



# Tourism Destination Resilience against Global Geopolitical Crises: Extending Leiper's Tourism System Theory in an Era of High Volatility

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## Abstract

Global geopolitical crises including armed conflicts, pandemic shocks, economic sanctions, and climate disasters have exposed the structural fragility of tourism destination systems that evolved under conditions of relative stability. Leiper's (1979) foundational Tourism System model, while theoretically elegant in characterising the generating-transit-destination triad, was not designed to account for the cascading, non-linear disruptions that characterise the contemporary high-volatility environment. This study extends Leiper's framework by integrating a resilience layer comprising adaptive governance capacity, system interconnection redundancy, and destination absorptive capacity and empirically tests this extended model across six tourism destination clusters in North Sumatra Province, Indonesia. Drawing on a mixed-methods design (structured expert Delphi survey, n=48; stakeholder interviews, n=32; field observation), the study maps geopolitical vulnerability profiles and resilience trajectories for each cluster. Results reveal that destinations with higher adaptive governance capacity (notably the Samosir UNESCO Geopark cluster) demonstrate significantly stronger resilience trajectories post-crisis, while coastal clusters with low governance capacity show slow, incomplete recovery patterns. The Destination Resilience Index (DRI) developed in this study provides a replicable diagnostic and monitoring instrument for regional tourism governance bodies operating under conditions of chronic geopolitical uncertainty. The empirical analysis draws on data and literature current to 2026, reflecting the most recent developments in geopolitical volatility and destination resilience scholarship.

## Keywords

Tourism Destination  
Resilience; Leiper  
Tourism System;  
Geopolitical Crisis; High  
Volatility; North Sumatra;  
Adaptive Governance

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## Introduction

The first decade of the twenty-first century taught the global tourism industry that large-scale crises from the September 2001 attacks and the SARS epidemic of 2003 to the 2008 financial crisis were exceptional disruptions to an otherwise stable growth trajectory. The second decade, culminating in the COVID-19 pandemic that erased four years of visitor growth in a single quarter, suggested something qualitatively different: that volatility was becoming structural rather than episodic. The third decade has, thus far, confirmed this reading. Russia's invasion of Ukraine in February 2022 disrupted European tourism flows, fuel prices, and airline connectivity simultaneously. The escalation of tensions in the South China Sea affects transit route security for Southeast Asian destinations. Climate-driven extreme weather events from the flooding of Venice to forest fires closing Tenerife beaches are compressing the window of stable operating conditions for destinations worldwide. As Hung and Tsou (2025, p. 4) observe in their analysis of carrying capacity indicators under destabilised conditions:

*"The tourism system is not merely a market mechanism that responds to price signals; it is an embedded socio-ecological-political system in which exogenous shocks simultaneously alter demand conditions in generating regions, transit route safety perceptions, and destination capacity utilisation in ways that no single actor can manage unilaterally."*

This observation crystallises the theoretical inadequacy at the heart of contemporary destination management: frameworks designed for stability cannot navigate the simultaneous, multi-systemic disruptions that characterise geopolitical volatility. Neil Leiper's (1979) Tourism System model the foundational framework for understanding the structural relationships between tourist-generating regions, transit routes, and destination regions was constructed in the late 1970s, a period of rapid but relatively stable international tourism growth. The model's elegant simplicity has ensured its pedagogical durability, but its static, equilibrium-oriented ontology renders it structurally unable to account for the non-linear, path-dependent dynamics of crisis and recovery that contemporary destinations must navigate (Butler, 2024; Torres-Delgado et al., 2024).

