Sectoral brief

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Reducing Risks Together: *Multi-hazards and multi-risks in the tourism sector*

myriad_eu

Executive summary & Recommendations

Tourism remains a vital economic sector but faces mounting risks from climate change, natural hazards, pandemics, and cascading disruptions across interdependent systems such as transport, energy, and agriculture. Conventional crisis management—focused on single hazards or generic disruptions—has proven insufficient in addressing the systemic, multi-hazard nature of these risks.

The Horizon 2020 MYRIAD-EU project offers a robust, science-based multi-risk framework that integrates hazard analysis, vulnerability assessment, and adaptive policy pathways. Applied in pilot cases like La Palma (Canary Islands), it demonstrates how destinations can identify both direct risks (e.g., infrastructure damage, business interruption) and indirect risks (e.g., supply-chain failures, reputational losses), while building forward-looking, climate-resilient strategies.

Key insights include the need to:

- Map systemic interdependencies between tourism and other sectors.
- Incorporate dynamic, scenario-based planning rather than static risk assessments.
- Strengthen governance and coordination among stakeholders.
- Provide financial protections and incentives for SMEs and local operators.
- Integrate sustainability and resilience without delaying economic recovery.

The MYRIAD-EU approach aligns with EU priorities under the Green Deal and Climate Adaptation Strategy, offering a clear roadmap for destinations to move from reactive crisis management to proactive resilience building.

Recommendations:

- **Mandate multi-hazard risk modeling** for all major tourism investments to capture direct, indirect, and cascading risks.
- **Adopt phased integration of MYRIAD-EU's six-step framework** into tourism policies, budgets, and destination master plans.
- **Leverage public–private partnerships** with incentives (e.g., tax credits, subsidised insurance) for hazard-resilient infrastructure and sustainable practices.
- **Deploy observatories and dashboards** to monitor risks and resilience metrics transparently, enhancing stakeholder trust.
- **Promote regional and global scaling** by replicating successful pilots (e.g., Canary Islands) and sharing best practices internationally.
- **Strengthen financial protections for SMEs and workers** through dedicated insurance schemes, relief funds, and risk pools.
- **Integrate adaptive land-use and sustainability policies** to balance short-term recovery with long-term resilience, avoiding maladaptation.

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1. Introduction: Moving Beyond Generic Crisis Management

The tourism sector remains a global economic powerhouse, yet its vulnerability to increasingly frequent and interconnected risks—from extreme weather to supply-chain disruptions—has never been more pronounced. Traditional crisis management models in tourism often focus on single hazards (e.g., a hurricane or earthquake) or generic disruptions (such as a reputational crisis), paying limited attention to systemic, cascading, and multi-hazard risks. This narrow approach leaves destination managers underprepared for a world where climate change, pandemics, and overlapping disasters amplify each other's impacts, causing long-lasting damage to the visitor economy, local communities, and critical infrastructure.

This policy brief makes the case for a more advanced, risk-based methodology rooted in the Horizon 2020 MYRIAD-EU project. MYRIAD-EU explicitly addresses multi-hazard and systemic risk, providing a structured set of tools and frameworks that help destinations capture both direct (e.g., damage to hotels and transport links) and indirect (e.g., disrupted supply chains, lost livelihoods, reduced revenues) threats. By incorporating intersectoral dependencies—for example, water resources shared among tourism enterprises, agriculture, and local communities—MYRIAD-EU promotes a new level of sophistication that has been lacking in conventional tourism resilience plans.

The MYRIAD-EU methodology supports the European Commission's objectives under the Green Deal and the EU Climate Adaptation Strategy by ensuring that tourism development integrates systemic risk analysis. This aligns with the EU's vision for a sustainable, climate-resilient tourism industry.

2. Application of the MYRIAD-EU Framework to Tourism Destination Resilience

Drawing on systemic risk research and extensive stakeholder engagement, the MYRIAD-EU multi-risk framework (Hochrainer-Stigler et al., 2023), offers a six-step process that has been translated as a multi-risk approach to enhance resilience of tourism destinations - moving beyond static, single-hazard and generic destination crisis management planning. While these six steps are distinct, they should be regarded as an iterative cycle. In parallel, a deeper tourism-focused approach—particularly outlined in the project's Pilot Application in La Palma, Canary Islands infuses each step with stakeholder engagement, multi-hazard risk and vulnerability assessments, option prioritization, and continuous monitoring. Together, they provide a science-based, operational roadmap for resilience.

