



# Administratio:

Jurnal Ilmiah Administrasi Publik dan Pembangunan

Volume 17(1) 2026: 101-114

P-ISSN: 2087-0825, E-ISSN: 2548-6977

DOI: 10.23960/administratio.v17i1.627

Accredited by Kemenristek Number 152/E/KPT/2023 (Sinta 3)



ARTICLE



## Community-Based Conservation and Tourism Integration: A Bibliometric and Risk-Based Assessment for Sustainable Management of Ranu Darungan

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How to cite: Novita, A.A., and Ramadhani, G.Z., (2026). Community-Based Conservation and Tourism Integration: A Bibliometric and Risk-Based Assessment for Sustainable Management of Ranu Darungan. *Administratio: Jurnal Ilmiah Administrasi Publik dan Pembangunan*, 17(1)

### Article History

Received: May 12, 2026

Accepted: June 22, 2026

### Keywords:

Collaborative  
Governance,  
Ecotourism,  
Conservation Areas,  
Sustainable Tourism,

### Kata Kunci:

Collaborative-Governance,  
Ekowisata,  
Kawasan Konservasi,  
Sustainable-Tourism,

### ABSTRACT

*This study aims to map research trends and strategic risks in sustainable tourism management within conservation areas using bibliometric analysis via VOSviewer and a risk assessment matrix. Based on 137 Scopus-indexed articles, findings reveal that themes such as sustainable tourism, collaborative governance, and conservation have evolved dynamically since 2013, shifting toward integrating governance, ecosystem services, and sustainable development. The six major thematic clusters identified were then translated into locally relevant risk categories through stakeholder-based assessment. The highest-priority risks were visitor overcapacity and habitat disturbance. This research provides an integrated analytical approach that links worldwide governance trends identified by bibliometric mapping with locally specific risk priorities, laying a pragmatic ground for adaptive governance and sustainable tourism management in conservation zones.*

### ABSTRAK

Studi ini bertujuan untuk memetakan tren penelitian dan risiko strategis dalam pengelolaan pariwisata berkelanjutan di dalam kawasan konservasi menggunakan analisis bibliometrik melalui VOSviewer dan matriks penilaian risiko. Berdasarkan 137 artikel yang terindeks Scopus, temuan menunjukkan bahwa tema-tema seperti pariwisata berkelanjutan, tata kelola kolaboratif, dan konservasi telah berkembang secara dinamis sejak tahun 2013, bergeser ke arah integrasi tata kelola, jasa ekosistem, dan pembangunan berkelanjutan. Enam klaster utama diidentifikasi, dengan risiko tertinggi terkait dengan kelebihan kapasitas pengunjung dan gangguan terhadap habitat serta nilai-nilai budaya. Penelitian ini menawarkan pendekatan analitis integrasi yang menghubungkan tren tata kelola global hasil pemetaan bibliometrik dengan prioritas risiko yang kontekstual pada tingkat lokal, sehingga memberikan landasan praktis bagi pengembangan tata kelola adaptif dan pengelolaan pariwisata berkelanjutan di kawasan konservasi.

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## A. INTRODUCTION

Bromo Tengger Semeru National Park (TNBTS) is a strategic conservation area with a high level of biodiversity. One of its significant zones is Ranu Darungan, a natural lake located in Lumajang Regency that serves as both a conservation buffer area and a livelihood space for the community of Pronojiwo Village. This area holds substantial ecological and economic potential through community activities organized under the Ranu Lingga Rekisi Conservation Farmers Group (Kelompok Tani Konservasi, KTK), which include orchid cultivation, wild honey harvesting, manure composting, and coffee and horticultural processing. In addition to maintaining forest sustainability, the group has also initiated special-interest tourism such as orchid studies (avichid tourism) and birdwatching.

