

Operational Risk Management Strategy Formulation of Curup Gangsa Lampung

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Input : January 17, 2026 Revised : February 22, 2026
Accepted : February 18, 2026 Published : February 27, 2026

Abstract

Tourism activities in open natural environments inherently contain uncertainty that may evolve into operational risks when management control and supporting infrastructure are inadequate. Curup Gangsa Lampung, as a nature-based tourism destination, faces increasing visitor flow without a structured operational risk management system. This study aims to identify operational risk events, map risk levels using a Risk Evaluation Matrix, and formulate relevant mitigation strategies. The research employed a quantitative descriptive approach involving 260 respondents selected using purposive sampling. Data were analyzed using Importance Performance Analysis (IPA), Risk Evaluation Matrix, and Fishbone Diagram to identify priority risks and root causes. The findings reveal that operational risks originate from both natural and human-related factors, with visitor accidents classified as the most critical risk due to high frequency and impact. Several indicators fall into the "Concentrate Here" quadrant in IPA analysis, particularly signage, toilet conditions, infrastructure maintenance, and WiFi availability. The Fishbone analysis confirms that deficiencies in infrastructure and information accessibility are dominant causal factors. The study concludes that preventive improvements in infrastructure quality and information systems are essential to reduce operational risk exposure and enhance destination sustainability.

Keywords : *Curup Gangsa, Importance Performance Analysis, Operational Risk, Risk Evaluation Matrix, Tourism Risk Management*

Citation :

Kesuma W P et al. 2026 Operational Risk Management Strategy Formulation of Curup Gangsa Lampung *MSJ: Majority Science Journal*, 4(1), 116-123.

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1. Introduction

The global tourism sector is currently operating within an environment characterized by structural uncertainty, rapid technological transformation, and increasing volatility in visitor expectations. Destinations are no longer evaluated solely based on scenic attractiveness or promotional intensity, but rather on their capacity to manage operational risk in a systematic and measurable manner. In contemporary tourism governance, resilience is increasingly defined by the ability of destination managers to anticipate, identify, and mitigate operational disturbances before they escalate into reputational or financial crises (Wijianto, 2023; Paulina, 2023). Climate variability, fluctuating visitor flows, and digital transparency through social media platforms have intensified managerial pressure to ensure consistent service quality and safety standards (Darsana, 2023). Under these conditions, destinations that fail to institutionalize structured operational risk management mechanisms are more vulnerable to service failures, visitor dissatisfaction, and long-term competitiveness decline.

Empirical evidence suggests that even minor operational weaknesses can significantly affect visitor perception and revisit intention. Duan (2022) emphasizes that destinations experiencing repeated service inconsistencies tend to suffer gradual visitor decline despite possessing strong natural or cultural assets. In the digital era, a single negative visitor experience can be amplified through online review systems, reducing public trust and weakening destination image (Satpathy, 2025). This phenomenon illustrates that operational

risk is not merely a technical managerial concern but a strategic determinant of sustainability. Therefore, performance evaluation systems capable of identifying priority weaknesses are essential to prevent reactive decision-making and ensure evidence-based governance.

Lampung Province, as one of Indonesia's ecotourism-rich regions, possesses diverse natural tourism assets, including beaches, forests, highlands, and waterfalls. Among these, waterfall destinations represent high-risk tourism environments due to slippery terrain, fluctuating water discharge, and limited structural control compared to built attractions. Curup Gangsa, located in Way Kanan Regency, has emerged as a prominent waterfall destination characterized by high visitor traffic, scenic vertical water formations, and adventure-based tourism activities. However, despite its growing popularity, the operational governance of Curup Gangsa has not yet been supported by a structured operational risk mapping system. Field observations reveal weaknesses in safety signage, sanitation facilities, infrastructure maintenance, and real-time information dissemination. These deficiencies indicate a structural vulnerability that may compromise visitor safety and experiential quality.