2.1 Define the System

MYRIAD-EU begins by systematically delineating the "destination system." For tourism, this boundary-setting exercise means identifying:

- Physical assets such as coastlines, coral reefs, or UNESCO heritage sites.
- Market linkages (hotels, attractions, SMEs, transport services).
- Governance structures (ministries, tourism boards, DMOs, civil protection agencies).
- Natural environment (water basins, protected areas, biodiversity hotspots).

By bringing in stakeholder engagement and scoping—the first element of a Destination and Resilience Framework—tourism managers map out who influences or depends on these resources (e.g., local communities, supply-chain partners), and where gaps in resilience knowledge may exist. This ensures that no hidden dependencies or critical players are

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missed, setting a solid foundation for the next steps.

Tourism is not an isolated system but is deeply embedded within local infrastructure, environmental resources, and socio-economic structures. In the Canary Islands, tourism relies heavily on shared resources such as water, energy, and food supply, creating interdependencies with other sectors such as agriculture, transportation, and urban development. These linkages mean that hazards affecting one sector often trigger cascading impacts on tourism operations, highlighting the need for cross-sectoral risk assessments.

2.2 Characterise Direct Risk

With system boundaries clear, MYRIAD-EU calls for rigorous hazard identification and their interactions to capture immediate impacts on tourism infrastructure, visitor flows, and business continuity. Specifically:

- **Quantitative (Asset-Level Modelling)**: Model damage to hotels or attractions (e.g., flood depth + building vulnerability) to yield a monetary loss estimate of repair/replacement costs.

- **Semi-Quantitative (Hazard Overlays & Indices)**: Map hazards (floodplains, wildfire zones) over resorts and landmarks, then apply socio-economic indicators as aggravating factors that amplify the direct risk. Output is a ranked "hotspot" map showing which sites face the highest direct damage potential.

- **Qualitative (Scorecard Approach):** In a scenario-based workshop (e.g., a volcanic eruption), local tourism stakeholders collectively rate how severely key facilities might be hit under a drought scenario, they might score the accommodation sector's vulnerability to water shortages. These consensus-based rankings help pinpoint where immediate protective investments are most needed (Khazai et al., 2016)

MYRIAD-EU's approach ensures that each hazard's distinct attributes are factored into "threshold metrics"—like damage to critical tourism infrastructure (e.g., major resorts or airports) or the share of businesses experiencing losses beyond a certain point. In line with the Dynamic Adaptive Policy Pathways - Multi Risk (DAPP-MR) approach developed in MYRIAD-EU (Schlumberger et al., 2022), these threshold metrics define "tipping points" where an existing measure (e.g., a flood barrier or early warning system) can no longer provide the required level of resilience. Once that tipping point is reached (or is clearly on track to be reached), decision-makers can adapt or switch to a new set of measures, keeping the disaster risk management plan effective under changing multi-hazard conditions.

2.3 Characterise Indirect Risk

A core principle of MYRIAD-EU is to capture ripple effects that propagate— for example transportation bottlenecks, power outages, or labour shortages—that arise when a primary hazard cascades across multiple sectors. In tourism, for instance, a drought that decimates local agriculture forces hotels to pay higher prices for produce—or face outright shortages. Likewise, landslide-driven road closures can interrupt tourist flows, slashing revenues and harming the destination's reputation. Rather than viewing these impacts merely as extensions of direct damage, the MYRIAD-EU multi-risk perspective recognises that such cascading losses can be critical to the destination's long-term resilience.

As with direct risks, indirect risks can be assessed using quantitative, semi-quantitative, and qualitative methods, but with a focus on the cascading or second-order effects that emerge from interlinked systems:

- **Quantitative (Input–Output Analysis):** Input direct-damage estimates (e.g., an airport closure) into an economic model to see how lost arrivals reduce revenue for hotels, shops, and local suppliers. The output is a knock-on figure for GDP or job losses across multiple sectors.

