Fragmented authority and institutional redundancy in tourism disaster management: Evidence from Toba, Indonesia

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Abstract. This study aims to elucidate the fragmentation of authority and institutional redundancy in tourism governance in response to disasters. The intricacy of governance engenders substantial challenges stemming from overlapping power and ambiguous operational catastrophe management within the tourism sector. Hence, these factors underpin the rationale for research in Lake Toba, Indonesia. A quantitative exploratory technique characterizes and elaborates the descriptive research statistically. The study involved 205 respondents and stakeholders. The study's findings reveal fragmented authority and institutional redundancy in prioritizing destinations, adversely impacting catastrophe response. Nonetheless, if addressed jointly, these challenges can enhance governance and the efficacy of disaster management. Trust, dedication, and equitable roles between tourism authorities and local communities are vital. A comprehensive relational approach is crucial for formulating a robust catastrophe management strategy. Moreover, data-driven collaboration and adaptive coordination methods can address institutional fragmentation, enhance bureaucratic efficiency and promote a more cohesive approach to tourism governance. Policymakers must include resilience in institutional frameworks and crisis management techniques, perceiving resilience as a continuous joint endeavor. These findings indicate the necessity for a contextual and nuanced approach to destination management, including local dynamics and minimizing the potential for conflict.

1 Introduction

Institutional fragmentation refers to the concurrent authority and accountability among many institutions and governments. In the tourism disaster management (TDM), this situation frequently results in coordination failures, duplications and resource-human misallocation [1]. The division of authority among disaster management institutions, tourism authorities, and both central and regional governments at Lake Toba has led to delayed responses, inter-agency conflicts, and inadequate disaster mitigation efforts.

The issue is intensified by dualism in governance and practices, which creates parallel yet disjointed frameworks between national and local governments in the tourism and disaster management sector [2]. These obstacles diminish the institutional capacity to respond to and recover from disasters, thereby adversely impacting the socio-economic welfare of the tourism sector [3]. Consequently, enhancing institutional integration and clarifying authority are essential for advancing disaster's governance and management in tourism regions.

Institutional redundancy arises when numerous similar mandate duties and positions exist, leading to overlap, resource wastage, and policy misunderstanding [4]. In Lake Toba, organizations overseeing tourism and disaster management at both national and regional levels frequently exhibit redundant structures and functions, lacking systematic clarity and coordination. This impedes catastrophe response coordination and diminishes handling efficiency.

Christensen asserts that a lack of coordinated design in institutional redundancy can diminish the efficacy of the governmental system in crisis response [5]. This aligns with Devi, Firoz and Saravanan, stated the presence of redundant institutions lacking integration heightens the likelihood of policy failure [4]. Consequently, assessing the institutional framework in crucial regions like Toba is important to ensure that existing institutions complement one another and prevent overlapping jurisdictions.

In this context, governance efficacy denotes the capacity to establish coordination, facilitate multi-actor participation, and guarantee accountability in policy implementation [6]. In TDM, governance depends on intersectoral coordination among the government, the business sector, community and disaster organizations. The effectiveness of disaster risk reduction is predominantly influenced by the degree of synergy, responsiveness, and integration among various stakeholders.

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Moreover, governance efficacy arises from collaborative governance and necessitates mutual commitment, explicit interaction protocols-supportive leadership. Without this, governance is likely to be reactive and exclusionary [7]. Also, within framework of contemporary governance, efficacy is influenced not solely by the government but by the interconnections among the state, society, and the market. Hence, expediting the advancement of prudent governance entails establishing a transparent, responsive, and collaborative framework to address disastrous emergencies.

Governance has emerged as the cornerstone of effective TDM, which pertains to the system's capacity to execute mitigation, emergency response, and post-disaster recovery in a coordinated and timely fashion [8]. Ritchie underscores the necessity for a comprehensive, integrated crisis management strategy between disaster authorities and tourism managers at tourist locations [9]. TDM approach underscores the interdependence of mitigation, preparedness, emergency response and recovery [10]. Inadequate performance during these phases exacerbates the disaster's effects, tarnishes the destination's reputation, and diminishes tourist trust. Consequently, TDM significantly relies on the degree to which cross-sectoral and institutional coordination can be established and executed regularly.

In this context, tourism resilience is the objective attained through disaster management and tourism governance; thus, it can absorb, adapt, and recover from disasters [11]. A destination is classified as resilient when it sustains its appeal, preserves tourist confidence, and demonstrates rapid and effective recovery following a disaster. In Toba, resilience is crucial due to its designation as a national priority destination, which relies heavily on security and risk preparedness perceptions. Hence, integrating the tourism disaster management and governance should aim to establish a cohesive system with sustainable potential.

