communities. This contradicts the goal of reducing the government's burden, as the government would then be forced to bear the cost for these vulnerable communities.

To overcome these challenges, a **synergistic public-private partnership (PPP)** was proposed, with the insurance industry proposed to help create a new stop-loss insurance product. Under this model, the government would pay a premium, and the insurance industry would cover payouts that exceed a pre-agreed threshold, thereby reducing the burden on public funds. They also ask the industry to invest in technology to verify affected households in real time and to utilise government data from agencies like DOSM to better understand risk exposures.

Insurance Industry

The Malaysian insurance industry was represented by the General Insurance Association of Malaysia (PIAM), Tune Protect Malaysia, and SunLife Malaysia⁶³. They stressed the role of insurance in managing climate risk, seeing it as a business of post-disaster payouts as well as a tool for risk avoidance and reduction. The industry recognises that the frequency and intensity of climate-related claims are increasing, with a low take-up rate of flood insurance. It is noted that data for underwriting and pricing for climate risk products are not generated by local insurers; rather are often sourced from global reinsurers because the local industry lacks the internal capacity to take on the entire risk by itself.

The industry's approach is to address climate risk through product innovation and collaboration. PIAM is actively engaged in studies of the entire electric vehicle (EV) ecosystem to support the government's national EV agenda, looking beyond insurance products to include infrastructure and repair services. On the health front, they are developing coverage for climate-related illnesses such as heatstroke. Malaysian insurers are also part of ASEAN Working Groups, such as the ASEAN Natural Disaster Research and Works Sharing (ANDREWS) Working Group, which serves as a regional platform for advancing natural disaster research, risk modelling, and knowledge

⁶³ SunLife Malaysia did not participate physically but submitted their written responses.

exchange to strengthen catastrophe risk management across ASEAN. This Working Group is under the umbrella of the ASEAN Insurance Council (AIC), which comprises insurance associations of ASEAN countries, including Malaysia.

The industry faces several critical challenges.

First is the **unreliability of historical data for predicting modern, intense weather events**, making risk modelling difficult. Data for underwriting and pricing for climate risk products are often sourced from global reinsurers because local insurers lack the capacity.

Second, they struggle with **balancing profitability with providing affordable and accessible products**, particularly in a premium regulated market where they cannot always price premiums according to risk. The low insurance penetration rate, especially among B40 and M40 income groups, is a major concern, as many people either cannot afford or are unaware of available coverage.

Finally, the industry is **constrained by the need for reinsurance capacity**, which is increasingly expensive and dictated by global catastrophe events.

To overcome these challenges, a **PPP to create a national catastrophe pool** was proposed that spreads risk across both the public and private sectors. The national pool would combine good and bad risks, addressing the problem of anti-selection⁶⁴, and could lead to a more sustainable and affordable insurance scheme. The industry requires access to more granular, real-time data from government sources to improve its risk models. Finally, they hope to see a fully liberalised market that allows for greater innovation and the ability to price premiums accurately according to risk, which they believe is essential for long-term sustainability.

4.3.2. Analysing the PPP Proposals

The roundtable discussion between the Malaysian government and the insurance industry resulted in two proposed PPP models. The analysis suggests that both proposals have their advantages and disadvantages. Each offers different approaches to risk distribution and fiscal management.

The first proposal is a sovereign stop-loss mechanism. In this model, the government acts as the primary policyholder, paying premiums to the insurer to cover losses that exceed a specific monetary threshold. An advantage of this model is that it aims to stabilise public funds and can spread out volatility, whereby the government manages smaller frequent disasters, while the insurance industry absorbs the catastrophic peaks.

As noted by an industry reviewer, this model can be viewed as a strategic reallocation of expenditure priorities. A portion of Malaysia's annual disaster relief budget can be used to

⁶⁴ Anti-selection is the tendency for higher-risk individuals to seek out insurance more than others. This creates an adverse selection problem because insurers take on a disproportionate number of high-risk policyholders, resulting in higher claims payouts. To cover these costs, insurers raise premiums for all policyholders.

purchase insurance coverage, which acts as a budget multiplier. The premium payment could open a larger pool of private capital in the event of a disaster, allowing the total assistance provided to the public to exceed the original public budget allocation.

A disadvantage of this model is the double payment trap. If the government pays for insurance but continues to provide ad-hoc cash aid regardless of the insurance trigger, it essentially pays twice for the same risk. Furthermore, stop-loss products tend to be tailored to the policyholder, which may lead to additional costs to cover the difficulty of pricing complex risks, known as uncertainty loadings. The premiums tend to be more expensive compared to the actual risks covered.

