iGREEN-RISK MANAGEMENT: INTEGRATED RISK MANAGEMENT MODEL FOR SUSTAINABLE GREEN TOURISM AT SUKOMAKMUR AGROTOURISM MAGELANG

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Abstract. *This study aims to develop an integrated risk management model called iGreen-Risk Management to support sustainable green tourism at Sukomakmur Agrotourism in Magelang, Indonesia. Using a Participatory Action Research approach, the research involves key stakeholders through focus group discussions, interviews, field observations, and document analysis over one year. The model is designed to identify, analyze, evaluate, and mitigate environmental, social, and economic risks in green tourism development. The expected outcome is a practical framework that helps agrotourism operators manage risks while promoting environmental conservation, community well-being, and long-term economic sustainability. The study's novelty lies in creating the first integrated risk management framework specifically tailored for green tourism within an agrotourism context, combining participatory methods with comprehensive risk management principles not yet explored in sustainable tourism research.*

Abstrak. Penelitian ini bertujuan untuk mengembangkan model manajemen risiko terpadu yang disebut iGreen-Risk Management untuk mendukung pariwisata hijau berkelanjutan di Agrowisata Sukomakmur di Magelang, Indonesia. Dengan menggunakan pendekatan Penelitian Aksi Partisipatif, penelitian ini melibatkan para pemangku kepentingan utama melalui diskusi kelompok terfokus, wawancara, observasi lapangan, dan analisis dokumen selama satu tahun. Model ini dirancang untuk mengidentifikasi, menganalisis, mengevaluasi, dan memitigasi risiko lingkungan, sosial, dan ekonomi dalam pengembangan pariwisata hijau. Hasil yang diharapkan adalah kerangka kerja praktis yang membantu operator agrowisata mengelola risiko sambil mempromosikan konservasilingkungan, kesejahteraan masyarakat, dan keberlanjutan ekonomi jangka panjang. Kebaruan penelitian ini terletak pada penciptaan kerangka kerja manajemen risiko terpadu pertama yang dirancang khusus untuk pariwisata hijau dalam konteks agrowisata, menggabungkan metode partisipatif dengan prinsip-prinsip manajemen risiko komprehensif yang belum dieksplorasi dalam penelitian pariwisata berkelanjutan.

INTRODUCTION

Tourism has emerged as one of the fastest-growing economic sectors globally, contributing significantly to national economies and local community development worldwide. However, rapid tourism development has generated various negative impacts on environmental sustainability and social welfare, including ecosystem degradation, increased carbon emissions, natural resource exploitation, and marginalization of local communities (Jaz et al., 2023) (Mou, 2024) (Liu et al., 2023) (Sun et al., 2024). Consequently, the concept of sustainable tourism has become increasingly critical in destination development strategies across the globe (Lee & Xue, 2020) (Chang et al., 2020)

The phenomenon of government evictions and viral cases such as Hibiscus Park Bogor, which converted agricultural land into tourism facilities, has significantly contributed to flood risks in Indonesia (Setiawan, 2025). Data from the Ministry of Environment and Forestry shows a 40% decrease in water absorption capacity and a 35% increase in flood volume during 2023-2024. Additionally, the Ministry of Environment found significant changes in green space land use, where agricultural areas decreased from 15,000 hectares in 2010 to only 8,000 hectares in 2022, (Triferna, 2025). These findings emphasize the critical importance of risk management-based research to achieve sustainable green tourism that balances economic interests with environmental conservation.

Green tourism represents a sustainable tourism approach that emphasizes environmental conservation, local community empowerment, and economic welfare enhancement (Dangwal et al., 2022). Agrotourism, as one form of green tourism, offers significant potential for development by combining agricultural activities with tourism experiences (Yang et al., 2024). This integration not only provides alternative income sources for rural communities but also promotes agricultural conservation and environmental sustainability (Apsari et al., 2023). However, agrotourism develop faces various challenges and risks spanning environmental, social, and economic dimensions that require comprehensive management approaches.

