



INSIGHTS

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NEW RISKS RESHAPING AVIATION INSURANCE



From Aspiration to Action:
Shaping the Future of
Captive Insurance

Captive for ESG
Risk Management

When Storms Become
Economic Shocks

Editor's Note: Elevating Connections in a Complex World

Dear Readers,

As corporate risk landscapes grow increasingly volatile, success depends less on static capital and traditional insurance frameworks, and far more on how effectively we understand interconnected exposures.

In this issue, we explore how digital infrastructure, AI, and geopolitical threats are reshaping aviation risks beyond physical airframes. We examine how captive insurance vehicles empower organisations to bridge the ESG protection gap by turning abstract sustainability risks into financeable, resilient assets. Additionally, our analysis of storm and hurricane risks highlights how climate-conditioned analytics and innovative parametric tools help protect coastal economies against escalating economic shocks.

Central to navigating these emerging paradigms is human capital and fresh perspective. In this edition, I share the vision behind launching the LIA Women in Captive Insurance initiative on 10 September 2026. Designed to foster structured mentorship, executive visibility, and global market connectivity, this initiative reflects our core belief that diversity in risk leadership is a strategic imperative

Lasting industry progress is achieved when talent meets opportunity and ambition meets sponsorship. I invite you to dive into these pages and join us in actively shaping the future of global risk management.



Annie Undikai

Annie Undikai, Managing Editor

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The New Risks Reshaping Aviation Insurance



For most of aviation's history, risks were tangible and predictable. Whether it's a damaged airframe, an engine failure, an injured passenger, or a storm-forced diversion, traditional aviation insurance was built around clear, physical events. And underwriters perfected sophisticated models to price and transfer them.

However, modern exposures no longer require physical wreckage. The 2024 CrowdStrike outage showed how a failure in a critical third-party technology provider could bring aviation operations to a standstill, disrupting thousands of flights worldwide and leaving fully operational aircraft grounded.

The aircraft themselves were not damaged. The disruption came from the digital infrastructure supporting the network, creating widespread delays, passenger disruption, and significant operational and financial losses.

The challenge for insurers lies not only in the increasing number of risks but also in the diminishing boundaries between them.

Other threats are even more difficult to detect: satellite spoofing provides inaccurate navigation data to a cockpit, or an autonomous AI makes an erroneous operational decision. In both scenarios, insurers are confronted with a new reality. Who bears the liability when a mistake is made by the code?

These are no longer hypothetical scenarios. They point to a fundamental shift in aviation risk. The challenge for insurers lies not only in the increasing number of risks but also in the diminishing boundaries between them.

Risk Is No Longer Where We Expect It To Be

Aviation has transformed into a highly interconnected ecosystem. Airlines depend on airports, which in turn rely on software providers. Manufacturers count on global suppliers, while navigation systems are supported by satellites—all seamlessly integrated by AI and data.

While this integration drives massive efficiency, it also breeds systemic concentration risk: a single digital point of failure can trigger a rapid, cascading crisis across the entire network.

Cyber risk provides the clearest example of the growing threats. Thales reported a 600% year-on-year increase in ransomware attacks against the aviation sector, recording 27 major attacks involving 22 ransomware groups between January 2024 and April 2025.

The targets, however, extended beyond just airlines. Airports, navigation systems, manufacturers, and suppliers were all at risk. The importance lies not solely in the growth metric, but in the structural vulnerabilities that these attacks reveal within the aviation ecosystem.

However, the most vulnerable point might not be within the airline itself. In June 2025, a cyber incident at Qantas stemmed from a customer relationship management platform. Around 5.67 million customer records were compromised, according to Australia's Office of the Australian Information Commissioner.

Although the incident did not involve an aircraft, it created a significant aviation insurance exposure through data, privacy, incident response and potentially reputational costs.

Traditionally, the insurance market divided risk into two categories: physical aviation liabilities and digital cyber exposures. However, modern aviation makes this distinction outdated.

Nowadays, software vulnerabilities, cyber intrusions, and supplier outages lead to operational challenges and tangible consequences. This shift calls for a cohesive underwriting model that acknowledges systemic cross-domain risk.



The Next Test Is Operational, Not Just Digital.

In September 2025, a cyber incident affecting Collins Aerospace's MUSE software disrupted check-in and boarding processes at Heathrow, Brussels, and Berlin airports. This incident highlighted the vulnerability of interconnected airport networks. As a result, passengers experienced delays, cancellations, and manual processing as airports sought to operate without the compromised systems.