Although these activities have the potential to improve local welfare, tourism management in Ranu Darungan still faces multiple challenges, ranging from limited institutional capacity to exposure to natural hazards such as the Semeru volcanic eruptions, landslides, and the impacts of climate change. The absence of an integrated governance model has resulted in fragmented tourism practices that are not yet fully aligned with conservation and risk mitigation principles. Institutionally, KTK's primary mandate focuses on conservation, while tourism management authority remains constrained by strict conservation zoning regulations. This condition creates a disparity between the area's potential and the managerial capacity to realize sustainable tourism.

Moreover, the lack of integration between ecotourism potential and sustainable marketing strategies reveals the weakness of collaborative governance among key actors—local government, the TNBTS Authority, academia, the tourism sector, and local communities. Such fragmentation undermines cross-institutional coordination and hampers the effectiveness of tourism management. Previous studies on Ranu Darungan have predominantly focused on biodiversity aspects, while issues of governance and multi-actor collaboration remain underexplored.

Despite the growing body of literature on sustainable tourism and collaborative governance, there remain considerable gaps in our understanding of how governance frameworks might be translated into actionable management priorities in conservation-based tourism destinations. Previous studies have mainly considered collaborative governance, community-based tourism and conservation management as separate streams of inquiry. These studies provide valuable insights into stakeholder participation and environmental stewardship but often lack consideration of how governance knowledge can be operationalized into context-specific risk management strategies. This is particularly important in protected areas where institutional authorities are often overlapping and the environmental vulnerabilities are high.

This limitation is especially acute in conservation areas where local communities are expected to promote tourism development while at the same time adhering to strict conservation regulations. This creates a tension in governance between economic aspiration, ecological protection and institutional control. In the case of Ranu Darungan, community-based conservation initiatives are nested in a highly regulated national park system, creating difficulties in balancing local livelihood opportunities with biodiversity conservation objectives. It is an important but under-researched question in the literature how governance priorities should be set under these conditions.

To fill this gap, this study proposes an integrated analytical framework that combines bibliometric mapping and stakeholder-based risk assessment. This study combines macro-level insights from the international literature and micro-level management realities in a conservation tourism destination, in contrast to previous studies which either focus on global research trends or site-specific tourism management challenges. By translating globally

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identified governance and sustainability themes into locally relevant risk priorities, the study contributes a practical approach to strengthen adaptive and collaborative governance in protected tourism areas.

Against this background, the study seeks to identify dominant governance and sustainability themes within the global literature on conservation-based tourism, and examine their relevance to the management of Ranu Darungan. Specifically, this study combines bibliometric analysis of publications indexed in Scopus with stakeholder-based risk assessment to identify priority management issues and potential mitigation strategies. The study is expected to contribute theoretically to the body of knowledge on collaborative governance and practically to managing sustainable tourism in conservation areas by combining global knowledge trends with local management realities.

## **B. LITERATURE REVIEW**

In the global context, this type of tourism is classified as nature-based tourism, a subcategory of sustainable tourism that emphasizes the balance among social, economic, and ecological dimensions (Pulido-Fernández et al., 2019; Gaonkar & Sukthankar, 2025). This concept promotes responsible tourism management aimed at reducing environmental pressures while empowering local communities (Dangi & Jamal, 2020). However, challenges often arise when the number of tourists increases without sustainable planning, a phenomenon known as overtourism, which has led to environmental degradation in regions such as the Mediterranean Coastal Region and Chilika Lake, India (Petrovszki et al., 2024; Dash & Balamurugan, 2024).

Several studies highlight that weak environmental education, low levels of ecotourism literacy, and inadequate infrastructure readiness contribute significantly to this imbalance (Ariza Sandy Najeha & Vitrianto, 2024; Goh et al., 2023). In the Southeast Asian context, sustainable tourism management continues to face the dilemma between economic growth and ecological conservation (Pham et al., 2022; Kunjuraman & Hussin, 2021). Therefore, the development of conservation-based tourism in areas such as Ranu Darungan must be guided by a sustainable tourism management approach that integrates socio-ecological dimensions and actively involves local communities (Sunaryo et al., 2023; Le et al., 2022).