Operational risk in tourism is primarily rooted in internal process failures, human resource limitations, infrastructure deficiencies, and system inadequacies (Bong, 2019; Sugiarto, 2023). Unlike external risks such as natural disasters, operational risks are largely manageable through systematic evaluation and preventive intervention. Research demonstrates that effective operational risk management positively influences visitor satisfaction and loyalty (Sugiarto et al., 2022; Sugiarto & Herawan, 2022). Nevertheless, most existing studies focus on homestay services or structured tourism villages, leaving open-nature destinations such as waterfalls underexplored. This indicates a theoretical and contextual gap in the literature.

Previous research by Eshun and Tichaawa (2020) identified key ecotourism risks in Ghana, including environmental degradation and community management issues, yet did not develop a priority-based operational risk mapping model for waterfall contexts. Similarly, Ramanpong et al. (2021) examined visitor injuries in forest recreation areas and highlighted weather influence but did not integrate risk frequency-impact mapping into a structured mitigation model. In the Indonesian context, Lesmana et al. (2022) developed competitive advantage frameworks for super-priority destinations, while Budhijono et al. (2023) evaluated governance performance using the Sapta Pesona framework. However, these studies did not specifically analyze operational risk prioritization for non-super-priority waterfall destinations such as Curup Gangsa.

Moreover, Sugiarto et al. (2023) successfully mapped priority operational risk events in Kebun Raya Cibodas using multiple detection tools. Yet, botanical garden environments differ structurally from waterfall ecosystems, which involve higher environmental uncertainty and physical hazard exposure. Research on small tourism enterprises during disasters (Mahembe & Mutezo, 2025) emphasizes resilience capacity but does not extend to open natural attractions. Likewise, Shaker and Shahin (2025) propose integrated risk prioritization frameworks in supply chain contexts without adaptation to tourism ecosystems. These findings collectively reveal that while operational risk management literature is growing, there remains a significant gap in applying priority mapping models to waterfall-based ecotourism destinations characterized by high environmental variability and physical hazard exposure.

From a managerial standpoint, Curup Gangsa faces a phenomenon of fluctuating visitor numbers combined with limited resource allocation. Resource constraints often result in reactive operational decisions rather than proactive risk mitigation strategies (Sugiarto, 2023). In such contexts, misallocation of limited financial and human resources may lead to persistent service gaps, particularly in sanitation management, safety supervision, and infrastructure maintenance. Tabaeian (2023) explains that discrepancies between expected service importance and actual performance significantly influence visitor dissatisfaction. When these discrepancies occur repeatedly, destination resilience weakens over time (Volden, 2022).

Furthermore, sustainable tourism requires a balance between environmental conservation, economic benefits, and visitor safety (Lesmana, 2022). Without structured operational risk evaluation, achieving this equilibrium becomes increasingly difficult.

Ariyachandra (2023) argues that risk management forms a critical foundation for sustainable destination governance, especially in ecologically sensitive environments. Lukoseviciute (2021) highlights the importance of priority mapping in resource allocation to prevent inefficient investment distribution. In the absence of such prioritization, managerial efforts risk being fragmented and ineffective.

In the case of Curup Gangsa, the absence of integrated risk evaluation tools such as Risk Evaluation Matrix and Importance Performance Analysis (IPA) creates a methodological gap in operational governance. While Sapta Pesona provides a normative framework for destination quality assessment (Laksmi, 2023; Bashori, 2025; Agustin, 2025), its application has rarely been integrated with quantitative risk frequency-impact mapping. Therefore, the present study positions itself at the intersection of Sapta Pesona dimensions and operational risk evaluation tools to generate a more structured mitigation framework.

The novelty of this research lies in the integration of three analytical instruments Risk Evaluation Matrix, Importance Performance Analysis (IPA), and Fishbone Diagram within the specific context of a waterfall-based tourism destination. Unlike prior studies that focus on general tourism governance or homestay-based services, this research develops a priority-based operational risk mitigation model tailored to the unique vulnerabilities of open-nature attractions. By combining visitor perception data with risk frequency-impact classification and root cause analysis, this study provides a multi-layered framework capable of translating empirical findings into actionable mitigation strategies. This integrative approach contributes both theoretically by expanding operational risk literature into waterfall ecotourism contexts and practically by offering a replicable model for similar destinations across Indonesia and Southeast Asia.