The lesson can easily be overlooked. The attack didn't have to target an aircraft to disrupt aviation; it merely needed to affect something that the aviation industry relies on.

For insurers, that changes the underwriting question. Instead of asking only, "What can happen to this aircraft or airline?", underwriters increasingly need to ask, "What does this organisation depend on, and what happens if one of those dependencies fails?"

Addressing this risk demands comprehensive oversight across the ecosystem, including technology vendors, cloud infrastructure, maintenance systems, telecommunications, and supply chains. It also involves a careful consideration of accumulation.

When a single software vendor powers dozens of airlines and airports, one breach can trigger massive, simultaneous losses across the entire sector. The traditional concept of geographic accumulation may no longer be enough.



Insurers may need to understand digital accumulation, where the common exposure is not a location but a piece of software, a cloud platform, or a technology supplier. This presents a profound challenge for the market, as systemic risk is exceptionally difficult to detect before a loss event.

AI Makes The Liability Question Harder

Artificial intelligence (AI) adds another layer of uncertainty. AI is moving from being a tool that assists humans to systems that can increasingly recommend, decide and act. In aviation, its applications could range from maintenance and predictive analytics to flight operations, customer service, security and autonomous systems.

While the attraction is obvious, so is the insurance problem. What happens when an AI system produces an incorrect output? What if it relies on flawed training data? What if someone manipulates it? What if its decision causes a financial loss but no physical damage? And who ultimately carries the responsibility: the developer, software provider, aircraft manufacturer, airline, or human operator?

Regulators are already confronting these questions. The EU AI Act took effect in February 2025, rolling out its initial wave of prohibitions on high-risk AI practices. As of August 2026, the wider regulatory framework is entering a significant new phase of application and enforcement.

At the same time, the EU's revised Product Liability Directive explicitly brings software, including AI systems, within the concept of a product for liability purposes. For insurers, this creates an uncomfortable overlap between cyber, technology errors and omissions, product liability, professional liability and aviation liability.

Insurers may need to understand digital accumulation, where the common exposure is not a location but a piece of software, a cloud platform, or a technology supplier.



The issue has evolved beyond just determining if an AI-related loss is insurable. It's now about whether the market can clearly identify which policy should take responsibility. This differentiation will become increasingly crucial as the aviation industry adopts AI on a larger scale.

Invisible Threats Hide In Plain Sight.

The most dangerous threats rarely look like cyberattacks. Consider the global navigation satellite system (GNSS) interference. GNSS jamming simply blocks satellite signals, but spoofing actively feeds fake location data to cockpit systems. Both tactics are accelerating across conflict zones, quietly turning everyday flight instruments into liabilities.

The European Union Aviation Safety Agency (EASA) and the International Air Transport Association (IATA) warned of the continued rise in GNSS interference across Eastern Europe and the Middle East. They called for stronger coordination and mitigation measures.

EASA's August 2026 assessment underscored a sharp rise in GPS jamming and spoofing since 2022, especially across the Mediterranean, Black Sea, Middle East, Baltic, and Arctic conflict zones.

The real danger does not stem from new threats, but rather from the intersection of existing ones. Jamming, navigation loss, and warfare have been around since the advent of flight; however, their dynamic convergence leads to unparalleled operational vulnerabilities.

A navigation disruption can lead to rerouting, delays, diversions, and additional operating costs. An interference event driven by political motives may exhibit cyber characteristics, yet it doesn't align perfectly with standard cyber policies. Furthermore, losses can happen even without any physical damage to an aircraft. This is exactly where conventional insurance categories begin to face challenges.

The Real Challenge Is Not Creating More Policies.

While emerging risks often trigger product creation, product innovation alone cannot resolve aviation's systemic exposure. Insurers require deeper risk intelligence before they require new policy structures.

Underwriters need visibility into four key areas: technology deployment, critical dependencies, supplier-network links, and failure scenarios. Insurers need clear policy language that explicitly defines where physical, digital, and operational losses begin and end.

Proactive risk management requires resolving claims protocols long before a loss actually materialises.

If a cyber incident shuts down an airport's check-in system, does the policy respond to the airline's lost revenue? What about passenger accommodation? What about airport charges? What if the same technology provider serves 50 insureds? If an AI system contributes to an operational error, where does liability sit?

These are not questions that can be solved by insurers alone. Technology providers, airlines, airports, regulators, brokers and reinsurers all have a role in defining the risk.