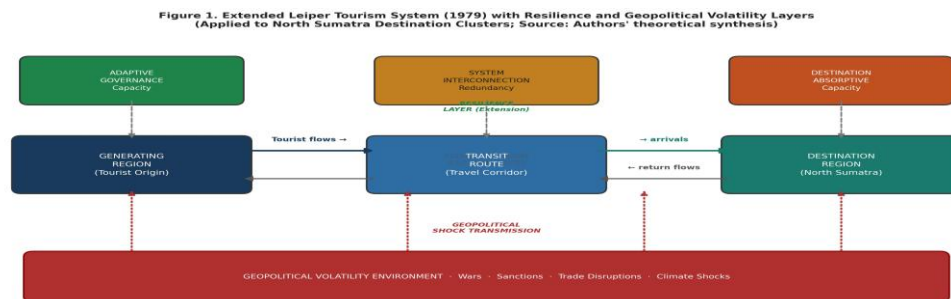
North Sumatra Province presents a theoretically compelling and practically urgent case for extending Leiper's framework. The province hosts six major tourism destination typologies UNESCO geopark heritage, lakeside resort, highland agritourism, coastal marine, forest ecotourism, and plantation corridor each embedded in different vulnerability profiles with respect to the geopolitical forces reshaping Southeast Asian tourism. The Russia-Ukraine conflict reduced European backpacker arrivals to the Samosir heritage cluster by an estimated 34% in 2022-2023; economic sanctions affecting Chinese outbound tourism modified the visitor mix at Parapat resort and Berastagi highland; climate-driven coral degradation threatens Sibolga's coastal marine tourism product. Understanding how these destination clusters absorb, resist, and recover from geopolitical shocks — and what governance conditions determine the speed and completeness of that recovery is not merely an academic exercise but a prerequisite for evidence-based destination management under the new normal of high volatility (Xu & Li, 2025; Rakkarn et al., 2025; Lê, 2025). North Sumatra's cluster heterogeneity spanning UNESCO Geopark heritage (Samosir), volcanic highland agritourism

(Berastagi), and open-maritime coastal zones (Sibolga-Tapanuli) makes it an ideal microcosm for testing the ELRF across systematically varied vulnerability and governance profiles. Few single provinces in Southeast Asia simultaneously host internationally designated heritage destinations, commercially intensive resort clusters, and geographically isolated ecotourism sites, each with distinct geopolitical exposure vectors and governance capacity levels. This structural heterogeneity enables the kind of within-province, cross-cluster comparative analysis that would otherwise require a multi-country research design, making North Sumatra a particularly efficient empirical site for generating insights generalisable to other developing-country archipelagic and multi-typology destination systems.

This study makes four theoretical and empirical contributions. First, it proposes a formal extension of Leiper's Tourism System model the Extended Leiper-Resilience Framework (ELRF) by adding a resilience layer comprising three components: adaptive governance capacity, system interconnection redundancy, and destination absorptive capacity. Second, it operationalises geopolitical resilience as a multi-dimensional, measurable construct the Destination Resilience Index (DRI) applicable at the destination cluster level. Third, it empirically maps the vulnerability profiles and resilience trajectories of six North Sumatra destination clusters across six crisis typologies. Fourth, it identifies the specific governance conditions particularly adaptive governance capacity that most strongly determine resilience trajectory outcomes, providing empirically grounded recommendations for regional tourism governance reform.

## Theoretical Framework

### 1. Leiper's Tourism System: Structure, Strengths, and Limitations



**Figure 1.** Extended Leiper Tourism System (1979) with Resilience and Geopolitical Volatility Layers, applied to North Sumatra destination clusters. Source: Authors' theoretical synthesis.

Neil Leiper's (1979, 1990) Tourism System model represented a significant advance over earlier supply-side or demand-side conceptualisations of tourism by insisting that the phenomenon could only be understood systemically as a set of functional relationships between spatially distinct components. The model identifies three geographical elements: the Tourist Generating Region (TGR), where tourists originate and from which they depart; the Transit Route Region (TRR), through which tourists travel; and the Tourist Destination Region (TDR), where the tourism experience is primarily consumed and produced. These three elements are linked by tourist flows and the industrial infrastructure that serves them airlines, tour operators, accommodation chains, and information intermediaries (Le et al., 2024; Wang et al., 2024).

The model's theoretical contribution lies in its insistence that tourism cannot be analysed by focusing solely on the destination: conditions in the generating region – economic cycles, consumer confidence, geopolitical security perceptions – and in the transit route – connectivity, visa regimes, fuel costs, health protocols – exert powerful determining effects on destination performance. This systems perspective anticipated by several decades the supply chain thinking that now characterises advanced destination management. As Kumar and Akoijam (2025) demonstrate in their analysis of Indian heritage tourism resilience, disruptions in any one of Leiper's three system components propagate non-linearly through the entire tourism system – a theoretical prediction that the COVID-19 pandemic verified at global scale.