Accordingly, this study is directed toward a central objective: to formulate an operational risk management strategy for Curup Gangsa Lampung through priority-based operational performance mapping using Risk Evaluation Matrix, Importance Performance Analysis, and Fishbone analysis. Through this objective, the research seeks to bridge the gap between theoretical operational risk frameworks and practical implementation in nature-based tourism governance, ultimately strengthening visitor safety, destination resilience, and sustainable tourism development.

2. Method

This study employed a quantitative research design to obtain an objective and systematic assessment of operational risk conditions at Curup Gangsa, Way Kanan Regency, Lampung Province. The research was conducted between October 2025 and January 2026, with visitors to Curup Gangsa serving as the unit of analysis. The population consisted of all tourists visiting the destination during the research period. Since the exact number of visitors was not publicly available, the sample size was determined using Hair et al.'s guideline, which recommends a minimum of five to ten respondents per research indicator. Given the use of 26 operational risk indicators derived from the Sapta Pesona framework and the Four Pillars of Operational Risk, the minimum sample size was calculated as 260 respondents (26×10). A purposive sampling technique was applied with specific inclusion criteria: visitors aged 17 years and above, those who had directly utilized the destination's facilities and services, and those willing to complete the questionnaire. Data collection was conducted through structured questionnaires designed to measure two primary dimensions, namely the level of importance (visitor expectations) and the level of performance (visitor perceptions) of each operational risk indicator. The instrument items were constructed based on measurable operational indicators, including safety information, infrastructure condition, sanitation facilities, staff performance, environmental management, and information systems. Prior to data analysis, validity was tested using Pearson Product Moment correlation with a significance level of 5 percent, and reliability was assessed using Cronbach's Alpha, where coefficients above 0.70 indicated acceptable internal consistency.

Data analysis was conducted using three integrated analytical techniques to formulate a priority-based operational risk mitigation strategy. First, Importance Performance Analysis (IPA) was employed to map operational indicators into four quadrants: Concentrate Here, Keep

Up the Good Work, Low Priority, and Possible Overkill. This method enabled the identification of performance gaps between visitor expectations and actual service delivery, thereby determining which operational aspects required immediate managerial attention. Second, the Risk Evaluation Matrix was utilized to classify operational risk events based on two dimensions, namely frequency of occurrence and level of impact. Risks were categorized into four strategic responses: risk retention (low impact–low frequency), risk reduction (low impact–high frequency), risk transfer (high impact–low frequency), and risk avoidance (high impact–high frequency). This matrix provided a structured framework for determining proportional and realistic mitigation strategies. Third, Fishbone Diagram analysis was applied to identify the root causes of dominant operational risks by examining contributing factors across four pillars: internal processes, human resources, software systems, and infrastructure. The integration of these three analytical tools ensured that the study not only identified priority performance gaps but also established a systematic and evidence-based operational risk management strategy for enhancing visitor safety, service quality, and destination sustainability at Curup Gangsa Lampung.

3. Results and Discussion

This section presents the empirical findings derived from quantitative data processing. The results are organized into several tables to systematically describe respondent characteristics, instrument testing, operational risk classification, and priority mapping outcomes. Each table is followed by an interpretation to clarify its implications for operational risk management at Curup Gangsa Lampung. The presentation format is aligned with the structure and content of the original research file

Table 1. Respondent Characteristics Summary (n = 260)

Variable	Category	Frequency	Percentage
Gender	Male	139	53.5%
	Female	121	46.5%
Age	<20 years	9	3.5%
	21–25 years	157	60.4%
	26–30 years	57	21.9%
	31–35 years	16	6.2%
	>35 years	21	8.1%
Place of Origin	Lampung Province	230	88.5%
	Outside Lampung	30	11.5%
Education	Senior High/Vocational	148	56.9%
	Diploma	26	10.0%
	Bachelor	82	31.5%
	Master	4	1.5%
Visiting Frequency	First time	88	33.8%
	Second time	99	38.1%
	Third time	36	13.8%
	Fourth or more	37	14.2%
Motivation	Leisure	233	89.6%
	Family	26	10.0%
	Education	1	0.4%

The results indicate that Curup Gangsa is predominantly visited by young adults aged 21–25 years (60.4%), with a relatively balanced gender composition. The dominance of visitors from Lampung Province (88.5%) confirms its strong regional orientation. The largest group of respondents are second-time visitors (38.1%), indicating emerging visitor loyalty. Leisure motivation (89.6%) strongly characterizes the destination as a recreational site rather than an educational tourism location. Overall, the demographic profile reflects a regional, youth-driven, leisure-oriented tourism market segment.