Empirical evidence shows that collaborative models can enhance the effectiveness of conservation area management. For instance, Dredge and Jenkins (2021) emphasize the importance of multi-stakeholder governance to ensure transparency and cross-sector participation, while Ahebwa et al. (2020) highlight the crucial role of local communities in developing community-based ecotourism in Uganda's national parks. In the Indonesian context, Untari and Sumarmi (2024) as well as Rangkuti et al. (2023) argue that collaborative governance in conservation areas can foster alignment among government policies, private sector initiatives, and the needs of indigenous and local communities.

Recent studies also stress that the success of sustainable tourism depends on the level of adaptation to climate change and technological readiness, including the implementation of smart ecotourism to monitor environmental impacts (Suryawan et al., 2024; Li et al., 2022). Bali, for example, has adopted this approach through renewable energy development, digital waste management systems, and the "green destination" program (Ghasemi et al., 2024). Meanwhile, Bhutan stands as a model of success through its "high value, low impact tourism" policy, which limits tourist numbers to preserve cultural authenticity and environmental integrity (Dorji & Nyima, 2021).

Accordingly, the development of conservation-based tourism in the Ranu Darungan area holds substantial potential to become a model of eco-conscious tourism in East Java. However, achieving long-term sustainability requires cross-sectoral governance that integrates conservation policies, local community engagement, and technological innovation (Nugroho

& Negara, 2023; Sari et al., 2024). Beyond strengthening the area’s ecological and educational values, such an approach also offers the potential to generate economic benefits through inclusive green growth and social empowerment for surrounding communities.

### C. METHOD

This study combines bibliometric and stakeholder-based risk assessment to investigate sustainable tourism governance in conservation areas, focusing on the Ranu Darungan case. The bibliometric analysis identifies key themes, research trends, and governance issues in global sustainable tourism literature. Meanwhile, the risk assessment contextualizes these insights within local management challenges at Ranu Darungan. This approach bridges global academic knowledge with practical, site-specific management considerations in conservation-focused tourism. The primary focus lies in bibliometric analysis as an analytical tool to identify dominant governance and sustainability themes in the global literature, while the Risk Assessment Matrix was developed through expert judgment and contextual interpretation of the Ranu Darungan case. The study aims to explore and interpret the underlying phenomena related to the research subject by detecting, analyzing, and reporting the emerging themes within the data.

#### Study Area

The designation of Bromo Tengger Semeru National Park (TNBTS) as stipulated in the Decree of the Minister of Forestry No. 178/Menhut-II/2005 is a continuation of the Decree of the Governor of the Dutch East Indies dated February 21, 1919, concerning the Tengger Sand Sea Nature Reserve. The area was later expanded to include the Ranu Kumbolo Nature Reserve and is currently established as a national park with a total area of 43,210.20 hectares. Administratively, the TNBTS area spans four regencies in East Java Province—Malang (18,692.96 ha), Pasuruan (4,642.52 ha), Probolinggo (3,600.37 ha), and Lumajang (23,430.35 ha). Its management is divided into twelve resorts, including Jabung, Pasrujambe, Pananjakan, Tengger Laut Pasir, Patok Picis, Coban Trisula, Ranupane, Gucialit Candipuro, Sendoro, Taraman Satriyan, and Ranu Darungan.

The bibliometric dataset included 137 Scopus-indexed journal articles published between 2007 and 2025. Articles were retrieved with keywords relevant to sustainable tourism, collaborative governance and protected areas. The search was restricted to peer-reviewed journal articles published in the English language and indexed on the Scopus database. After initial screening, duplicate and irrelevant records were excluded, leaving a final dataset of 137 publications for analysis.

Additionally, the dimensions of sustainable tourism encompass Environmental, Economic, Social, Managerial, Governance, and Infrastructure aspects. Li et al. (2021) emphasized that the variables related to sustainable tourism may differ among stakeholders due to internal and external contextual factors. Nevertheless, sustainable tourism is generally categorized into four overarching dimensions: Environmental, Economic, Infrastructure, and Governance.