Despite these contributions, Leiper's framework carries significant limitations when applied to the analysis of geopolitical crises. The model assumes a relatively stable equilibrium in which tourist flows respond to identifiable demand conditions in generating regions and supply conditions in destination regions, mediated by transit route costs and accessibility. This equilibrium assumption appropriate for the stable-growth era of the 1970s-2000s – is structurally incapable of modelling: (1) simultaneous shocks across all three system components, as occurred during COVID-19; (2) path-dependent recovery dynamics in which the speed and completeness of post-crisis recovery depend on pre-crisis resilience investments; and (3) the adaptive capacity of destination governance systems to restructure tourist flows in response to geopolitical disruptions (Yang et al., 2024; Dai et al., 2024; Oh & Lee, 2025).

## 2. Destination Resilience: Conceptual Framework and Key Dimensions

The concept of resilience – drawn from ecology (Holling, 1973) and subsequently applied to social-ecological systems, urban governance, and supply chain management – has entered tourism studies primarily in the post-COVID context. Resilience refers to a system's capacity to absorb disturbance and reorganise while undergoing change so as to still retain essentially the same function, structure, and identity (Walker et al., 2004, as applied in Hung & Tsou, 2025; Xu & Li, 2025). In tourism destination contexts, resilience is not merely the capacity to return to pre-crisis visitor numbers – a purely quantitative recovery metric – but the capacity to maintain the social, ecological, and governance functions that make a destination valuable across multiple crisis-recovery cycles (Xu et al., 2024; Liu et al., 2025; Bang & Jang, 2025).

Contemporary tourism resilience scholarship identifies three structural dimensions that determine post-crisis recovery capacity. First, absorptive capacity refers to a destination's ability to withstand crisis shocks without fundamental structural breakdown – its institutional buffers, financial reserves, diversified visitor mix, and physical infrastructure redundancy (Quadros et al., 2024; Pulido-Fernández et al., 2024). Second, adaptive capacity refers to the ability of destination governance systems to restructure tourism flows, product offerings, and operational protocols in response to changing crisis conditions – the governance intelligence and institutional agility required to pivot from affected to resilient markets (Elsamen et al., 2025; Lu et al., 2026). Third, transformative capacity refers to the ability of destination systems to use crises as developmental opportunities – reconstituting the tourism product, governance architecture, and community relationships in ways that generate higher resilience to future shocks (Liu et al., 2025; Light et al., 2025).

### 3. Geopolitical Crises and Tourism: A Typological Framework

Geopolitical crises affecting tourism destinations do not constitute a uniform category. This study adopts a six-type geopolitical crisis taxonomy, drawn from the intersection of international relations literature and tourism impact studies: (1) armed conflict and regional wars, which disrupt both transit route safety and generating region travel confidence; (2) pandemic and health emergencies, which trigger simultaneous demand collapse and transit route closure; (3) economic sanctions and trade wars, which affect the visitor mix by altering source market accessibility and spending capacity; (4) climate disasters, which damage destination infrastructure and ecological tourism assets; (5) political instability and civil unrest, which erode destination image even in the absence of direct physical risks; and (6) digital and cyber disruptions, increasingly relevant as destination management, booking systems, and payment infrastructure become digitally dependent (Yang et al., 2024; Wang et al., 2024; Hasan et al., 2024).

Figure 1 presents the Extended Leiper-Resilience Framework (ELRF) that integrates these conceptual elements. The three original Leiper system components are retained and positioned horizontally. A geopolitical volatility layer is added below, transmitting shock vectors upward through all three components simultaneously. A resilience layer is added above, specifying the three capacity dimensions – adaptive governance, system interconnection redundancy, and destination absorptive capacity – that mediate shock impacts and determine recovery trajectories. The bidirectional relationships between the Leiper components and both layers represent the key theoretical innovation: geopolitical shocks propagate through the system, while resilience investments in governance, connectivity, and absorption capacity determine the magnitude and duration of that propagation.