- **Semi-Quantitative (Downstream Disruption Scores)**: Assign a 1–5 "disruption" rating to each supplier if a hazard hits (e.g., farmland flooding). A final scorecard shows which

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essential services (food supply, transport) are at greatest risk of cascading failures.

- **Qualitative (Storylines Approach)**: Construct narrative-based "storylines" that trace how a hazard might evolve through different interconnected systems, highlighting intangible social and institutional factors often missed in purely quantitative models (García-Vaquero et al., 2024)

Multi-hazard risk assessments must go beyond single-event damage estimates and account for long-term economic and operational disruptions. In the Canary Islands, prolonged air traffic disruptions, shifts in traveller confidence, and increased insurance costs created extended economic downturns even after the primary hazard had subsided. Additionally, recovery loops in infrastructure capacity affected demand restoration, particularly for eco-tourism accommodations dependent on local SME investments with low financial resilience. These findings suggest that indirect risks require dynamic tracking mechanisms that incorporate financial, regulatory, and behavioural trends.

By spotlighting second-order impacts from the start, destinations can anticipate where vulnerabilities might multiply—and design flexible pathways that adapt measures once thresholds are reached. This ensures tourism systems are better prepared for the full complexity of multi-risk environments.

2.4 Evaluate the Overall Risk

When direct and indirect threats are combined, MYRIAD-EU produces a combined multi-risk profile which can be tailored to tourism. Here, hazard metrics (e.g., storm intensity, flood height) intersect with tourism-specific vulnerabilities—like the proportion of businesses lacking hazard insurance, the condition of transport infrastructure, or limited local government budgets.

A key question driving the evaluation of overall risk pivots around risk reduction measures. For example, if flood defences are robust for a 100-year storm but local roads are prone to landslides, a volcanic mudflow could still devastate access to major resorts—rendering current zoning policies ineffective.

Using multi-criteria methods helps compare options (e.g. nature-based reefs vs. hard seawalls vs. insurance) in terms of cost efficiency, co-benefits (like biodiversity), and alignment with other tourism or community goals. In this way, "evaluating the overall risk" becomes an iterative check on whether tourism's resilience strategy remains adaptive and coherent under multiple hazards.

2.5 Identify and Implement Risk Management Options

Translating risk evaluation into practical, on-the-ground interventions is at the core of MYRIAD-EU. This might involve:

- **Structural measures**: Upgrading coastal defences, constructing flood barriers, retrofitting buildings to withstand earthquakes or typhoons, and introducing water recycling facilities to combat drought.

- **Financial instruments**: Setting up microinsurance or a dedicated resilience fund for small tourism enterprises; exploring catastrophe bonds to spread large-scale risk.

- **Policy and governance shifts:** Enhanced zoning or stricter building codes. Linking public investment to compliance with hazard-specific resilience standards.

Throughout this stage, implementation and monitoring—a key part of any integrated Destination Resilience Framework—ensures continuous refinement.

2.6 Plan for Future Changes

Finally, the MYRIAD-EU approach remains dynamic by integrating climate projections, socio-economic trajectories, and emerging policy shifts. For tourism, where climate change can alter the very foundation of a destination's appeal (e.g., declining snow reliability for ski resorts or increasing heat stress in beach zones), scenario testing is paramount:

- **Climate scenarios:** Combine sea-level rise

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predictions with demographic changes (e.g., global tourism demands) to envision long-term impacts.

- **Adaptive management:** Adjust risk reduction strategies as new hazard data emerges, or as visitor trends shift.

Central to this step is public monitoring, dashboards, and data-sharing so that both authorities and the private sector can track evolving risks and measure the efficacy of implemented measures.

The Canary Islands Pilot further underscores the importance of integrating forensic disaster analysis into resilience planning. Tourism risk assessments must shift from static hazard modelling to dynamic, scenario-based evaluations that incorporate cascading vulnerabilities and cross-sectoral interdependencies. Scenario testing—factoring in multi-hazard interactions, evolving market structures, and sustainability transitions—can inform more adaptive, forward-looking tourism risk governance.