Accordingly, the research trend analysis was conducted by identifying 137 Scopus-indexed articles using the following search query:

The literature search was conducted using the	("sustainable tourism" OR "sustainable development") AND ("collaborative governance" OR "governance approach") AND
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following Boolean query:	("conservation area" OR "national park" OR "protected area")
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In order to analyze the networks of co-occurrence of keywords and to detect the main thematic clusters in the literature, a bibliometric analysis was performed using VOSviewer software. Co-occurrence analysis was selected to explore relationships among research themes, with author keywords as the unit of analysis. The resulting network, overlay and density visualizations were interpreted to identify dominant governance issues, emerging research trends and conceptual linkages between sustainable tourism, conservation and governance-related topics.

### **Risk Assessment Development**

Risk identification was based on the main themes emerging from the bibliometric analysis and discussed with local stakeholders involved in conservation and tourism management. The stakeholder-based risk assessment was carried out in a Focus Group Discussion (FGD) with 14 participants. These were 11 members of the Ranu Lingga Rekisi Conservation Farmers Group (KTK) representing local community and tourism actors, and 3 forest rangers (Polisi Kehutanan/Polhut) from the Bromo Tengger Semeru National Park Authority (BB-TNBTS) representing conservation management authorities. Participants were purposely selected according to their direct involvement in conservation activities, tourism management and environmental monitoring in Ranu Darungan area. The risk assessment matrix was then developed based on the expert judgement generated during the FGD. For each identified risk, participants scored the perceived probability of occurrence and impact on tourism sustainability and conservation objectives. The probability and the severity were scored on a four-point scale from 1 (low) to 4 (very high). The risk scores were calculated by multiplying the likelihood and impact values. Those scores were then ranked into priority levels to help inform management decisions and mitigation planning.

## **D. RESULT AND DISCUSSION**

### **Global Research Trends in Conservation Governance**

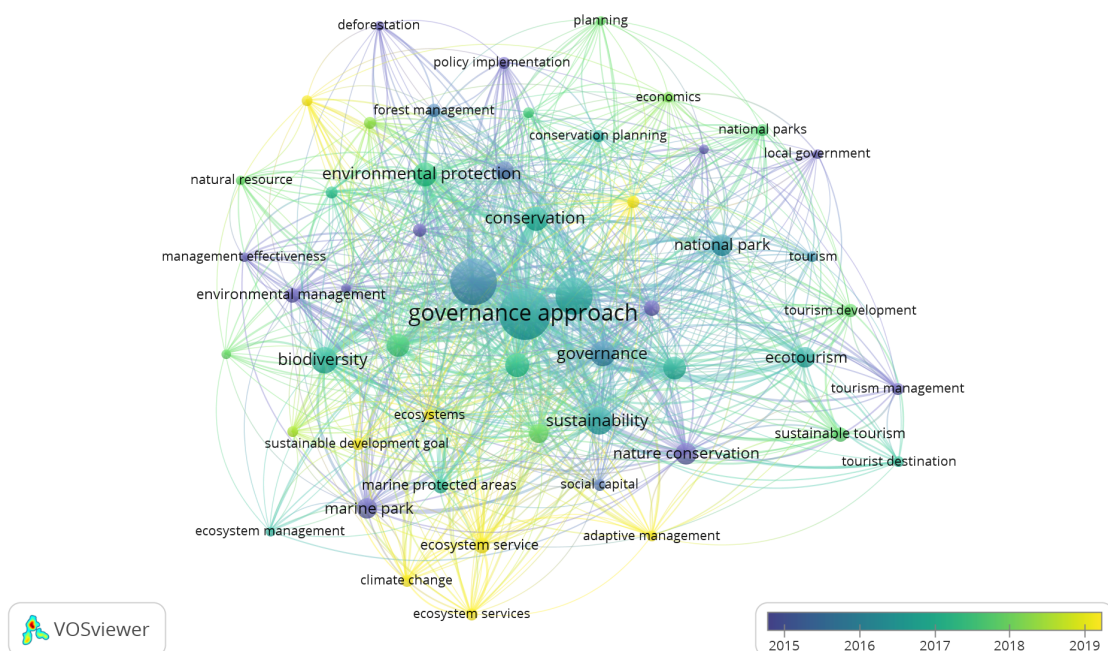
The research results were obtained based on related keywords using the Scopus database. From the findings, it is known that among 137 related articles, research conducted annually on sustainable tourism, sustainable development, collaborative governance, governance approach, conservation area, national park, and protected area can be considered relatively stable. However, publication output fluctuated across the study period, with a peak observed in 2013 (15 publications). Although publication frequency varies across years, the thematic evolution observed in the bibliometric mapping suggests a continuing diversification of governance and sustainability-related topics. Over time, these keywords began to merge with other emerging terms. In 2024, there were 10 journal articles identified, and in the current year, 2025, 3 articles have been found. Furthermore, the annual distribution of publications can be seen in the figure below.