The future of aviation insurance will not belong simply to those who can price emerging risks. It will belong to those who can understand how those risks connect.

The next aviation loss might not originate from an aircraft. Instead, it could stem from a line of code, a supplier, a satellite signal, or a decision made by a machine. By the time this loss manifests at the runway, it may have already traversed a significant portion of the aviation ecosystem.

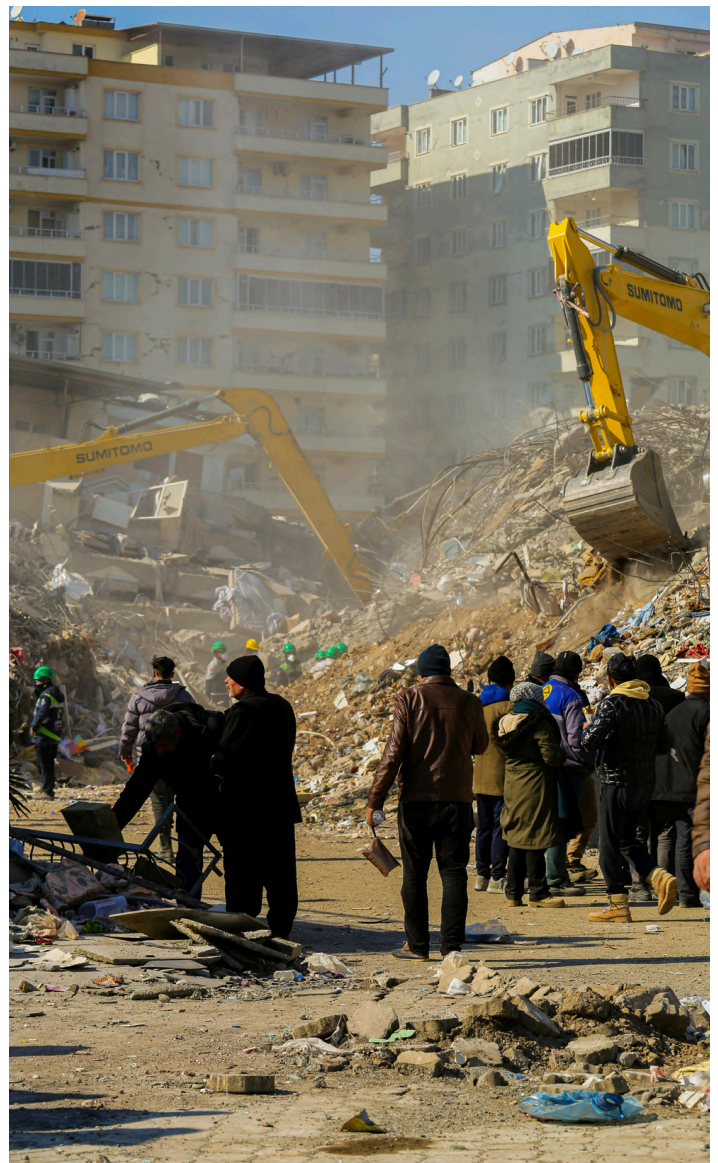
These pressures compound one another. Higher repair costs amplify catastrophe losses, while litigation extends claim lifecycles. Reinsurance responds with higher pricing, which feeds back into primary market affordability. The system is increasingly interconnected.

Conditional Future for Protection

The insurance landscape is transforming into a more nuanced arena. It is becoming increasingly conditional, with coverage more affected by measurable resilience, data transparency, and the ability to manage risk at the property level. The line between what is insurable and uninsurable is no longer fixed; it evolves in response to advancements in technology, financial circumstances, and public policy changes.

The central question is no longer whether risk is present to how society decides to allocate the necessary tools to manage it. In this context, the future of insurance extends beyond mere climate adaptation. It revolves around whether access to protection will serve as a common basis for resilience or create a divide between those who can afford to adapt and those who cannot.

The primary question has shifted from whether risk is present to how society decides to allocate the necessary tools to manage it.



FROM ASPIRATION TO ACTION



**SHAPING THE FUTURE
OF CAPTIVE INSURANCE**

The global captive insurance landscape is undergoing a profound evolution, driven by increasing risk sophistication and the demand for innovative risk management structures. At the heart of this transformation within the Labuan International Business and Financial Centre (Labuan IBFC) is Annie Undikai, Founder and Group Managing Director of Brighton Group, Chairman of the Labuan International Insurance Association (LIIA), and Lead Founder of LIIA Women in Captive Insurance.