Tourism Disaster Management (TDM) is critical in sustaining the resilience and competitiveness of tourism destinations worldwide, particularly in regions susceptible to natural and human-induced disasters [12]. Lake Toba, designated as a super-priority destination in Indonesia, encounters considerable challenges in disaster risk management attributable to its distinct geographic and socio-political context. While disaster preparedness and recovery are emphasized, TDM in Lake Toba is frequently hindered by institutional fragmentation and dualistic structures, resulting in overlapping responsibilities and regulatory ambiguity.

This study investigates the fragmented authority and institutional redundancy that impact disaster management and contribute to tourism resilience in Toba, Indonesia. The questions are: Do institutional fragmentation and redundancy adversely affect governance design? How does governance influence disaster management and tourism resilience? This study offers theoretical and practical insights to enhance the disaster governance framework within priority tourism sectors in Indonesia, presenting novel perspectives for policymakers and stakeholders engaged in tourism and disaster risk reduction.

2 Research method

2.1 Design and instrument

The Indonesian government recognizes Lake Toba as a super-priority destination and places particular focus on it. The study of Lake Toba is important for other places because it has a mix of resources, including history, culture, and traditional elements, as well as popular types of tourism like rural, nature, and sports tourism.

This study employs an exploratory quantitative approach to elucidate the causal relationships among variables defined by a theoretical framework. We selected the exploratory design to evaluate consistency of independent variables influencing the dependent variable. The study used a method called structural equation modeling with partial least squares (SEM-PLS) to examine the relationships, as it works well for testing theoretical models and real-world situations with different research topics and sample sizes. Figure 1 illustrates the variables in accordance with the research design.

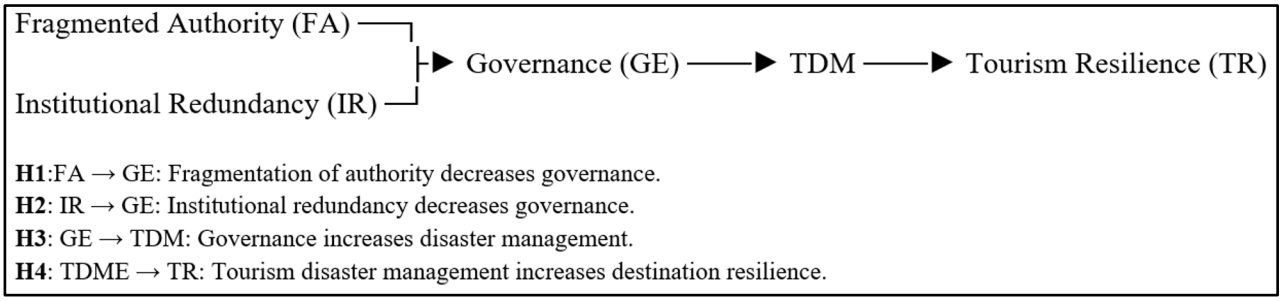

Fig. 1. Research framework

Table 1 presents the assessment framework. The instrument is based on a compilation of theories concerning patterns of disaster management in tourism. The objective is to address the complexities associated with disaster management in vulnerable tourism contexts. The results are significant as they pertain to the future of Lake Toba, emphasizing its status as a priority destination that enhances the tourist experience to ensure their reasons for returning to Lake Toba, Indonesia, are upheld. A quantitative approach examines the TDM phenomenon, highlighting the correlation between future tourism, fair governance, and the necessity to address disaster uncertainty.

Table 1. Research variables and indicators

Variable	Dimension	Indicator
Fragmented Authority [1, 6]	Authority with minimal coordination resulting in duplication of roles	FA1 – overlapping central-regional authority
		FA2 – mismatch of the rules between agencies
		FA3 – unclear leadership during crisis
		FA4 – weak and less mitigation coordination
		FA5 – conflict of interest in emergency response
Institutional Redundancy [4]	Creating inharmonization and inefficiency of collaboration	IR1 – duplication of function of disaster management institution
		IR2 – regulatory disharmony
		IR3 – inefficiency of coordination forums
		IR4 – low integration of information systems
		IR5 – role struggle between agencies
Governance Effectiveness [7]	Coordination and accountability of collaboration become questions in governance schemes	GE1 – Cross-sector coordination
		GE2 – Local community participation
		GE3 – Disaster management SOPs available
		GE4 – Accountability for plan implementation
		GE5 – Private sector involvement
TDM Effectiveness [10, 11]	Emergency response becomes a priority for all stakeholders	TDME1 – Tourism contingency plan in place
		TDME2 – Tourism preparedness training
		TDME3 – Evacuation route effectiveness
		TDME4 – Early warning system integration
		TDME5 – Destination image restoration
Tourism Resilience [13]	Revitalization of the structure, social and psychological aspects of stakeholders	TR1 – Post-disaster visitation levels
		TR2 – Tourist perceptions of safety
		TR3 – Economic resilience of tourism actors
		TR4 – Risk-based policy adaptation
		TR5 – Community participation in recovery