appears as the central node with the largest size, signifying its role as the main axis of discourse, closely linked to themes such as biodiversity, sustainability, nature conservation, and national park.

The colors in the visualization group keywords into thematic clusters. For instance, the green cluster includes topics such as environmental protection, natural resources, and biodiversity, representing a focus on conservation and ecosystem management. The red cluster relates to sustainability, marine park, ecosystem services, and climate change, emphasizing the connection between governance and global environmental challenges as well as ecosystem benefits. Meanwhile, the yellow cluster centers on ecotourism, tourism management, and sustainable tourism, linking governance with sustainable tourism development in conservation areas. The blue cluster comprises national park, local government, tourism, and conservation planning, highlighting the relationship between protected area governance, local government roles, and conservation planning strategies.

The relationships between clusters are represented by the connecting lines between nodes, indicating interdisciplinarity, for example, a direct link between governance approach and ecosystem services in the red cluster, as well as ecotourism in the yellow cluster. This demonstrates that governance approaches in conservation areas are not solely ecological but also encompass social, economic, and political dimensions. Based on these connectivity patterns, it can be concluded that research in this field perceives the governance approach as an overarching framework that bridges biodiversity conservation, climate change adaptation, and ecotourism development agendas. The complexity of these relationships indicates the need for collaborative and cross-sectoral approaches, where environmental policies, tourism management, and ecosystem protection are deeply interconnected. Therefore, this visualization not only maps popular terms but also reveals a conceptual landscape that serves as a foundation for strengthening collaborative governance models in national park areas.



Sumber: Author's Elaboration, 2025

Graph 3. Overlay Visualization

A further analysis was conducted by mapping the overlay visualization, which depicts the relationships among keywords in the literature on conservation area governance, enhanced with



in this analysis, followed by governance, conservation, sustainability, biodiversity, and environmental protection. The high density surrounding governance-related concepts indicates that academic discourse is heavily focused on the role of governance approaches in integrating conservation and sustainable development goals. Furthermore, clusters related to ecological and socio-economic dimensions are interconnected through governance concepts. This demonstrates that, within the academic context, conservation area management is no longer viewed solely from an ecological perspective but increasingly through the lens of multisectoral integration.

Based on the bibliometric analysis results, it can be inferred that the relationship between sustainable tourism, national park, and buffer zone offers opportunities to develop a governance framework that integrates core conservation with sustainable tourism activities in buffer zones. The national park functions as the center of conservation under strict regulations, while the buffer zone serves as a transitional space accommodating environmentally friendly tourism activities such as special-interest tourism (e.g., birdwatching, orchid studies, and ecology-based trekking). This model enables a more balanced distribution of tourism pressure, reducing degradation in core zones while simultaneously generating economic benefits for surrounding communities.