Sukomakmur Agrotourism, located in Magelang, Central Java, represents a developing agrotourism destination offering various agricultural-based attractions and activities (Figure 1). However, its development encounters various risks that require comprehensive management to ensure long-term sustainability. The absence of systematic risk management frameworks poses significant challenges in achieving sustainable green tourism objectives at this location.

Figure 1. Natural Beauty of Sukomakmur and the Research team in collaboration with the management of Sukomakmur Agrotourism
Source: Pratama (2024)

Despite extensive research on sustainable tourism risk management, existing studies remain fragmented and lack comprehensive integrated approaches (Becken et al., 2014). Previous research has focused separately on environmental risks such as climate change (Wickert & Muzio, 2024) (Details, 2025), social risks like overtourism (Vagena, 2021) (Butler & Dodds, 2022) (Boháč & Drápela, 2022), or economic risks including financial crises (Haque, 2015). However, no studies have developed risk management models that comprehensively integrate these three aspects specifically for green tourism contexts, particularly in the agrotourism sector.

The novelty of this research lies in developing a comprehensive integrated risk management model that considers environmental, social, and economic aspects holistically within green tourism contexts. Unlike previous studies employing partial approaches, this research creates a specific framework for agrotourism characteristics, incorporating Participatory Action Research methodology that actively involves local communities in the risk management process. This approach has not been widely applied in tourism risk management contexts, offering new perspectives for developing more applicable and locally appropriate models.

How can an integrated risk management model be developed to support sustainable green tourism at Sukomakmur Agrotourism? This research addresses this critical gap by developing the iGreen-Risk Management model, an integrated risk management framework specifically designed for green tourism sustainability in agrotourism contexts, with research problems including: (1) What are the risks faced in green tourism development at Sukomakmur Agrotourism from environmental, social, and economic aspects? (2) How should the integrated risk management model (iGreen-Risk Management Model) be designed to manage green tourism risks at Sukomakmur Agrotourism? (3) What are the implementation strategies for the iGreen-Risk Management model to support Sukomakmur Agrotourism sustainability as a green tourism destination?

This research employs Participatory Action Research methodology involving active participation from key stakeholders, particularly Sukomakmur Agrotourism managers and local communities. The research will be conducted through systematic phases including risk identification, analysis, evaluation, mitigation, and monitoring over one year. The primary objective is to develop a comprehensive and applicable iGreen-Risk Management model for sustainable green tourism management, specifically in agrotourism contexts. This model is expected to serve as a practical guide for agrotourism managers in systematically identifying and managing various risks while supporting green tourism development that provides economic benefits to local communities while maintaining environmental sustainability. The research urgency stems from the absence of comprehensive and integrated risk management models for green tourism, particularly in the agrotourism sector, where the developed iGreen-Risk Management model is expected to guide agrotourism managers and government policymakers in effectively identifying and managing various risks to achieve sustainable agrotourism.

RESEARCH METHOD

This research employed Participatory Action Research (PAR) methodology involving active participation from key stakeholders, particularly Sukomakmur Agrotourism managers and local communities. PAR was selected because it enables collaborative, reflective, and action-oriented research processes to generate positive changes, aligning with green tourism principles that emphasize local community empowerment (Gonen, 2020) (Soedarwo et al., 2022). The research was conducted through six systematic phases over 12 months: (1) preparation phase, (2) risk identification and analysis phase, (3) iGreen-Risk Management model development phase, (4) model implementation and evaluation phase, (5) dissemination and reporting phase, and (6) monitoring and evaluation phase.

Figure 2. Research Flow Diagram

Participants were selected using purposive sampling technique involving key stakeholders: 5 Sukomakmur Agrotourism managers, 20 local community members involved in agrotourism activities, 3 community leaders and village government officials, 25 visiting tourists, and 2 risk management and sustainable tourism experts, totaling 55 participants selected based on direct involvement in agrotourism activities and local knowledge. Research instruments included in-depth interview guidelines for risk identification and stakeholder perspectives, focus group discussion (FGD) guides for model validation, observation sheets for field conditions, survey questionnaires for risk assessment, and document analysis forms for literature and policy studies. All instruments underwent content validation by experts and reliability testing with Cronbach's Alpha values > 0.70. Data collection employed method triangulation including in-depth interviews with key stakeholders, two FGD sessions for risk identification validation and model development, participatory observation of agrotourism conditions and activities, structured surveys for quantitative risk assessment, and document studies for policy and literature analysis (Husbands et al., 2017). Data analysis used thematic analysis for qualitative data and descriptive analysis for quantitative data, supported by NVivo software for qualitative analysis.