Key Takeaway: MYRIAD-EU weaves hazard analysis, vulnerability assessment, and future-focused adaptation and Disaster Risk Management into a unified, iterative system. By capturing both direct and indirect threats, clarifying intersectoral dependencies, and embedding a forward-looking perspective, destinations can rise above conventional, one-dimensional planning.

Building on the MYRIAD-EU foundation, the project's Methodology and Case Studies, a Destination Resilience Framework has been outlined that helps tourism authorities adapt MYRIAD-EU's multi-risk logic to real-world policy processes.

3. Why Conventional Crisis Management in Tourism Falls Short —and How MYRIAD-EU Fills the Gaps

Many tourism strategies remain rooted in broad crisis-management approaches, seldom reflecting deeper risk analytics or multi-hazard data integration. By weaving in advanced multi-hazard risk insights, MYRIAD-EU shifts the paradigm from reactive crisis planning to proactive, science-based resilience-building. Below are four core gaps in conventional approaches and the specific benefits a multi-hazard model delivers:

1. Generic vs. Hazard-Specific

- **The gap:** Many tourism frameworks focus on generic emergency drills and broad communications protocols, overlooking specific hazard dynamics (e.g., wildfire ignition zones or flash flood surge heights).

- **Myriad benefit:** Through advanced risk analytics, MYRIAD-EU pinpoints each hazard's probability, intensity, and cross-impacts. This fosters better-targeted actions—like installing flood barriers in storm-surge hotspots or selecting building materials that resist wildfires.

2. Direct vs. Indirect Impacts

- **The gap:** Sector analyses typically focus on obvious physical losses (e.g., a resort's structural damage), neglecting the ripple effects on supply chains or social cohesion (e.g., shortages of fresh produce or displaced local workforce).

- **Myriad benefit:** MYRIAD-EU explicitly models how disasters disrupt labour markets, resource flows, and overall destination image. Destinations can then implement measures such as strategic stockpiles, alternate supplier agreements, or mutual-aid pacts—averting wider knock-on losses.

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3. Intersectoral Dependencies

The gap: Tourism doesn't stand alone: if transport, power, or agriculture falter, the entire destination can stall. However, standard resilience plans often handle tourism in isolation, missing critical connections to other sectors. By examining multi-sector linkages, MYRIAD-EU prevents isolated "fixes." For instance, risk financing for hotels might be integrated with drought mitigation for agriculture, ensuring uninterrupted supply chains and stable resources—even under compounding hazards.

4. Short-Term vs. Long-Term

Most crisis frameworks aim at near-term recovery ("back to normal") without considering how climate change or shifting visitor preferences may shape risk in 5–10 years. MYRIAD-EU's iterative scenario testing looks ahead. If coastal erosion is likely to worsen, for example, it recommends not just temporary shoreline barriers but also diversifying products or relocating facilities well before major climate or market shifts take hold.

Core Message: Combining MYRIAD-EU's multi-hazard rigor with modern data-driven, risk-based planning yields robust, forward-looking resilience solutions that surpass the limitations of traditional tourism crisis management.

4. Building Resilient Tourism Destinations: Insights from the Canary Islands Pilot

The Canary Islands Pilot offers key lessons on the challenges tourism destinations face when managing multi-hazard (dynamic) risks. The recent volcanic eruption in La Palma provides insights on how natural hazards, economic disruptions, and governance gaps interact, affecting tourism recovery and local businesses. This case study points to the need for stronger destination coordination, better planning, and more adaptive strategies to help tourism build resilience.

The dynamic vulnerability of tourism

Tourism in the Canary Islands depends on mass visitor flows, strong ties with global travel companies, and significant reliance on local resources such as water, energy, and food. These dependencies make the sector highly vulnerable to disruptions, whether from natural hazards or from economic downturns, which often shifts visitor behaviour and risk perception. Additionally, island regions must address risks from both climate-related and geological hazards, further emphasising the need for improved planning, coordination, and investment in preparedness.

One important risk driver for destinations is the continuous transformation of tourism demand due to evolving visitor preferences and market trends. Emerging patterns such as remote work, digital nomadism, and increasing demand for sustainable experiences are gradually reshaping the sector, creating new pressures on local infrastructure, accommodation availability, and service models. These gradual shifts require destination managers to integrate adaptive planning strategies that anticipate not only how visitor behaviour affects tourism revenues, business operations, and long-term growth models, but also how they transfer risks in the context of natural hazards.