### **Translating Global Governance Themes to the Ranu Darungan Context**

To enhance the analytical relations between the bibliometric results and the localized risk assessment, the dominant themes generated by VOSviewer were translated to context-specific risk categories in the Ranu Darungan tourism area. The translation process was not meant to establish a direct cause-effect relation between bibliometric clusters and local risks, but rather to use bibliometric clusters as conceptual references to identify governance and sustainability challenges that might arise in tourism destinations based on conservation. Stakeholder discussions with conservation managers, local tourism actors and representatives of the Conservation Farmers Group (KTK) were used to contextualize the global themes into locally relevant risk categories that reflect environmental, institutional and socio-economic conditions in Ranu Darungan. Table 1 shows the relationship between the bibliometric themes and the identified risk categories.

Table 1. Translation of Bibliometric Themes into Local Risk Categories

<b>Bibliometric Theme</b>	<b>Key Keywords</b>	<b>Local Risk Category</b>
Sustainable Tourism and Tourism Management	Sustainable Tourism; Ecotourism; Tourism Management	Tourist Overcapacity
Biodiversity & Conservation	Biodiversity; Environmental Protection; Conservation	Habitat and Cultural Value Disturbance
Climate Change and Ecosystem Services	Climate Change; Ecosystem Services; Adaptive Management	Climate Change
Governance Approach	Governance Approach; Local Government; Conservation Planning	Stakeholder Conflict of Interest
Sustainable Development and Community Participation	Sustainable Development; Community Participation	Local Economic Dependency
Management Effectiveness and Information Systems	Management Effectiveness; Policy Implementation	Data and Information Limitations

Source: Author's Elaboration, 2025

As Table 1 shows, the translation process reveals a strong conceptual fit between the global governance themes and local management challenges. The risk of visitor overcapacity was associated with sustainable tourism and tourism management themes, reflecting the concerns related to carrying capacity and visitor pressure. Biodiversity and conservation themes were related to potential disturbances to ecological integrity and local cultural values. Governance themes also pointed to the possibility of stakeholder conflicts emanating from overlapping authorities and differing management priorities. These relationships demonstrate how broader debates in the international literature can be a useful conceptual basis for identifying and prioritising risks in conservation-based tourism destinations such as Ranu Darungan.

### Priority Risk Assessment for Ranu Darungan

The conceptual groundwork for the stakeholder-based risk assessment in Ranu Darungan was laid by the thematic clusters derived from bibliometric analysis. Table 2 shows the scores of likelihood and impact based on expert judgment and discussion with stakeholders including conservation managers, local tourism actors and representatives of the Conservation Farmers Group (KTK). The likelihood and impact scores presented in Table 2 represent the consensus result of the stakeholder FGD, as follows:

Table 2. Risk Assessment Matrix

No	Cause Of Failure	Likelihood	Effect Of Failure	Impact	Risk Score	Recommended Actions
1	Tourist Overcapacity	4	Disturbance to endemic bird habitats, degradation of orchid vegetation, and erosion along lake edges	4	16	Establishment of visitor quotas, implementation of tourism zoning, and adoption of an online reservation system
2	Habitat and Cultural Value Disturbance	4	Decline in wildlife populations, loss of floral diversity, and shifts in local social norms	4	16	Tourist education programs, development of guided interpretation trails, and regular conservation patrols.
3	Climate Change	3	Decreased lake water quality and loss of sensitive species	4	12	Ecosystem monitoring, ecological adaptation research, and habitat restoration initiatives.
4	Stakeholder Conflict of Interest	3	Delays in development processes and inconsistent policy implementation	4	12	Establishment of multi-stakeholder coordination forums, partnership agreements, and inclusive conservation collaboration models.
5	Local Economic Dependency	3	Economic vulnerability during park closures or	3	9	Business diversification (e.g., handicrafts, organic farming) and integration of local

			disaster events			products into tourism value chains.
6	Data and Information Limitations	3	Planning based on assumptions and suboptimal management decisions.	3	9	Regular ecological and social surveys, academic involvement, and evidence-based decision-making processes.