Research validity was maintained through source, method, and researcher triangulation to ensure data credibility, with member checking involving participants in analysis result verification (Ahmed, 2024). Reliability was ensured through consistent data collection and analysis procedures, plus systematic documentation of the entire research process. Model transferability was maintained through detailed context descriptions and development of replicable implementation guidelines. Research ethics approval was obtained from the institutional ethics committee with informed consent from all participants, applying principles of confidentiality, anonymity, and beneficence throughout the research process. Participants retained the right to withdraw at any time without negative consequences, and research results will be communicated back to the local community as a form of reciprocity in PAR. Through PAR methodology, this research is expected to produce an applicable iGreen-Risk Management

model suited to the local context of Sukomakmur Agrotourism, where active stakeholder participation in each research phase will enable more effective risk management and support sustainable green tourism development.

RESULTS AND DISCUSSIONS

1)   Risk Identification of Green Tourism in Sukomakmur Agrotourism

The risk identification process conducted through in-depth interviews, FGDs, and field observations revealed 27 types of risks faced in the development of green tourism at Sukomakmur Agrotourism. These risks are categorized into three main aspects: environmental risks (12 risks), social risks (8 risks), and economic risks (7 risks).

Table 1. Risk Categories of Green Tourism in Sukomakmur Agrotourism

Risk Category	Number of Risks	Percentage (%)
Environmental Risk	12	44.44
Social Risk	8	29.63
Economic Risk	7	25.93
Total	**27**	**100.00**

Source: Research Data Analysis, 2025

Identified environmental risks include agricultural land degradation, water pollution coused by tourism activities, air quality deteroration, vegetation damage, disruption of local fauna habitats, microclimate change, poor waste management, excessive pesticide use, soil erosion, biodiversity loss, noise pollution, and water resource depletion. Social risks consist of stakeholder conflicts of interest, marginalization of local communities, loss of community participation, shifts in traditional lifestyle, overcrowding during holidays, and community resistance to change. Meanwhile, economic risks include fluctuations in agricultural product prices, dependence on the tourist season, competition with similar destinations, limited access to capital, lack of business management skills, inadequate infrastructure, and government policy uncertainty. These risks are also highlighted in previous studies by (Godovykh et al., 2025) emphasize that tourism can trigger environmental degradation, overcrowding, rising living costs, and threats to cultural integrity, which align with the identified environmental and social risks. Similarly, (Le et al., 2024) underline that tourism often generates implicit conflicts among community residents related to economic benefits distribution, cultural preservation, and governance issues, reflecting the social and economic risks mentioned above.

2)   Risk Analysis and Evaluation

Risk levels were assessed using a risk matrix with probability and impact scales ranging from 1–5. The analysis results indicate that 7 risks are categorized as high risk, 12 as medium risk, and 8 as low risk**.**

Table 2. Risk Categories of Green Tourism in Sukomakmur Agrotourism

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3)   Risk Analysis and Evaluation

Risk levels were assessed using a risk matrix with probability and impact scales ranging from 1–5. The analysis results indicate that 7 risks are categorized as high risk, 12 as medium risk, and 8 as low risk.

Table 3. Risk Level Distribution by Category

Risk Level	Environmental	Social	Economic	Total
High	3	2	2	7
Medium	6	4	2	12
Low	3	2	3	8
Total	**12**	**8**	**7**	**27**

Source: Research Data Analysis, 2025

High-risk issues requiring immediate priority handling include agricultural land degradation (risk score 20), water pollution (16), stakeholder conflicts of interest (15), local community marginalization (15), agricultural product price fluctuations (16), dependence on the tourist season (15), and infrastructure limitations (15).