Ahead of the highly anticipated launch of LIIA Women in Captive Insurance on 10 September 2026, we sat down with Annie for an in-depth conversation on her vision for the industry, the strategic imperative of diversity in risk management, and how this new platform aims to turn ambition into opportunity.

Q: The captive insurance sector is evolving rapidly across Asia and globally. Beyond balance sheets, capital reserves, and corporate structures, what do you believe will truly drive the future of this industry?

Annie Undikai: The future of captive insurance will not be shaped by capital and structures alone. It will be shaped by people, ideas, relationships, and the willingness to step forward.

Captive insurance is fundamentally an inclusive and highly adaptable risk management instrument. It was created to address risks that traditional commercial insurance markets either could not handle or priced inefficiently. However, as corporate risk landscapes become more volatile, which is driven by geopolitical shifts, climate vulnerabilities, regulatory changes, and economic disruptions, the governance and leadership surrounding captives must also become more dynamic.

LIIA has long served as a unifying voice for the Labuan IBFC re/insurance community, bringing together insurers, reinsurers, brokers, managers, and captive owners who collectively drive market growth. As the industry grows more sophisticated, international, and central to how global organizations navigate complex risks, that evolution requires diverse perspectives and innovative thinking. We need fresh minds, non-traditional approaches, and leaders who are prepared to challenge long-held industry assumptions.

Q: On 10 September 2026, LIIA is launching the "LIIA Women in Captive Insurance" initiative. What was the catalyst behind creating this dedicated platform within LIIA?

Annie Undikai: Now is the time to strengthen our community further. Over my years in the re/insurance space, I have seen an incredible pool of female talent across risk management, legal, regulatory, and corporate leadership roles. Yet, we recognized that while talent is abundant, talent alone isn't enough.

Women in our industry need direct access to networks where they can exchange ideas, find mentors, build confidence, and unlock new opportunities. They need platforms where their expertise is visible, their voices are heard, and their ambitions are taken seriously. Because captive insurance is an inclusive instrument at its core, it is only natural that we established a dedicated women's vertical within our ecosystem.

Inclusion is in our DNA. This initiative was designed to turn ambition into opportunity, shifting the focus from mere connection to true collaboration, from experience to active mentorship, and from visibility to executive leadership. This isn't about creating another networking group. It is about creating a community where a woman can say: 'I have someone to learn from,' 'I have somewhere to turn,' 'My experience has value,' and 'I have a voice at the table.'



Q: Mentorship and professional development are central pillars of this movement. What do you see as the biggest hurdle for women climbing the ranks, and how does this platform help solve it?

Annie Undikai: One of the main challenges isn't a lack of technical competence. It is often a lack of structured mentorship, sponsor support, and executive visibility. In specialised financial sectors, decision-making circles can remain relatively tight, making it harder for mid-career professionals to access top-tier advisory networks or board-level exposure

Through LIIA Women in Captive Insurance, we aspire to bridge that gap by connecting early- and mid-career women directly with industry leaders through structured mentorship and knowledge-sharing initiatives. We are focused on turning experience into guidance and knowledge into confidence.

Fostering meaningful opportunities for inclusion in panels, working groups, and leadership discussions is essential. This approach ensures that qualified women gain the visibility and platform they need to progress naturally into senior leadership positions.

Q: How will this initiative function across the broader captive ecosystem, and what specific activities or engagement mechanisms can members expect?

Annie Undikai: LIIA Women in Captive Insurance operates directly under the existing LIIA Captive Sub-Committee. It brings together professionals across the entire value chain, including captive owners, managers, risk professionals, advisors, and regulators.

To ensure this initiative delivers continuous, tangible value rather than standard networking, we have developed a structured roadmap of engagement. It starts with **The Captive Exchange**, which is our quarterly "*Women in Conversation*" series that will dive deep into technical trends, emerging risk classes, regulatory updates, and strategic management.

Complementing that technical depth is **The Captive Collective**, our bi-annual, informal gatherings designed to cultivate genuine relationships and peer support.

**We are focused on turning
experience into guidance
and knowledge into confidence.**

Q: Captive insurance is an international business. How does LIIA Women in Captive Insurance plan to interface with the international market?

Annie Undikai: Diversity and growth shouldn't exist in a regional silo. One of our core strategic objectives is to create global links with established international organisations. For instance, we look at global benchmarks like the Captive Insurance Companies Association's (CICA) "Amplify Women" initiative, which launched in 2019 to advance leadership exposure and professional networks.