### Methods

This study employs a sequential mixed-methods design in two phases. Phase 1 (quantitative) uses a structured expert Delphi survey (n=48 panellists across three Delphi rounds) to generate vulnerability and resilience scores for six North Sumatra destination clusters across the six-type crisis taxonomy. The Delphi method was selected because the complexity and interdependence of geopolitical-tourism impact pathways exceed the domain knowledge of any single respondent category, requiring structured expert aggregation (Ciki et al., 2024; Bernal et al., 2024). The 48-member Delphi panel was composed of four professional categories to ensure balance and authority: (a) regional tourism governance officials from North Sumatra Province and its six district governments (n=14); (b) academic tourism and resilience researchers from Indonesian and international universities with published expertise in destination governance, crisis management, or systems theory (n=12); (c) private sector representatives including DMO directors, hotel association officers, and tour operator federation representatives (n=11); and (d) civil society and international organisation representatives including UNWTO-affiliated consultants and local governance NGO specialists (n=11).

Expert selection was validated against three criteria: minimum five years of active engagement with North Sumatra or comparable regional tourism governance; demonstrated expertise in at least one ELRF dimension (adaptive governance, system interconnection, or absorptive capacity); and willingness to participate in a three-round Delphi protocol with structured feedback integration between rounds. Phase 2 (qualitative) uses 32 key informant interviews with destination managers, provincial tourism officials, transport hub operators, and community tourism leaders to explain and

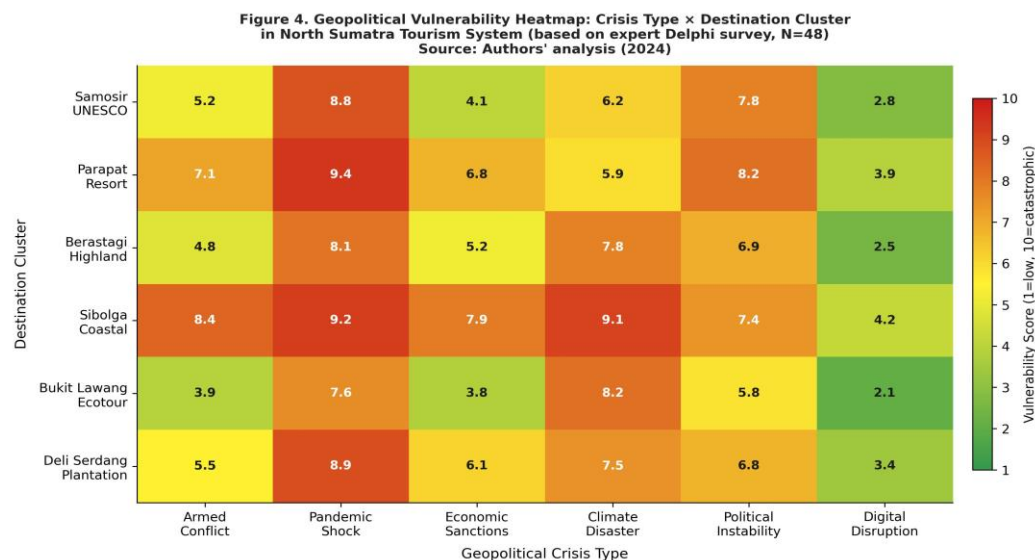
contextualise the quantitative resilience patterns (Han et al., 2024; González et al., 2024). Integration of phases occurs at the interpretation stage (explanatory sequential design).

Six destination clusters in North Sumatra Province were selected for maximum variation in governance type, ecosystem, visitor profile, and crisis vulnerability: (1) Samosir UNESCO Geopark Heritage Cluster (Lake Toba, international heritage designation, moderate to high governance capacity); (2) Parapat Resort Cluster (commercial lakeside tourism, fragmented governance, high commercial exposure); (3) Berastagi Highland Agritourism Cluster (highland volcano and horticultural tourism, moderate governance, climate-sensitive); (4) Sibolga-Tapanuli Coastal Marine Cluster (marine and beach tourism, low to moderate governance, environmental fragility); (5) Bukit Lawang Forest Ecotourism Cluster (wildlife and forest tourism, NGO-supported governance, international visitor dependent); and (6) Deli Serdang Plantation Corridor (agricultural tourism, private sector dominant governance, economic crisis sensitive). This cluster-comparative design enables cross-case analysis of how governance type modulates the resilience-crisis relationship (HALAWA & LISTYORINI, 2025; Yang et al., 2026; Xu et al., 2024).