2.2 Technique and analysis

The study population comprises key participants in tourism disaster management (TDM) at Lake Toba, including the regional disaster management agency (BPBD), the tourism office, tourism business operators (hospitality and transportation) and local communities engaged in managing tourism-related disasters. 205 respondents participated in the study, selected through purposive sampling methods according to specific criteria.

The data collection process involved a closed questionnaire with a likert scale, with responses ranging from 1 to 5 (disagree to agree). The instruments were constructed using findings from literature, theoretical frameworks and aligns with the operationalization table of variables that have been established. Every variable the study is assessed using its corresponding indicators and testing for both validity and reliability has been performed, with modifications tailored to the Lake Toba region.

Also, the analysis using SmartPLS 4.3.0.1, which helps with a type of statistical method called variance-based SEM and included tests for how well the constructs work together, how different they are from each other, checking reliability, and calculating Cronbach's alpha. Then, we tested the outer model to investigate the relationship between indicators and constructs. The inner model was studied to understand how strong the connections are between hidden constructs, and the coefficient of determination was used to see how much each variable contributes.

3 Finding and discussion

17 out of 25 binding indicators successfully upheld the acceptance criteria for the measurement model, or valid and acceptable with a value exceeding 0.70, as noted by Hair [14]. This evidence indicates that the indicators possess strong convergent validity. The other eight indicators were excluded due to non-compliance with the measurement requirements. The results showed a cronbach’s alpha greater than 0.60 and an average AVE of 0.50, satisfying the established criteria. This evidence suggests that each variable's involvement effectively enhances construct validity (Table 2).

Table 2. Outer loading result

Variable	Measurement items	Outer loading	Cronbach's alpha	Composite reliability	Average Variance Extracted (AVE)
FA			0.785	0.847	0.550
	FA1	0.944			
	FA2	0.768			
	FA5	0.877			
GE			0.803	0.870	0.586
	GE1	0.844			
	GE2	0.901			
	GE3	0.896			
IR			0.801	0.864	0.567
	IR1	0.805			
	IR2	0.813			
	IR3	0.898			
TDME			0.863	0.868	0.644
	TDME1	0.778			
	TDME2	0.832			
	TDME3	0.778			
	TDME4	0.758			
	TDME5	0.816			
TR			0.721	0.818	0.590
	TR1	0.919			
	TR2	0.744			
	TR3	0.751			

Subsequently, we provide an assessment of the inner model, which includes multicollinearity testing (VIF), yielding a value of <5. Results suggest multicollinearity is absent in the inner model calculation, were VIF values for the variable range 1.000 to 3.135, this indicated a robust and unbiased parameter estimate in PLS-SEM.

Table 3. Significant path coefficients for the direct effects in the inner model

	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	Path Coefficient Confidence Interval (95%)		P-Values	F-Square
					2.5%	97.5%		
H1: FA-GE	0.087	0.094	0.065	2.044	0.053	0.241	0.292	0.003
H2: IR-GE	0.503	0.313	0.054	4.328	0.173	0.639	0.000	0.110
H3: GE-TDME	0.715	0.485	0.021	7.566	0.402	0.756	0.000	1.045
H4: TDME-TR	0.818	0.543	0.075	9.482	0.353	0.706	0.000	1.180

Cohen established the threshold values for evaluating F^2: 0.02 (small), 0.15 (moderate), and 0.35 (significant). The four developed hypotheses yielded the following results (Table 3).

H1. FA shows a positive influence path of 8.7% or 0.87; however, it is not statistically significant to GE, as evidenced by p-value (0.292), which exceeds the threshold of 0.05. The impact of FA on GE is minimal, as indicated by an F2 value of 0.003.

H2. IR exhibits a positive path coefficient of 50.3% (0.503) and shows a significant effect on GE with a p-value of 0.000, which is below the threshold of 0.05. However, the strength of this relationship is relatively weak, as indicated by the F^2 value of 0.110.

H3. GE demonstrates a positive path coefficient of 71.5% (0.715) and has a significant effect on TDME with a p-value of 0.000, which is below the threshold of 0.05. This effect is further supported by a strong F^2 value of 1.045.