Asia's captive market is uniquely diverse, yet the fundamental challenges and opportunities surrounding risk leadership remain universal. Establishing these global bridges ensures our local insights contribute directly to international discussions, while giving our members front-row access to global best practices.

By connecting our platform with similar international networks, we open doors for cross-border knowledge exchange, international mentorship, and elevated market connectivity for our members across Asia and beyond.

Q: You've emphasised that this initiative is open to male allies as well. What role do male leaders play in this vision?

Annie Undikai: Sustainable progress isn't something one group achieves in isolation. Real industry evolution requires shared responsibility.

The initiative is fully open to all professionals—both members and non-members—who believe in advancing talent and strengthening the broader captive community. Men and women alike play critical roles as mentors, advocates, sponsors, and champions for the next generation.

In fact, active allyship is embedded into our launch campaign strategy. We are calling on respected male leaders across the financial services sector to visibly advocate for our initiatives, engage in our events, and champion gender diversity within their own organisations, boards, and selection committees.

We need leaders who are prepared to open doors, challenge traditional thinking, and actively support women as they step into pivotal governance and leadership roles.

Q: If you could leave the global insurance community with one final thought as this launch approaches, what would it be?

Annie Undikai: Progress isn't an abstract concept—it is a choice that each of us makes in how we build our teams, sponsor rising talent, and structure our decision-making tables. The strength of our industry has always come from its people, but its future resilience depends on how effectively we cultivate and elevate every voice within it.

Whether you are a young professional taking your first steps in risk management, a senior executive with years of experience to share, or a male ally in a position to advocate for talent, there is a clear and meaningful role for you here. Real, lasting transformation doesn't happen overnight or through a single event, but through consistent, intentional choices to open doors, share insights, and challenge the status quo

Ultimately, this initiative is about building a lasting impact. When we create spaces where talent meets opportunity and ambition meets sponsorship, we don't just elevate individual careers; we raise the standard for the entire industry.



I invite everyone across the insurance ecosystem—captives, reinsurers, brokers, managers, and regulators alike—to step forward on September 10th and beyond. Let's not just watch the industry evolve; let's actively shape it together and build a movement that redefines risk leadership for generations to come.

CAPTIVE

FOR ESG RISK MANAGEMENT



Businesses worldwide face a growing convergence of environmental, social, and governance (ESG) risks. Extreme weather, human rights issues in supply chains, regulatory change, cyber threats, and emerging environmental liabilities can disrupt operations, damage reputations, and weaken long-term financial resilience.

Yet many of these exposures are difficult to insure through traditional commercial markets. Conventional insurance is generally built around established risks, historical claims data, and exposures that can be modelled with reasonable confidence.

ESG risks often do not fit that mould. They are interconnected, evolving rapidly, and in some cases lack sufficient historical data to support conventional pricing and underwriting.

This creates a growing protection gap. As ESG risks become harder to insure, organisations need greater control over how these exposures are identified, retained and financed.

Captive insurance provides that control. By establishing a dedicated insurance entity, companies can retain and finance difficult-to-insure risks, design coverage around their specific exposures, and build internal capacity

to absorb future losses. A captive is therefore more than an alternative insurance structure. It can become a strategic tool for making ESG risk management measurable, financeable, and closely aligned with broader corporate resilience.

The Escalating ESG Protection Gap

The challenge becomes clearer when considering the types of risks businesses are now taking on.

Novel green technologies, including hydrogen production, industrial carbon capture, and utility-scale battery storage, present operational profiles that standard underwriting models may struggle to assess accurately. Insurers may have limited claims experience from which to determine appropriate pricing, limits, deductibles, and coverage terms.

Climate risk presents a similar challenge. Physical exposures such as flooding, wildfires and severe storms are becoming more volatile. Meanwhile, transition risks can arise from changing technologies, regulations, carbon policies and market expectations.

Insurers are also reducing capacity for certain carbon-intensive industries or applying tighter terms to secondary climate perils.

The social and governance dimensions create further uncertainty. Labour standards across multi-tiered supply chains and human rights obligations can create complex liabilities.

Geopolitical instability, cybersecurity and data privacy add further layers of risk. Rapidly evolving ESG disclosure requirements can also create liabilities that are difficult to define within conventional policy structures.

The result can be higher premiums, tighter limits, significant sub-limits and exclusions precisely where businesses need protection most.