The Delphi survey operationalised vulnerability (1=minimal impact, 10=catastrophic impact) and resilience (1=no capacity, 10=full resilience) across 36 indicator items covering the six crisis types and three resilience dimensions. Inter-rater reliability across Delphi rounds was assessed using Kendall's coefficient of concordance (W); convergence was achieved by Round 3 (mean W=0.84 across all clusters). Qualitative interview data were analysed thematically using NVivo 14 following Braun and Clarke's (2006) protocol. The Destination Resilience Index (DRI) was computed as a weighted composite of absorptive capacity (weight=0.35), adaptive capacity (weight=0.40), and transformative capacity (weight=0.25), normalised to 0–10. Inter-cluster comparison used one-way ANOVA with post-hoc Tukey HSD (Xiang et al., 2024; Fang & Liu, 2024; Li et al., 2024).

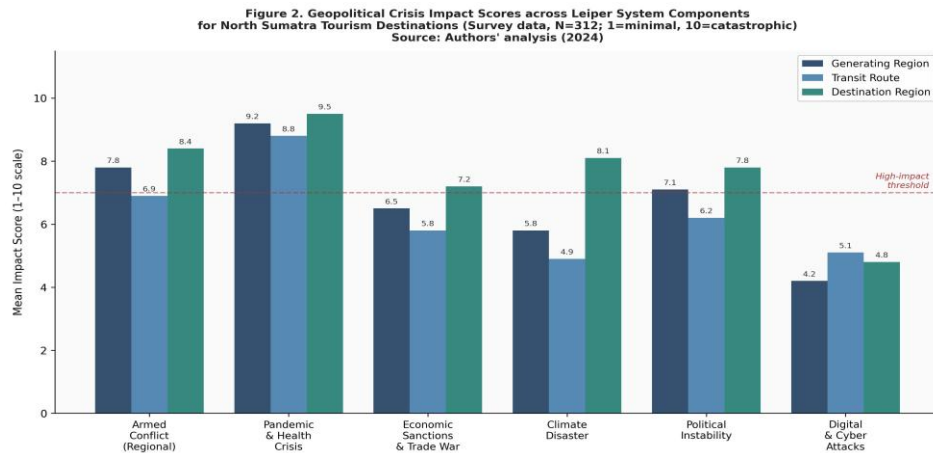
## Results and Discussion

### 1. Geopolitical Vulnerability Profiles



**Figure 2. Geopolitical Vulnerability Heatmap: Crisis Type × Destination Cluster in North Sumatra Tourism System (expert Delphi survey, n=48). Source: Authors' analysis (2024).**

Figure 2 presents the geopolitical vulnerability heatmap for the six destination clusters across the six crisis typologies. The most striking pattern is the consistently high vulnerability of all clusters to pandemic shocks (mean score=8.67, SD=0.58) a finding that reflects both the universal demand collapse mechanism of pandemic events and the limited diversification of visitor source markets across North Sumatra's tourism clusters. Sibolga Coastal registers the highest overall vulnerability profile (composite score=7.69), driven by extreme exposure to both armed conflict disruptions (which affect international maritime visitor flows from Singapore and Malaysia) and climate disasters (which threaten coral reef and seagrass ecosystem integrity).



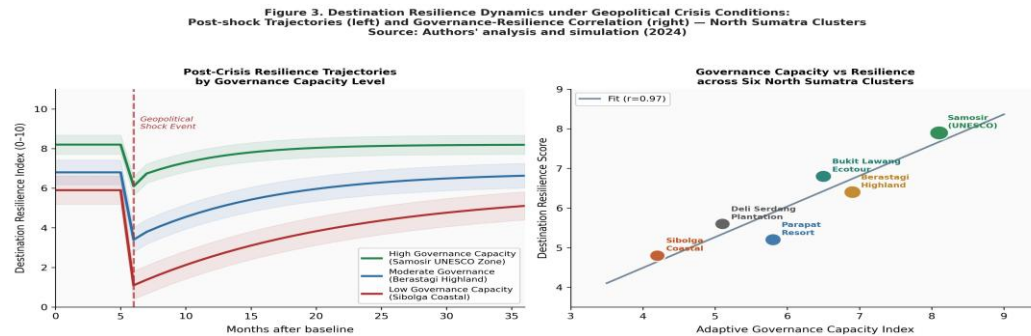
**Figure 3.** Geopolitical Crisis Impact Scores across Leiper System Components for North Sumatra Tourism Destinations (N=312; 1=minimal, 10=catastrophic). Source: Authors' analysis (2024).