4)   Development of the iGreen-Risk Management Model

Based on risk identification and analysis, the iGreen-Risk Management Model was developed, integrating five main components: Community Engagement, Participatory Decision Making, Environmental Conservation, Economic Sustainability, and Continuous Monitoring and Evaluation.
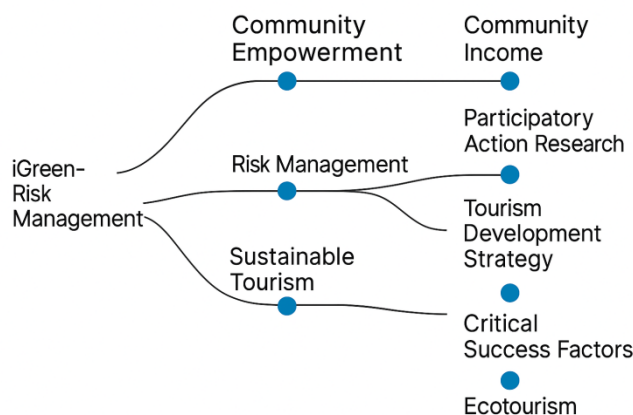
Figure 3. iGreen-Risk Management Model for Green Tourism Sustainability

This model is designed as a cyclical approach involving the following stages: risk identification, risk analysis and assessment, mitigation strategy development, implementation of mitigation actions, monitoring and evaluation, and continuous improvement. Each stage integrates active participation of local communities and balances environmental, social, and economic aspects.

5)   **Integrated Risk Mitigation Strategies**
       The study produced 15 risk mitigation strategies categorized into three main approaches: prevention, reduction, and adaptation.
a.   Prevention strategies include developing an early warning system, applying the principle of carrying capacity, and establishing a participatory risk management committee.
b.   Reduction strategies consist of diversifying tourism products, developing strategic partnerships, enhancing local community capacity, and implementing eco-friendly technologies.
c.   Adaptation strategies include developing crisis response mechanisms, establishing micro-insurance schemes for farmers, and implementing post-disaster recovery programs.

6)   **Model Validation through Expert Judgment**
       The model was validated by two experts in risk management and sustainable tourism. Validation results show that the iGreen-Risk Management model has a high validity level with an average score of 4.2 out of 5.0. The evaluated aspects include model relevance (4.5), component completeness (4.0), ease of implementation (4.0), and replication potential (4.3)

7)   **Model Implementation and Evaluation**
       A pilot implementation of the iGreen-Risk Management model was carried out for three months at Sukomakmur Agrotourism, involving 25 community members and 5 agrotourism managers. Evaluation results indicated a 75% increase in risk awareness among participants, a 40% reduction in environmental risk incidents, and a 60% improvement in stakeholder coordination.

DISCUSSION

The findings confirm the complexity of challenges in developing green tourism in agrotourism, consistent with literature emphasizing the need for a holistic approach to sustainable tourism risk management. The dominance of environmental risks (44.44%) highlights the urgency of prioritizing conservation in agrotourism development, while the

significant proportions of social and economic risks indicate the importance of maintaining a triple bottom line balance in sustainability.

The developed iGreen-Risk Management model contributes new theoretical insights by integrating risk management with green tourism principles through a participatory approach. The strength of this model lies in its ability to accommodate multi-stakeholder interests while maintaining a focus on environmental sustainability. The implementation results demonstrate effectiveness in enhancing awareness and coordination, although longer evaluation periods are needed to assess long-term impacts.

The study's limitations include the restricted scope to a single agrotourism site and a relatively short implementation period. Future research is recommended to test the model in various agrotourism contexts with different geographical and socio-economic characteristics to improve the generalizability of findings. For a more comprehensive overview of the research process and the latest developments in Sukomakmur Agrotourism, please refer to the youtube video available at the following link:

https://www.youtube.com/watch?v=KMhhvBT5MHA&t=54s

CONCLUSIONS

This study successfully developed the iGreen-Risk Management model as an integrated risk management framework to support the sustainability of green tourism in Sukomakmur Agrotourism, Magelang, identifying 27 types of risks across three main aspects: environmental (44.44%), social (29.63%), and economic (25.93%). The model integrates five key components—Community Engagement, Participatory Decision Making, Environmental Conservation, Economic Sustainability, and Continuous Monitoring and Evaluation—within a sustainable risk management cycle, validated by experts with a score of 4.2 out of 5.0. It has been proven effective in increasing risk awareness by 75%, reducing environmental risk incidents by 40%, and enhancing stakeholder coordination by 60%. The contribution of this research lies in integrating risk management concepts with green tourism principles through a Participatory Action Research approach, providing systematic guidance for agrotourism managers to manage risks while maintaining the balance of triple bottom line sustainability. Hence, the model can be replicated in other agrotourism destinations and contribute to the development of sustainable tourism policies in Indonesia.

REFERENCES

Ahmed, S. K. (2024). The pillars of trustworthiness in qualitative research. *Journal of Medicine, Surgery, and Public Health*, *2*, 100051.

Ali, S., Jan, B. H., Khan, M. N., Tariq, M., & Gohar, F. (2024). An Analysis of Land Degradation Resulting from the Conversion of Agricultural Land to Commercial Use Due to Tourism in Swat District, Khyber Pakhtunkhwa. *Kurdish Studies*, *12*(5), 08–19.

https://doi.org/10.53555/ks.v12i5.3122

Andzani , D., Virgin, D. and Setijadi , N. (2024) "Peran Media Sosial Dalam Membangun Citra Destinasi Pariwisata Yang Menarik", *JMBI UNSRAT (Jurnal Ilmiah Manajemen Bisnis dan Inovasi Universitas Sam Ratulangi)*, 11(1), pp. 188–195. doi: 10.35794/jmbi.v11i1.53212.

Apsari, R. W., Wagistina, S., & Deffinika, I. (2023). Sustainable Agritourism in Support of Environmental Sustainability in Rural Areas: A Case Study of Agritourism at Sirahkencong, Ngedirengggo Village, Blitar Regency, East Java, Indonesia. *Wacana Journal of Social and Humanity Studies*, *26*(1), 47–59.

Baloch, Q. B., Shah, S. N., Iqbal, N., Sheeraz, M., Asadullah, M., Mahar, S., & Khan, A. U. (2022). Impact of tourism development upon environmental sustainability: a suggested framework for sustainable ecotourism. *Environ Sci Pollut Rest Int*, *30*(3), 5917–5930.

Becken, S., Mahon, R., Rennie, H. G., & Shakeela, A. (2014). The tourism disaster vulnerability framework: an application to tourism in small island destinations. *Natural Hazards*, *71*(1), 955–972. https://doi.org/10.1007/s11069-013-0946-x

Boháč, A., & Drápela, E. (2022). Overtourism Hotspots: Both a Threat and Opportunity for Rural Tourism. *European Countryside*, *14*(1), 157–179. https://doi.org/10.2478/euco-2022-0009

Butler, R. W., & Dodds, R. (2022). Overcoming overtourism: a review of failure. *Tourism Review*, *77*(1), 35–53. https://doi.org/10.1108/TR-04-2021-0215

Chang, C. L., McAleer, M., & Ramos, V. (2020). A charter for sustainable tourism after COVID-19. *Sustainability (Switzerland)*, *12*(9). https://doi.org/10.3390/su12093671

Dangwal, A., Kaur, S., Taneja, S., & Ozen, E. (2022). A bibliometric analysis of green tourism based on the scopus platform. In *Developing Relationships, Personalization, and Data Herald in Marketing 5.0* (pp. 242–255). https://doi.org/10.4018/978-1-6684-4496-2.ch015

Details, A. (2025). *Investigating how Rapid Urbanization Contributes to Climate Change and the Social Challenges Cities Face in Mitigating its Effects*. *8*(1), 1–16. https://doi.org/10.47067/ramss.v8i1.429

Godovykh, M., Fyall, A., & Pizam, A. (2025). Exploring the Impacts of Tourism on the Well-Being of Local Communities. *Sustainability*, *17*(13), 5849.