When commercial coverage is unavailable, prohibitively expensive, or too restrictive, organisations can be left carrying material exposures on their own balance sheets. A captive provides a structured, regulated alternative.

It enables the parent company to retain risks for which it possesses the financial capability and expertise, while still being able to access reinsurance or commercial options when external risk transfer is deemed suitable.

The objective is not to replace commercial insurance altogether. It is to create greater choice over what risks to retain, what risks to transfer, and how much capacity to maintain for each.



What Is Captive Insurance in the ESG Context?

At its core, captive insurance involves establishing an in-house insurance subsidiary to cover selected operational and financial risks of the parent organisation and its affiliates. Instead of transferring every exposure to an external commercial carrier, the organisation retains some risk within a controlled insurance vehicle.

In the ESG context, this structure can address exposures across the three pillars. These may range from climate and environmental exposures to supply-chain and workforce risks, as well as emerging regulatory, cybersecurity and data privacy challenges.

A well-structured captive provides three primary advantages: cost control, tailored coverage, and financial resilience.

Cost control comes from reducing reliance on commercial insurer overhead, distribution costs, and profit margins, while giving the parent greater control over its risk-financing budget. This can help reduce dependence on volatile commercial market pricing.

Tailored coverage allows risk managers to develop policy terms around exposures that standard market contracts may restrict, sub-limit or exclude. The captive can be structured around the organisation's actual risk profile rather than forcing emerging exposures into standard policy templates.

Financial resilience is achieved by maintaining underwriting profits and surplus capital within the corporate group, while adhering to the captive's regulatory and capital requirements. Over time, this approach can enhance loss-absorbing capacity and offer increased internal liquidity when unforeseen risks arise.

How Captives Apply ESG Risk Transfer

A well-structured captive can address risks across all three ESG pillars by turning broad sustainability objectives into specific, measurable exposures that can be identified, financed and, where appropriate, transferred.

A well-structured captive provides three primary advantages: cost control, tailored coverage, and financial resilience.

Environmental Risk Protection: The "E"

Climate change creates both physical and transition risks, and captive structures can provide flexibility across both.

For physical asset protection, captives can provide bespoke property and business interruption coverage for climate-related events such as hurricanes, severe flooding and wildfires. This is especially valuable when commercial capacity is constrained or terms have become restrictive.

Captives can also support the energy transition by providing tailored coverage for renewable energy projects and emerging sustainability infrastructure. Technologies such as hydrogen, carbon capture and large-scale battery storage can present risks that are still developing and therefore difficult to price using traditional loss histories.

For emissions and pollution liabilities, captive programmes can provide tailored environmental impairment liability coverage, helping organisations manage exposures associated with pollution incidents, environmental remediation and evolving regulatory requirements.

The role of the captive here is not simply to insure a green asset. It is to create a risk-financing structure that can evolve as the technology and its risk profile mature.

Social Risk Management: The "S"

Social risks centre on people, human capital, workplace practices, and supply-chain integrity.

Captives can finance proactive measures that protect employees and support their well-being, while incorporating risk-mitigation incentives into underwriting and



coverage structures. This can encourage investment in workplace safety and loss-prevention programmes.

For employee wellbeing, captives can also support tailored employee-benefit and wellness programmes, particularly where multinational organisations face fragmented coverage across jurisdictions.

Supply-chain risks present another area of opportunity. Human rights violations, labour disputes, supplier misconduct or failures to meet required labour standards can interrupt production and damage corporate reputation.

Captive structures can be designed to address selected business interruption and contingent exposures associated with supply-chain disruption, subject to the underlying risk and regulatory requirements.

The broader objective is to connect risk financing with the organisation's responsibility to its employees, suppliers and wider stakeholder ecosystem.

A captive should complement governance and compliance controls, rather than replace them.

Governance and Regulatory Risk: The "G"

Governance risks can carry significant legal, financial, and reputational consequences.

Captives can support risk financing for selected defence costs, investigation expenses and other insurable liabilities associated with evolving regulatory requirements and corporate governance exposures, subject to applicable laws and policy terms.

Cybersecurity and data privacy are increasingly important within this category. Captives can provide tailored cyber risk coverage for exposures such as data breaches, ransomware demands, business interruption and regulatory costs as data protection requirements expand globally.

Captives can also complement broader governance frameworks by supporting insurance arrangements around areas such as directors' and officers' liability, professional liability and other corporate risks where conventional market capacity may be constrained.