The second proposal is a national catastrophe pool, likely underpinned by parametric insurance, payout triggered by data rather than manual damage assessments. This model would focus on a wider risk-sharing instead of a sovereign transfer. An advantage of this model is pooling good and bad risks together, potentially spreading the overall risk across a larger group. In the event a parametric insurance model is used, data-driven triggers can facilitate the real-time response requested by the government.

Some disadvantages are that real-time response is not guaranteed because parametric triggers are specific. If a disaster occurs but falls short of the agreed trigger, no payout is made. As described in the Malawi case study (see Box 1), this can leave the government fiscally vulnerable despite having paid for coverage.

Furthermore, the industry's request for market liberalisation, which is to allow prices to fluctuate based on risk, is a double-edged sword. While it promotes the pool's long-term solvency, it may lead to a premium shock for individuals and households in high-risk areas. This could lead to pricing out people and communities from the market, leaving the most vulnerable without protection.

Overall, both proposals offer viable pathways to address climate risks using insurance. The sovereign stop-loss model can protect the national treasury from extreme fiscal shocks, while the national catastrophe pool offers a more inclusive framework for stabilising the domestic insurance market.

The choice of model is less critical than the underlying principle of equitable risk sharing. An effective PPP is more than a buyer-seller relationship, and the goal is to ensure that the financial burden of climate change is shared.

4.4. Avenues for Development

Based on the roundtable discussion, a significant capacity gap exists on both sides. Despite this, there is an acknowledgment of insurance's usefulness in addressing climate risk in Malaysia. While useful for post-disaster financial recovery, **insurance provides only partial protection against climate risks** and should be viewed as a **secondary complement to broader measures**.

There is scope to explore further applications of insurance, particularly in **promoting adaptation efforts**. As Malaysia seeks to attract and retain foreign direct investment, projects

backed by comprehensive insurance coverage offer a level of assurance to investors. The development of a sustainability-linked insurance product, as detailed in Box 2, would require operational shifts by insurers and targeted government support. Admittedly, this approach requires comprehensive information with robust data, resources that are currently lacking in the Malaysian context.

The insurance industry's work on the electric vehicle (EV) ecosystem provides a template for managing emerging risks. As shared during the roundtable discussion, the whole ecosystem approach evaluates the technical and physical environment in which new technologies operate and redefines risk parameters. For EVs, this includes assessing the availability of charging facilities and workshops' readiness for specialised repairs. Additionally, the conventional business-as-usual structures, such as betterment clauses⁶⁵ in motor insurance, they are unsuitable for EVs because they do not account for accelerated battery degradation and rapid asset depreciation.

The challenges posed by high repair costs and battery lifespan demonstrate the need for a holistic, ecosystem-wide framework that integrates insurance with infrastructure and support services. This model could be adapted to address other emerging climate-related risks.

5. Policy Recommendations

Insurance has existed in various forms for centuries, and over that period, it has adapted to suit the needs of industries and countries. The escalating impacts of climate change, particularly the increasing frequency and severity of flooding, necessitate a fundamental rethinking of it in Malaysia. Below are the policy implications that reinforce each other:

1. **Improved climate and asset risk database.** Malaysia should work towards an integrated national risk database that merges granular climate and hazard risk with asset-level information to support the effective functioning of insurance as part of a larger resilience strategy. While there are efforts to consolidate climate and hazard data, the utility of this database can benefit from linking those data with asset-level information, such as land use patterns, property ownership records, building structural characteristics, and insurance coverage. Integration of the data from various sources, including government agencies, research institutions, and the insurance industry, must adhere to a standardised format. Synchronising these datasets onto an integrated database would allow Malaysia and the insurance industry to better assess climate risk. At the insurance industry level, it would enhance their capacity to offer coverage.

⁶⁵ A betterment scale is used by insurance companies, particularly in motor insurance, to calculate the portion or percentage of a replacement cost that a policyholder must pay out of pocket. This method ensures policyholders do not profit from a claim. Since replacing an old or damaged item with a new one increases the vehicle's overall value beyond its original state, the owner is required to cover the difference in value.