H4. TDME presents a positive path coefficient of 81.8% (0.818) and significantly influences TR with a p-value of 0.000, which is below the threshold of 0.05. The magnitude of this effect is reinforced by a high F^2 value of 1.180.

Table 4. Indirect effect results

	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	p-values
FA—GE—TDME—TR	0.051	0.053	0.061	0.836	0.403
IR—GE—TDME—TR	0.020	0.020	0.019	1.059	0.002

Table 4 presents the results of the indirect relationships between all exogenous variables and the endogenous variables through the mediating variable. The FA variable shows a small positive connection of 5.1% (0.051) with the GE and TDME variables related to TR, but this is not significant since the p-value is 0.403. Tourism resilience is not significantly affected by a one-unit increase in involvement.

Unlike previous findings, the connection between the IR variable and the GE and TDME variables to the TR variable shows a positive but weak relationship, measured at 2% (0.020), and is statistically significant with a p-value of 0.002. A one-unit increase in weak involvement can significantly affect the tourism sector's resilience.

This finding backs the neo-institutional view, which says that social influences and unwritten rules often affect how well governance works more than official actions do. In other words, even weak or informal involvement can still have a strong positive effect on enhancing the resilience of the tourism sector, particularly in areas facing conflict and institutional crises.

Therefore, a collaborative and community-based approach is essential in designing inclusive and adaptive destination resilience strategies.

Moreover, tourism governance should be viewed not solely as a bureaucratic framework but as a domain characterized by intricate institutional interactions among formal and informal participants. The success of tourism resilience is greatly affected by how well the governance system can include informal contributions from local social connections, such as trust, community support, and shared values.

Excessively procedural, top-down approaches have failed to establish meaningful connections between policymakers and local stakeholders, as suggested by the limited correlation between FA and TR. The importance of IR for TR indicates that adaptive capacity can develop through grassroots participation, which, while not always formally institutionalized, possesses considerable social legitimacy. Consequently, strategies to enhance tourism resilience should transition from a formal-structural framework to a reflective institutional framework that acknowledges the contributions of informal actors and local practices in promoting destination sustainability.

These findings indicate symptoms of fragmented authority and institutional redundancy that often arise in the governance of destinations like Toba. Fragmentation of authority arises when no single entity possesses exclusive or predominant decision-making power, leading to policy inconsistencies and inadequate coordination among institutions. In this context, the dual roles of institutions-central government, regional government an and local communities-frequently do not function synergistically but instead overlap and undermine one another. Institutional redundancy refers to multiple institutions performing similar functions, which does not enhance effectiveness and leads to confusion in policy implementation.

The lack of integrated governance mechanisms weakens the influence of FA on TR, as formal policies frequently lack coercive power in a fragmented institutional ecosystem. Understanding tourism resilience necessitates an examination of fragmented authority and institutional duplication, which inherently diminishes the system's ability to adapt to risks and crises.