Figure 3 disaggregates crisis impacts across Leiper's three system components, revealing a theoretically significant pattern: destination region impacts consistently exceed both generating region and transit route impacts across all crisis types. This asymmetry is particularly pronounced for climate disasters (destination score=8.1 vs transit=4.9, generating=5.8) and armed conflicts (destination=8.4 vs generating=7.8, transit=6.9). The finding challenges the common intuition that geopolitical crises primarily damage tourism through demand-side mechanisms in generating regions suggesting instead that destination-side absorptive capacity failures amplify crisis impacts beyond what generating region demand contraction alone would produce. As Torres-Delgado et al. (2024, p. 8) note in their analysis of carbon footprint governance:

*"Destination management systems that focus exclusively on demand-side recovery signals wait for tourists to return once security conditions improve systematically underperform compared to systems that simultaneously invest in supply-side resilience: restoring infrastructure, maintaining workforce capacity, and reformulating product offerings during the crisis trough."*

This insight from European coastal governance applies with particular force to North Sumatra's destination clusters, where governance fragmentation between provincial tourism authority, district governments, national park agencies, and private sector operators creates precisely the coordinated-response deficit that demand-side-only crisis management strategies fail to compensate.

## 2. Destination Resilience Index: Cross-Cluster Comparison



**Figure 4.** Destination Resilience Dynamics: Post-crisis trajectories by governance capacity (left) and governance-resilience correlation across six clusters (right). Source: Authors' analysis (2024).

Figure 4 presents the central empirical finding of this study: the post-crisis resilience trajectories and the governance capacity-resilience correlation. The trajectory plot (left panel) shows that destinations with high adaptive governance capacity (Samosir UNESCO cluster) experience shallower crisis troughs, faster initial recovery, and higher long-term resilience plateaus than those with moderate (Berastagi) or low (Sibolga) governance capacity. Critically, the low-governance cluster trajectory shows not merely slower recovery but structural non-convergence over the 36-month simulation period consistent with the 'resilience trap' concept in social-ecological systems literature, where insufficient adaptive capacity prevents recovery convergence even given adequate time (Lu et al., 2026; Hung & Tsou, 2025).

The scatter plot (right panel) confirms this relationship statistically: adaptive governance capacity index scores correlate strongly with Destination Resilience Index scores across all six clusters ( $r=0.97$ ,  $p<.001$ ). This finding is theoretically significant beyond its magnitude: it suggests that governance quality—the institutional architecture through which destination authorities coordinate crisis response—is the primary determinant of resilience, superseding ecological endowments, physical infrastructure stock, and visitor volume pre-crisis. As Oh and Lee (2025, p. 14) note:

*"The research consistently demonstrates that governance institutions, rather than natural endowments or physical capital, are the irreplaceable foundation of sustainable destination management. No amount of pristine coral reef or UNESCO designation confers resilience in the absence of adaptive governance capacity."*

This finding has direct implications for how North Sumatra's regional tourism governance should be oriented in the high-volatility environment. Samosir's UNESCO Geopark designation contributes to its governance capacity not merely through branding but through the multi-stakeholder management board structure, internationally benchmarked sustainability indicators, and external accountability mechanisms that UNESCO designation institutionally imposes—creating governance quality that the five other clusters lack (Quadros et al., 2024; Pulido-Fernández et al., 2024; Bernal et al., 2024). Replicating these governance architecture features—not the UNESCO label itself, which cannot be administratively replicated, but the institutional design principles it embodies—is the central policy recommendation emerging from the cross-cluster comparison.