This aligns with and expands upon efforts of Malaysia's Joint Committee on Climate Change (JC3), specifically its JC3 Climate Data Catalogue (DC)⁶⁶. The DC currently identifies 186 unique environmental and climate-related data items, such as GHG emissions and exposure to physical risks. While the DC presently acts as a directory linking to data sources, it represents a collaborative foundation among JC3 members that can be further developed into a dynamic repository of climate threats and physical asset vulnerabilities. This could also bridge the gaps that hinder underwriting complex climate risks. Refining the data infrastructure can improve insurance as a proactive tool for national resilience and informed disaster planning.

- 2. To enhance standardised calculation of flood-related losses and develop a standardised framework.** By developing a standardised framework, Malaysia can ensure that data collected at the local level is comparable across sectors, thus allowing the benchmarking of Malaysia's resilience progress. This effort can be supported by DOSM in coordination with NADMA, as they are already involved in these efforts.

While DOSM's annual *Special Report on Impact of Flood in Malaysia* provides foundational data, existing figures likely underestimate the true economic loss due to the difficulty of accounting for factors that inform asset valuation. An enhanced calculation must account for sectoral variations in asset valuation, specifically distinguishing between public and private assets where differences in ownership, management, and existing insurance coverage significantly influence how losses are reported. For example, standardising how uninsured versus insured damages are recorded across different industries would provide a nuanced view of the protection gap.

Although adopting these rigorous valuation standards may result in higher reported financial losses, it would provide a more realistic baseline for risk pricing. Thus, enhancing these calculations is a prerequisite for developing a national insurance strategy that reflects Malaysia's climate-related financial exposure.

- 3. To promote investment in adaptation at the national level,** through risk-based insurance mechanisms that complement ongoing national mitigation and preparedness measures. Insurers can leverage their pricing influence to encourage policyholders to reduce physical vulnerabilities by offering incentives such as premium discounts or enhanced coverage for resilience upgrades. To mobilise these efforts at the national level, insurance-linked incentives must be integrated into a broader government-led support system. Malaysia can facilitate the support structure to make adaptation more accessible, specifically by establishing technical guidelines based on sectors, creating a country-led roadmap for adaptation that insurers can formally recognise.

This approach may break the uninsurability trap for certain sectors, particularly hard-to-abate industries. Standardising these incentives at a national scale can encourage the use of parametric insurance tied to resilience outcomes. This mechanism can provide automated payouts that preserve an industry's financial liquidity following a climate

⁶⁶ JC3, n.d.

event, ensuring that any government support acts as a strategic catalyst for private investment.

This recommendation aligns with the strategic pillars of Malaysia's National Adaptation Plan (MyNAP), specifically the goal to secure scalable and sustainable funding for adaptation efforts⁶⁷. By utilising these incentives in a coordinated national strategy, Malaysia can ensure that adaptation is treated with the necessary urgency.

4. **To establish a public-private risk-sharing framework.** To ensure long-term financial stability against growing climate risks, a formal public-private risk-sharing framework should be established that integrates the respective public-private partnership (PPP) proposals from both the government and insurance industry.

Given the limited capacities on both sides to fully absorb climate-related liabilities, a collaborative mechanism is needed to distribute these risks across a broader capital base through carefully structured layers of responsibility. This framework is specifically designed to ensure the government is not the ultimate backstop and that any government intervention is a measure of last resort rather than a primary guarantee.

The Unit Kerjasama Awam Swasta (UKAS) can facilitate the development of the framework as it complements existing UKAS functions, particularly in formulating policies and strategies for public and private partnerships⁶⁸. The framework provides a scalable blueprint for future climate-related insurance initiatives, ensuring the financial weight of the climate crisis is not borne by any single party in isolation.

6. Conclusion

Rethinking the role of insurance is essential for effective climate risk management in an increasingly unpredictable world. A foundational shift is required in how climate risk is perceived and financially assessed across Malaysia. Crucially, the financial burden of escalating climate impacts must be distributed equitably, ensuring neither the public nor the private sector faces systemic insolvency when climate disasters occur.

While insurance is increasingly recognised globally as an instrument for addressing climate change, any policy intervention in Malaysia must be rooted in domestic capacity to ensure viability and enforceability within the local landscape. Given that Malaysia's recorded flood-related losses reach hundreds of millions of Ringgit annually, insurance offers a dual-action solution. It offers predictable financial liquidity after a disaster and incentivises adaptation efforts before one occurs. By strategically re-evaluating the utility of insurance in the era of climate change, Malaysia can move toward securing long-term financial stability and national resilience.

⁶⁷ GIZ (2024)

⁶⁸ UKAS, n.d.

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