Table 2. Instrument Quality and Operational Risk Classification

Component	Indicator Category	Result	Standard Classification	Interpretation
Validity Test	IM01–IM26	r-value > 0.123	r-table = 0.123	All items valid
	PR01–PR26	r-value > 0.123	r-table = 0.123	All items valid
Reliability Test	Importance (26 items)	Cronbach’s Alpha = 0.905	≥ 0.70	Reliable
	Performance (26 items)	Cronbach’s Alpha = 0.798	≥ 0.70	Reliable
Risk Evaluation Matrix	Wild animals (snakes, monkeys)	Rarely – Low Impact	Risk Retention	Manageable risk
	Floods	Rarely – High Impact	Risk Transfer	Requires anticipatory control
	Skin infections (dirty water)	Often – Low Impact	Risk Reduction	Requires frequency control
	Visitor accidents (negligence)	Often – High Impact	Risk Avoidance	Critical priority risk

The integrated table demonstrates that all research instruments meet statistical validity and reliability requirements, confirming the robustness of the measurement model. Furthermore, the Risk Evaluation Matrix clearly identifies visitor accidents as the most critical operational risk due to their high frequency and high impact classification. While wildlife disturbances remain manageable, and skin infections require reduction strategies, flood risks necessitate institutional coordination through risk transfer mechanisms. This integrated presentation strengthens the analytical coherence between instrument quality assurance and operational risk prioritization at Curup Gangsa.

Discussion

The objective of this study was to formulate an operational risk management strategy for Curup Gangsa Lampung through priority-based operational performance mapping. The findings provide empirical evidence that operational risks in nature-based tourism destinations are predominantly shaped by internal management factors rather than uncontrollable external forces, thereby emphasizing the strategic importance of structured risk mitigation.

The Risk Evaluation Matrix results demonstrate that visitor accidents represent the most critical operational risk at Curup Gangsa due to their high frequency and severe impact. This finding aligns with Ritchie (2021), who argues that everyday operational failures often pose greater threats to tourism sustainability than rare catastrophic events. In open-nature destinations, repeated exposure to unsafe visitor behavior combined with inadequate safety communication significantly increases the likelihood of serious incidents. The classification of visitor accidents as an unacceptable risk underscores the urgency of implementing risk avoidance strategies to eliminate exposure to hazardous zones.

The identification of floods as high-impact but low-frequency risks further supports the argument that not all critical risks can be addressed through internal controls alone. Consistent with the findings of Ramanpong et al. (2021), natural hazards in nature-based destinations require anticipatory planning and inter-institutional collaboration rather than purely operational interventions. Risk transfer strategies, such as coordination with meteorological agencies and the use of early warning systems, therefore become essential components of destination resilience.

Importance Performance Analysis reveals substantial gaps between visitor expectations and perceived performance, particularly in signage, sanitation facilities, infrastructure maintenance, and WiFi availability. These gaps confirm the argument of Tabaeian (2023) that discrepancies between expected and delivered services are a primary source of visitor dissatisfaction, even in destinations with strong natural appeal. In the context of Curup Gangsa, the underperformance of safety-related indicators directly contributes to elevated operational risk exposure.

The prominence of signage as a priority issue across multiple analytical tools highlights the central role of information accessibility in tourism risk management. According to Satpathy (2025), effective communication systems are critical in shaping visitor behavior and minimizing unsafe actions. The lack of clear and visible signage at Curup Gangsa limits visitors' ability to assess risk independently, thereby increasing reliance on personal judgment, which is often insufficient in complex natural environments.

Sanitation and infrastructure maintenance also emerge as critical determinants of operational risk. The frequent occurrence of minor health disturbances related to water conditions illustrates how low-impact but high-frequency risks can cumulatively damage destination reputation. Duan (2022) emphasizes that persistent service shortcomings, even when individually minor, can gradually erode visitor trust and reduce repeat visitation. Therefore, risk reduction strategies focusing on routine maintenance and environmental monitoring are essential for sustaining visitor satisfaction.