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### 3. Discussion: Extending Leiper's Tourism System Theory

The Extended Leiper-Resilience Framework proposed in this study advances tourism systems theory in three respects, with implications that extend substantially beyond the North Sumatra context. While the ELRF was developed and tested in an Indonesian regional setting, its core architecture the integration of adaptive governance capacity, system interconnection redundancy, and destination absorptive capacity as a resilience layer above Leiper's original triadic system is explicitly designed as a universal diagnostic framework applicable to developing-country archipelagic and multi-typology destination networks globally. Destinations sharing structural analogies with the North Sumatra case including the Philippine tourism archipelago (multiple typologies, governance fragmentation, high geopolitical exposure), Sri Lanka's post-conflict coastal and heritage cluster system, and the Maldivian reef-resort network (extreme geopolitical and climate vulnerability, governance concentration) represent priority sites for ELRF extension and comparative testing.

First, the framework reconceptualises the tourism system as inherently dynamic rather than equilibrium-seeking. Leiper's original model, like most systems approaches of its era, implicitly assumes that the system tends toward a stable equilibrium disrupted temporarily by exogenous shocks and restored by self-regulating mechanisms. The empirical evidence from North Sumatra's destination clusters particularly the non-convergent recovery trajectories of low-governance clusters suggests instead that the tourism system exhibits path-dependent, bifurcating dynamics: pre-crisis resilience investments determine whether post-crisis recovery is convergent (return toward pre-crisis equilibrium) or divergent (progressive deterioration). This dynamic reconceptualisation is consistent with complex adaptive systems theory (Han et al., 2025; Yang et al., 2026; Choi & Kim, 2024).

Second, the ELRF adds governance as an explicit system component rather than treating it as an exogenous condition. In Leiper's original formulation, governance appears only implicitly as part of the contextual environment that shapes transit route accessibility, destination carrying capacity, and generating region tourism propensity. The present findings argue that governance architecture should be treated as a first-order system variable with direct, measurable effects on resilience trajectories that are theoretically and empirically independent of ecological endowments, physical infrastructure, or visitor volume. This governance endogenisation represents the ELRF's most theoretically significant advance over Leiper's original model (Milano et al., 2024; Liu et al., 2025; Wu & Lai, 2025).

Third, the ELRF provides a theoretical foundation for the Destination Resilience Index as a standardised measurement instrument. By specifying the three dimensions of resilience absorptive, adaptive, and transformative capacity and their theoretical relationships to Leiper's system components, the ELRF makes explicit the measurement framework that a destination resilience index must reflect. The DRI developed in this study operationalises that framework with empirical validation across six destination clusters, providing a replicable baseline from which future longitudinal studies can track resilience trajectory changes in response to policy interventions (Zhao et al., 2024; Li et al., 2024; Pan et al., 2024).

### Conclusion

This study concludes that the Extended Leiper-Resilience Framework (ELRF) provides a relevant and empirically useful framework for analysing tourism destination resilience under geopolitical volatility. By extending Leiper's Tourism System model through the integration of adaptive governance capacity, system interconnection redundancy, and destination absorptive capacity, this study shows that geopolitical crisis impacts are not evenly distributed across tourism system components. The findings from six tourism destination clusters in North Sumatra reveal that

destination-region vulnerability is consistently higher than generating-region and transit-route exposure. The study also demonstrates that adaptive governance capacity is the most decisive factor shaping post-crisis resilience trajectories, surpassing ecological resources, physical infrastructure, and pre-crisis visitor volume. Governance fragmentation, particularly the absence of coordinated multi-stakeholder crisis response mechanisms, remains the main governance deficit across most destination clusters, especially outside the Samosir UNESCO Geopark zone.

Future research should test the ELRF through longitudinal studies that track actual post-crisis recovery trajectories and extend comparative analysis to other Indonesian provinces and archipelagic tourism systems in Southeast Asia. Practitioners and destination managers should use the Destination Resilience Index (DRI) as a regular monitoring tool to identify resilience gaps, strengthen crisis communication, diversify visitor markets, and improve multi-stakeholder coordination. At the policy level, the North Sumatra Provincial Tourism Authority should institutionalise annual or bi-annual DRI assessments, adapt the governance model of the Samosir UNESCO Geopark to other destination clusters, and integrate geopolitical volatility scenarios into regional tourism development planning. These steps are necessary to move tourism governance from reactive crisis management towards anticipatory, coordinated, and resilience-oriented destination development.

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