The key is discipline. A captive should complement governance and compliance controls, rather than replace them.

Beyond Risk Transfer: The Strategic Role of the Captive

The strongest ESG captive programmes do more than pay claims. They create a feedback loop between risk identification, prevention, financing and performance.

Because the parent organisation retains greater visibility over its own loss experience, it can use claims data to identify recurring problems and direct investment towards prevention. Better workplace safety can reduce losses. Improved supply-chain controls can reduce disruption.

Stronger cyber defences can lower the frequency and severity of incidents. Over time, the captive can therefore become a source of information as well as insurance capacity.

This is particularly valuable for ESG risks because many are difficult to measure using conventional insurance metrics alone. A captive can help translate broad sustainability objectives into financial measures such as loss frequency, claims severity, risk-adjusted cost, retained exposure and capital requirements.

Building Sustainable Enterprise Value

ESG risk management is no longer simply a reporting or sustainability function. It is increasingly a question of financial resilience and operational continuity.

Relying only on traditional commercial insurance can expose businesses to risks during capacity constraints or price increases. A captive insurance option allows organisations to retain manageable risks while transferring larger ones and customising the financing structure based on their actual risk profile.

The real value of an ESG captive is therefore not simply filling gaps left by the commercial market. It is giving organisations greater control over risks that are difficult to predict, price, and transfer.

As ESG exposures continue to evolve, that control can become an important source of long-term financial resilience, helping organisations protect the balance sheet while turning sustainability risks into risks that can be measured, managed and financed.



WHEN STORMS BECOME ECONOMIC SHOCKS

Storms and hurricanes are no longer merely seasonal hazards for coastal areas. They now challenge cities, businesses, insurers, and governments to understand evolving risk conditions.

A powerful storm can destroy buildings, disrupt supply chains, close ports and airports, interrupt electricity and communications, and leave businesses without revenue for weeks or months. Yet the financial consequences are not determined by the storm alone.

They are shaped by where people build, how much property is concentrated in exposed areas, how resilient those assets are, and how much of the resulting loss insurance can absorb.

This distinction is critical because, in many regions, the economic cost of tropical storms and hurricanes is rising faster than the physical threat. Climate change is intensifying storm surge and extreme rainfall risks, while development patterns are increasing vulnerability. More homes, businesses, and infrastructure are being built in coastal areas, heightening potential damage.

The central challenge, therefore, is not simply predicting the next storm. It is understanding what will be at risk when it arrives.

The Risk Is Changing On Two Fronts

Warmer oceans and a warmer atmosphere can provide tropical systems with more energy and moisture. Higher sea levels can also allow storm surge to reach further inland, increasing the potential for coastal flooding.

At the same time, heavier rainfall can compound wind and surge damage, overwhelming drainage systems and creating secondary disruption far from the coastline. But climate change is only part of the story. The other driver is exposure.

Coastal populations have grown rapidly in many parts of the world. Valuable residential developments, ports, industrial facilities, warehouses, tourism infrastructure and transport networks have increasingly concentrated around coastlines.

In some locations, development has outpaced the expansion of flood defences, drainage systems and other measures designed to protect against these risks.

That creates a difficult equation. Even if the likelihood of a particular event changes only slightly, the financial loss can rise sharply because more people, property, and economic assets are exposed.

A storm that caused manageable losses 20 years ago can cause far greater economic damage today because it may now hit a larger and more valuable concentration of buildings, infrastructure and businesses.

For insurers and businesses, this means that historical loss experience can provide only part of the answer. The physical hazard may be familiar, but the exposure beneath it is constantly changing.

Protection Gap Worsens the Problem

The financial repercussions intensify when insurance coverage fails to align with the level of exposure. Flooding is a particularly important example.

Tropical cyclones can generate substantial flood losses through storm surge, extreme rainfall and river flooding, yet these risks are often excluded, subject to separate deductibles or inadequately insured. Globally, more than 80% of flood losses caused by tropical cyclones remain uninsured, according to Swiss Re Institute analysis.

The result is a protection gap that shifts the burden of recovery away from insurers and onto businesses, households and governments.

For a company, an uninsured loss can mean delayed reconstruction, lost revenue and pressure on cash flow. For a household, it can mean an inability to rebuild. For a government, it can mean diverting public funds from infrastructure, healthcare or development programmes towards emergency response and reconstruction. And the consequences can persist long after the storm has passed.