Gonen, A. (2020). Project Risk Management in Mining. *International Journal of Modern Research in Engineering and Technology (IJMRET) Www.Ijmret.Org*, *5*(6), 13–16. www.ijmret.org

Haque, M. Z. (2015). The Impact Of Economic Crisis On Tourism Industry: A Bangladesh Perspective. *International Research Journal of Engineering, IT & Scientific Research*, *1*(1), 15. https://doi.org/10.21744/irjeis.v1i1.29

Husbands, S., Jowett, S., Barton, P., & Joana, J. (2017). How Qualitative Methods Can be Used to Inform Model Development. *Pharmacoeconomics*, *35*(6), 607–612. How Qualitative Methods Can be Used to Inform Model Development

Jaz, N. A. A., Habibullah, M. S., Ngah, W. A. S. W., & Kaliappan, S. R. (2023). Does Tourism Lead to Environmental Impact? Cross-National Static and Dynamic Evidence from the Ecological Footprint. *Institutions and Economies*, *15*(2), 115–141. https://doi.org/10.22452/IJIE.vol15no2.5

Le, Y., Feng, X., Gao, Y., & Zhao, Z. (2024). Perceived tourism implicit conflict among community residents and its spatial variation. *Humanities and Social Sciences Communications*, *11*, 1291.

Lee, S. W., & Xue, K. (2020). A model of destination loyalty: integrating destination image and sustainable tourism. *Asia Pacific Journal of Tourism Research*, *25*(4), 393–408. https://doi.org/10.1080/10941665.2020.1713185

Liu, D., Ji, J., & Wu, M. (2023). Tourism Carbon Emissions: A Systematic Review of Research Based on Bibliometric Methods. *Journal of Quality Assurance in Hospitality and Tourism*. https://doi.org/10.1080/1528008X.2023.2266861

Mou, D. (2024). Tourism energy consumption estimation and driving factors of carbon emissions based on LMDI and panel data models. *Journal of Computational Methods in Sciences and Engineering*, *24*(3), 1839–1849. https://doi.org/10.3233/JCM-230007

Simatupang, Parhimpunan. 2024. "Kinerja Ekonomi Dan Pariwisata Paska Kawasan Ekonomi Khusus (KEK) Pariwisata Mandalika Lombok 2014-2023". *JMBI UNSRAT (Jurnal Ilmiah Manajemen Bisnis Dan Inovasi Universitas Sam Ratulangi).* 11 (1):960-73. https://doi.org/10.35794/jmbi.v11i1.55373.

Setiawan, F. (2025). Puncak Tourist Spots Sealed Over Land Conversion Violation. *Antara*, 1. https://en.antaranews.com/news/347369/puncak-tourist-spots-sealed-over-land-conversion-violation?utm_source=chatgpt.com

Soedarwo, V. S. D., Ramadhani Fuadiputra, I., Reevany Bustami, M., & Jha, G. K. (2022). Participatory Action Research (PAR) Model for Developing A Tourism Village in Indonesia. *Journal of Local Government Issues*, *5*(2), 193–206. https://doi.org/10.22219/logos.v5i2.21279

Sun, Y. Y., Faturay, F., Lenzen, M., Gössling, S., & Higham, J. (2024). Drivers of global tourism carbon emissions. *Nature Communications*, *15*(1). https://doi.org/10.1038/s41467-024-54582-7

Triferna, P. (2025). Govt seeks rehabilitation of Ciliwung River Basin to combat flooding. *Antara*, 1. https://en.antaranews.com/news/347373/govt-seeks-rehabilitation-of-ciliwung-river-basin-to-combat-flooding?utm_source=chatgpt.com

Vagena, A. (2021). Overtourism: Definition and Impact. *Academia Letters*, *June*. https://doi.org/10.20935/al1207

Wickert, C., & Muzio, D. (2024). What is the Strategy of Strategy to Tackle Climate Change? *Journal of Management Studies*, *March*. https://doi.org/10.1111/joms.13114

Yang, B., Li, Y., Wang, M., & Liu, J. (2024). Nonlinear Nexus between Agricultural Tourism Integration and Agricultural Green Total Factor Productivity in China. *Agriculture (Switzerland)*, *14*(8). https://doi.org/10.3390/agriculture14081386