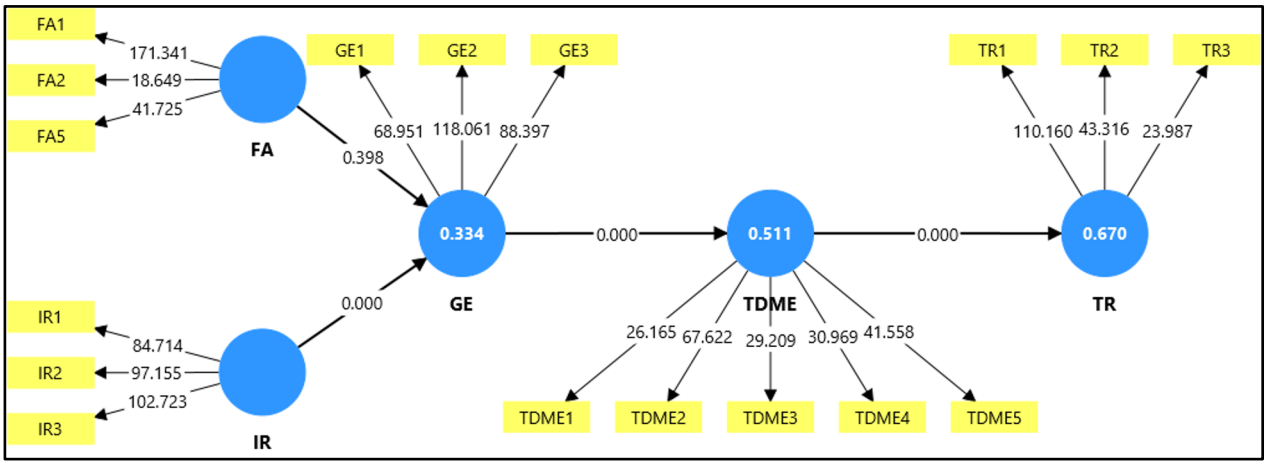

Fig. 2. Research model

The results from the model calculations using the bootstrapping method show that FA has a strong impact on GE, with a score of 0.398 and a p-value of 0.000 (Fig. 2). This value indicates that the growing complexity and fragmentation of authority in tourism management can enhance governance effectiveness, provided that appropriate coordination mechanisms are in place. This finding supports the idea of polycentric governance by Ostrom [15], which suggests that having different authoritative groups can improve how well governance works, as long as there is good coordination both among and between these groups.

Moreover, IR demonstrates a significant positive impact on GE, evidenced by a path coefficient of 0.334 and a p-value of 0.000. Institutional redundancy, frequently viewed as bureaucratic inefficiency, is a buffer for managing tourism emergencies in this context. Comfort's study indicates overlapping institutions facilitate and more flexible responses, particularly regarding multidimensional risk management.

The association between GE and TDME exhibits a path coefficient of 0.511 and a p-value of 0.000, indicating a high significance level. This finding affirms that effective governance is crucial for successful disaster management within the tourism sector. According to Faulkner and Ritchie [9, 10], effectiveness of TDM system is significantly affected by leadership quality, inter-institutional collaboration, and transparent decision-making processes.

The findings highlight TDME as the most influential factor on tourism resilience (TR), as reflected by a path coefficient of 0.670 and a highly significant p-value of

0.000. This implies that well-implemented tourism disaster management plays a crucial role in enhancing destination resilience.

This resilience encompasses capacity of destinations to respond, recover, and adapt to external disturbances. This finding aligns with the framework established by Cochrane and Shaw on resilience thinking in tourism, emphasizing system adaptability as the primary indicator of tourism resilience.

The R^2 values indicate that the structural model exhibits moderate to strong explanatory power across its primary constructs. Governance effectiveness (GE), with an R^2 of 0.334, shows that it explains a large part of the differences in fragmented authority (FA), which means there is a strong link between how well institutions perform and the issues in disaster governance. TDME explains 51.1% of the differences in governance quality, showing that good disaster management practices greatly affect how people view the quality of governance. Tourism resilience (TR) demonstrates a significant explanatory outcome, with TDME explaining 67% of its variance (R^2=0.670), illustrating the vital role of disaster management systems in developing resilient tourism destinations.

The statistical results back up the theory of adaptive governance and resilience, particularly in situations where there are complicated rules and shared responsibilities. The model indicates that enhancing the effectiveness of disaster management strategies fortify governance structures and improve the system's adaptive capacity to respond to shocks. The strong influence of the TR construct shows that well-managed disaster response plans are crucial for building long-term resilience in tourism systems.

These results have important implications for public policy and administrative reform. They argue that data-informed collaboration and adaptive coordination mechanisms can strategically manage institutional fragmentation, typically regarded as a governance liability. Policymakers are encouraged to utilize these insights to enhance bureaucratic efficiency, minimize redundancy, and implement a more integrative and participatory approach to tourism governance. They conceptualize resilience as an outcome and an ongoing, collaborative process that they integrate into institutional design and crisis response strategies.

4 Conclusion

This study shows that fragmented authority and institutional redundancy are key features of the system that manages priority destination management, as seen in lake Toba. While sometimes perceived as a flaw in the system, the study's findings indicate that when these two components are adeptly managed through a collaborative and participatory methodology, they can enhance governance effectiveness and tourism disaster management effectiveness. These findings underline the importance of establishing governance founded on trust, commitment, and equitable roles between tourism authorities and local communities.

An inclusive relational approach and rather than a purely administrative one, is essential for developing resilient and adaptive tourism disaster management. The active engagement of local communities from the design phase through to policy implementation is essential for minimizing institutional friction and fostering consensus on disaster management strategies. Communities that have coexisted with the destination landscape are vital actors and must not be ignored.

These findings suggest that government and tourism stakeholders should adopt a contextual and sensitive approach to destination management, considering local dynamics. Prior to designating an area as a priority destination, it is essential to conduct a thorough mapping of the community's institutions and socio-cultural characteristics, employing a sequential exploratory design approach. Consequently, we may reduce the likelihood of conflict and enhance the destination's capacity for resilience in addressing future disasters in a sustainable manner.

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