Source: Author's Elaboration, 2025

The six priority risk categories were defined based on the thematic clusters identified through the bibliometric analysis and evaluated through a stakeholder based risk assessment . The bibliometric results served as a conceptual basis and the likelihood and impact scores were defined on the basis of expert opinion and group discussions with conservation managers, local tourism actors and representatives of the Conservation Farmers Group (KTK). This process allowed the translation of global governance themes into locally relevant management priorities for Ranu Darungan. The risk assessment results show that visitor overcapacity and habitat disturbance are the highest priority risks, each scored 16. These findings echo the concerns of stakeholders about the growing pressures of tourism activities on ecological integrity and local conservation objectives.

The first cluster, representing the highest risk level, concerns tourist overcapacity, with a risk score of 16. This finding indicates that excessive visitor pressure beyond the area's carrying capacity may significantly disrupt endemic bird habitats and surrounding ecosystems. Recommended mitigation measures include the establishment of visitor quotas, implementation of tourism zoning, and the development of online reservation systems to regulate tourist flows. The second cluster, disturbance to flora-fauna habitats and local cultural values, also obtained a risk score of 16. This indicates that uncontrolled tourism activities may lead to wildlife population decline and degradation of local cultural heritage. Suggested interventions include visitor education programs, the development of integrated interpretation trails, and periodic conservation patrols.

Meanwhile, climate change ranks third with a risk score of 12. The impacts of climate change on water quality, vegetation loss, and ecosystem stability require more comprehensive adaptation strategies. Priority actions include ecosystem monitoring, ecological adaptation research, and habitat restoration to ensure long-term sustainability. Climate change and stakeholder conflict of interest were categorized as high-priority risks (score=12) while local economic dependency and data-informations limitations were classified as moderate risks (score = 9). Stakeholder conflicts arise from misaligned interests among parties involved, necessitating multi-stakeholder coordination forums, cooperation agreements, and more inclusive conservation partnership models. Local economic dependency on the tourism sector highlights vulnerability to tourism disruptions; therefore, business diversification and the integration of local products into tourism value chains are primary recommendations.

Data and information limitations increase the risk of planning errors, requiring regular ecological and social surveys, academic involvement, and evidence-based policymaking. Overall, the integration of VOSviewer clustering results with Risk Assessment Matrix analysis provides a comprehensive overview of risk priorities in managing conservation-based tourism areas. These findings emphasize the importance of collaborative, science-based policy approaches that balance conservation interests, local economic development, and environmental sustainability. The results show that bibliometric analysis and

stakeholder-based assessment play complementary roles. Bibliometric mapping gives a wider view of governance challenges often discussed in the international literature and stakeholder assessment allows to prioritize risks based on local conditions. The integration enhances the relevance of global knowledge for practical decision making in conservation-based tourism management.

## E. CONCLUSION

The study points to a growing trend to incorporate governance, sustainability and conservation perspectives in the sustainable tourism literature. The bibliometric analysis shows the growing importance of governance-related themes as a means to bridge ecological, social, and economic goals in conservation-based tourism management. Methodologically, the study demonstrates how bibliometric mapping can be integrated with stakeholder-based risk assessment to translate global governance knowledge into locally relevant management priorities.

The risk mapping based on the Risk Assessment Matrix reinforces the urgency of implementing collaborative governance in the development of ecotourism within areas such as Ranu Darungan, where environmental carrying capacity pressures, conflicting interests, and data limitations emerge as dominant issues. Therefore, conservation area management should be directed toward an approach that balances biodiversity conservation, local economic empowerment, and environmental risk mitigation. Conceptually, these findings may serve as a foundation for developing adaptive governance models in Indonesia's conservation areas, integrated with the global sustainable development agenda.

## Acknowledgement

The researcher extends sincere gratitude to the Bromo Tengger Semeru National Park Authority (BB-TNBTS) for their support and access to field data, as well as to Universitas Brawijaya for facilitating this research through academic and technical assistance. Appreciation is also conveyed to fellow researchers and members of the Ranu Lingga Rekisi Conservation Community, whose contributions of local knowledge have greatly enriched the outcomes of this study.

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