Indeed, tourism understands risk management well, particularly when there is damage to infrastructure or disruptions to flights and supply chains. However, future risk management must consider that many risks are becoming more complex and harder to manage, particularly those that evolve over time or cut across multiple sectors. Here are some examples on how transformation in the tourism markets is transferring risk to destinations and visitors.

- Traditionally, tour operators played a central

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role in managing risk by offering prepaid packages, enforcing safety guidelines, and coordinating emergency responses. This system provided security for both travellers and businesses. However, the rise of online platforms and direct bookings has altered how risks are distributed, shifting more responsibility onto local businesses and destination managers. While direct bookings allow hotels and local businesses to engage more efficiently with guests in crisis situations, the fragmentation of risk management across multiple platforms and actors has also created new challenges. Unlike traditional tour operators, online travel agencies (OTAs) and digital intermediaries may lack centralised crisis coordination, making it unclear who holds responsibility in emergencies. The Package Travel Directive addresses some of these concerns by strengthening consumer protections, insolvency coverage, and crisis-related refund mechanisms. However, it does not explicitly define risk management responsibilities across all actors in the tourism chain, leaving gaps in coordination. As risk management becomes more decentralised, a stronger systemic approach is needed to ensure clear communication, rapid response, and financial protections for travellers and businesses alike.

- Online booking platforms have increased accessibility but also transferred risk management to individual travellers and small businesses. Digital tools create new challenges, such as AI-driven pricing fluctuations, unpredictable visitor flows, and fragmented emergency communication networks. Furthermore, online reviews and social media amplify reputational risks, sometimes prolonging a crisis even after conditions have stabilised.

- Sustainability efforts are essential for long-term resilience but can also present financial and operational challenges that end up increasing the vulnerability of small companies in tourism. Many small hotels and tour operators struggle to keep up with evolving environmental regulations or the costs of green certifications. Additionally, sustainability policies can sometimes conflict with economic recovery—such as restrictions on short-haul flights to lower emissions, which may inadvertently slow tourism recovery after a crisis. An interesting issue emerged in La Palma following the volcanic eruption, mirroring Puerto Rico's slow recovery after Hurricane Maria (2017). The 'Build Back Better' initiative aimed to transition toward a more sustainable tourism development model, but bureaucratic delays extended recovery timelines, frustrating residents and businesses in need of faster economic stabilization. *This highlights, particularly, the challenge of balancing long-term resilience-building with immediate recovery priorities.*

- Economic resilience is a growing concern, particularly for small and medium-sized tourism businesses. Unlike multinational chains, local businesses often lack financial buffers, insurance coverage, or access to recovery funding. Without better financial protections—such as tourism-specific insurance programs, emergency relief funds, or shared risk pools—many small operators remain highly exposed to shocks. *Examining disaster risk financing mechanisms that enable tourism operators to recover more quickly after crises could offer valuable insights into how financial protections can be adapted for tourism-dependent economies.*

- Risks are not evenly distributed across all tourism stakeholders. Seasonal or informal workers, as well as low-wage employees are particularly vulnerable to natural hazards, often lacking access to financial support systems. Housing affordability is another concern, as short-term rentals and rising property prices and land conflicts after natural hazards may displace local residents and tourism workers, adding social strain to destination recovery. *Ensuring the long-term stability of local populations is essential for maintaining a resilient tourism sector.*

- A major gap in tourism risk management is the absence of clear communication channels and crisis coordination. Many small businesses are excluded from risk discussions and lack structured guidance on how to respond to emergencies. Stronger risk communication strategies are needed to ensure that businesses, residents, and visitors are well-informed and prepared. Governments should also integrate early warning systems

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into tourism management, providing real-time updates and structured crisis response strategies. Digital tools such as mobile apps and AI-driven forecasting systems can enhance these efforts, allowing tourists to receive location-specific risk alerts and emergency instructions, thereby improving overall safety and response efficiency.

To build more resilient tourism destinations, governments and industry leaders in the Canary Islands should take action in the following key areas:

- **Strengthening collaboration** between tourism authorities, emergency response agencies, and infrastructure managers will enhance crisis planning, response, and recovery.