A factory may be physically repaired but unable to operate because a nearby road or port remains closed. A logistics company may have undamaged warehouses but no electricity, communications, or functioning suppliers.

This is why measuring the protection gap only through physical property damage can underestimate the real economic vulnerability.



Risk Models Need To Look Ahead

Traditional catastrophe models have relied heavily on historical observations. Those records remain valuable, but they can become less informative when climate conditions, development patterns and asset values shift.

The industry is increasingly moving towards climate-conditioned modelling that incorporates how physical risks may evolve under different climate scenarios.

Advanced data and analytics can also provide a much more granular view of individual assets. Swiss Re's CatNet and Risk & Data Services, for example, allow users to combine hazard information with detailed property and location data.

This approach can help insurers and corporates understand not only whether an asset sits in a hurricane-prone region, but how specific characteristics of that asset influence its potential loss.

Incorporating asset-level data into underwriting processes and risk assessments can reveal concentrations of risk that may not be visible through regional averages. Building interdisciplinary teams by combining underwriters, data analysts, and risk engineers can help ensure insights from advanced analytics are applied to pricing, product development, and reinsurance strategies.

Regularly updating models with new data, collaborating with technology partners, and investing in staff training on interpretation of analytic outputs are practical steps that can embed these capabilities into everyday decision-making.

The concept of a digital twin takes this further. By creating a digital representation of an asset and its surrounding environment, risk managers can examine how different hazards could affect a particular location.

This matters because two properties in the same city can have very different risk profiles. One may sit on higher ground, have stronger construction, and protected critical equipment. Another may be more exposed to flooding, depend on vulnerable infrastructure, and contain high-value machinery at ground level.

A regional risk score may treat them as broadly similar, but a granular assessment will not. The shift towards more detailed data is therefore changing catastrophe risk from a broad geographic exercise into a more precise asset-level discipline.

That creates a difficult equation. Even if the likelihood of a particular event changes only slightly, the financial loss can rise sharply because more people, property, and economic assets are exposed.

Address Loss Beyond The Building

The financial impact of a tropical storm rarely ends with repairing physical damage. For many businesses, the larger problem is what happens while operations are interrupted.

When a storm disrupts operations, businesses suffer financial losses beyond physical damage, including prolonged revenue declines from employee absenteeism, customer loss, and supply chain disruptions. Even after repairs, companies may struggle with lost customers, reduced market share, and ongoing rebuilding costs.

Coastal populations have grown rapidly in many parts of the world. Valuable residential developments, ports, industrial facilities, warehouses, tourism infrastructure and transport networks have increasingly concentrated around coastlines.

Traditional insurance can struggle to capture some of these consequences, particularly when the loss is difficult to quantify or falls outside conventional coverage. This is where alternative risk transfer and parametric insurance can play a role.

Parametric insurance offers a pre-established payment once a specified trigger such as wind speed, rainfall, or storm intensity is met. This approach facilitates rapid liquidity following an event, enabling businesses or governments to finance immediate recovery efforts without the delays associated with a lengthy loss-adjustment process.

Localised products can also address specific protection gaps. Hong Kong's Insur8 typhoon warning coverage, for example, illustrates how insurance can be structured around a clearly defined weather trigger rather than relying solely on traditional property damage assessment.

This approach has enabled businesses and public entities to receive timely funds for recovery, even when losses are difficult to assess immediately. By adapting such models to different regions and perils, insurers can close protection gaps and build more resilient financial strategies.

Such products are not a replacement for conventional insurance. Their value lies in filling specific gaps, particularly where speed, certainty, or coverage for indirect financial impacts matters. The overarching lesson is that resilience increasingly requires a broader insurance toolkit.





Preparing For The Storm

The hardest part of tropical storm risk management is preparing for a future that does not look exactly like the past.

The question is no longer simply whether a particular coastline has experienced a major storm before. It is whether the coastline, its population, its infrastructure, and its economic value have changed since the last event. They almost certainly have!

That makes forward-looking risk assessment essential. Insurers require improved exposure data, businesses must understand asset vulnerabilities and supply chains, and governments should factor in future climate and hazard conditions in development. All three parties must acknowledge that resilience cannot be achieved through a single intervention.

Tropical storms will continue to test coastal economies. The most resilient communities will not necessarily be those that experience fewer storms. They will be those that understand their changing exposure, invest before losses occur, and ensure that the financial consequences of a catastrophe do not become a second disaster. The storm itself may be unavoidable, but the scale of the loss is not.