The Fishbone Diagram analysis further clarifies that infrastructure and information systems constitute the dominant root causes of operational risk at Curup Gangsa. This finding is consistent with Bong's (2019) classification of operational risk as primarily originating from internal process and facility failures. Although human resource performance is generally perceived as positive, its effectiveness is constrained by inadequate supporting systems. This confirms the argument of Sugiarto et al. (2022) that operational risk management must be approached holistically, integrating human, physical, and technological dimensions.

The integration of *Sapta Pesona* principles with operational risk analysis provides additional insight into destination governance. While elements such as hospitality and natural beauty are well maintained, deficiencies in safety, cleanliness, and memorable experience indicators weaken overall destination performance. Budhijono et al. (2023) note that imbalance among *Sapta Pesona* elements can undermine visitor satisfaction, even when certain dimensions perform strongly. Thus, priority-based improvement is essential to restore equilibrium across experiential dimensions.

From a strategic perspective, the findings support the argument that priority mapping is a crucial tool for resource allocation in destinations with limited operational capacity. Lukoseviciute (2021) emphasizes that without clear priorities, managerial efforts risk being dispersed across low-impact areas, reducing overall effectiveness. The identification of Quadrant A indicators in this study provides a concrete basis for directing investments toward high-impact improvements.

The results also reinforce the importance of preventive rather than reactive management. Volden (2022) argues that destinations failing to periodically reassess operational priorities are more vulnerable to escalating service gaps over time. By employing IPA, Risk Evaluation Matrix, and Fishbone analysis simultaneously, this study offers a proactive framework capable of identifying emerging risks before they develop into crises.

In addressing the research objective, the study demonstrates that operational risk management at Curup Gangsa should prioritize infrastructure enhancement, safety communication, and information system development. These strategies directly respond to the most critical risks identified and align with the theoretical framework of operational risk management in tourism. Moreover, the findings contribute to the broader literature by extending priority-based risk mapping to waterfall tourism destinations, which have been underrepresented in previous research.

In summary, the discussion confirms that operational risk mitigation at Curup Gangsa Lampung must be grounded in empirical priority mapping to ensure effectiveness and sustainability. By addressing high-impact and high-frequency risks through avoidance

strategies, reducing recurrent low-impact risks through preventive measures, and transferring uncontrollable risks through institutional collaboration, destination managers can enhance visitor safety, strengthen destination resilience, and support long-term sustainable tourism development.

4. Conclusions and Suggestions

This study concludes that operational risks at Curup Gangsa Lampung originate from both natural risk and human risk factors, with visitor accidents emerging as the most critical operational risk due to their high frequency and high impact classification. The Risk Evaluation Matrix indicates that several risks fall into unacceptable categories requiring immediate managerial control, particularly those related to visitor negligence and inadequate safety communication. Furthermore, the Importance Performance Analysis (IPA) reveals significant performance gaps in signage, toilet quality, infrastructure maintenance, and reliable Wifi access. These findings are reinforced by the fishbone analysis, which identifies deficiencies in infrastructure quality and information accessibility as dominant root causes of operational vulnerability. Therefore, the formulation of an operational risk management strategy at Curup Gangsa must prioritize preventive and structural improvements, especially in safety communication systems and facility maintenance, in order to reduce risk exposure and enhance overall destination resilience.

Based on the findings, it is recommended that the management of Curup Gangsa implement a priority based risk mitigation strategy focusing on strengthening infrastructure, improving safety signage, enhancing sanitation standards, and ensuring stable information systems including reliable Wifi access in emergency-prone areas. Collaboration with external institutions such as disaster management and meteorological agencies should also be reinforced to support early warning systems for high impact natural risks such as flooding. In addition, periodic evaluation of operational performance using structured priority mapping tools such as IPA and Risk Evaluation Matrix should be institutionalized to ensure continuous improvement. Through systematic, evidence based, and preventive operational management, Curup Gangsa can enhance visitor safety, maintain service quality, and strengthen its long term sustainability as a nature based tourism destination.

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