- **Tourism should be integrated into destination-wide risk management strategies** to ensure a coordinated response to disruptions.

- Governments should **explore incentive-based financial mechanisms, such as tax credits for hotels** investing in hazard-resistant infrastructure or subsidised insurance premiums for SMEs participating in resilience programs. Examples from Japan show how dedicated tourism risk financing can accelerate post-crisis economic recovery.

- Tourism businesses, visitors, and local communities need timely and accurate risk information before, during, and after crises, which requires **implementing early warning systems and digital communication tools** to provide real-time safety updates and emergency coordination.

- Tourism sustainability efforts should also contribute to risk reduction and resilience-building, ensuring that **sustainability measures and investments do not delay economic recovery** following disasters.

- Destinations should adopt **risk-sensitive land-use planning** to balance tourism expansion with urban resilience and climate adaptation and disaster risk management - addressing short-term rentals and tourism-driven real estate speculation- which can increase land use conflicts and destabilise communities.

- Destination Management Organizations should **adopt scenario-based planning models, based on flexible and robust multi-criteria decision making**, to anticipate how different crisis scenarios could impact tourism economies and improve long-term decision-making.

5. Policy Recommendations

Policy action in tourism destinations must start by addressing structural drivers of vulnerability that make hazards more damaging and recovery more uncertain. Weak land-use planning often permits development in exposed zones and fails to integrate multi-hazard and multi-risk dynamics, locking in future risks. Compensation schemes for geological and environmental damages frequently undervalue land and property and, critically, tend to overlook the cumulative nature of repeated disasters in floodplains, volcanic zones, or coastal erosion areas. This approach prioritises short-term payouts over more demanding but necessary measures such as reallocation or transformative land-use change—precisely the type of adaptation and disaster risk management envisioned in the EU Green Deal, the Climate Adaptation Strategy, and Cohesion Policy. At the same time, recovery processes often prioritise housing and community services while delaying the rehabilitation of tourism assets, underestimating the sector's role in restoring revenues and jobs that sustain broader economic resilience.

Building on these challenges, the following recommendations outline concrete steps—ranging from multi-hazard risk modeling to strengthened public–private partnerships—that can guide EU and national authorities in aligning tourism resilience with systemic risk reduction goals.

1. Mandate Multi-Hazard Risk Modeling

Tourism ministries and DMOs should require multi-risk assessments as a prerequisite for major infrastructure investments, ensuring that all hazards and risk—direct and indirect—are recognised upfront.

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2. Adopt a Phased Implementation

Integrate MYRIAD-EU's six steps into existing policy cycles (annual budgets, destination master plans) to systematically embed robust resilience measures at every stage.

3. Leverage Public-Private Partnerships

Provide incentives (tax breaks, credit facilities, or microinsurance) for tourism enterprises that adopt advanced disaster risk reduction actions—e.g., green infrastructure, hazard-proof building codes—aligned with multi-hazard findings.

4. Deploy Observatories for Transparency

Use user-friendly dashboards to track hazard indicators and resilience metrics in real time, following the multi-hazard analytics approach. Public-facing transparency boosts stakeholder trust and encourages innovation.

5. Scale Regionally and Globally

Once validated in pilot areas (e.g., Canary Islands, Danube Region), replicate the methodology for broader application across Europe, drawing on cross-national networks and sharing best practices internationally.

6. Conclusion

As climate extremes and social–economic uncertainties rise, the tourism sector can no longer rely on outdated, one-size-fits-all approaches. The MYRIAD-EU framework offers a game-changing approach: it captures interlinked hazards, includes direct and indirect losses, clarifies intersectoral dependencies, and propels destinations toward science-driven resilience strategies. Coupled with a phased, data-friendly implementation plan inspired by more modern risk-analytics thinking, tourism policymakers and businesses have a clear roadmap to manage systemic threats, protect local livelihoods, and ensure long-term environmental stewardship.

By bridging rigorous multi-hazard modelling with advanced resilience analytics, destination resilience can finally transition from a reactive, broad-strokes tactic to a proactive, climate-savvy foundation for sustained growth.

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List of resources

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