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Research Paper

The Structural Drivers of Community-Based Green Tourism Development: Evidence from Jatiluwih Cultural Landscape, Bali

Dewa Ayu Made Lily Dianasari[1*]

Luh Yusni Wiarti[2]

I Gede Gian Saputra[3]

[1,2,] Tourism Destination, Politeknik Pariwisata Bali, Bali, Indonesia

[3] Tourism, Udayana University, Bali, Indonesia

*Corresponding author e-mail: lily.dianasari@ppb.ac.id

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ABSTRACT
This study aims to develop a Community-Based Green Tourism (CBGT) model by identifying the hierarchical relationships among the critical factors influencing sustainable tourism development in the Jatiluwih Cultural Landscape, Bali, a UNESCO World Heritage Site. A qualitative case study was conducted using Interpretive Structural Modelling (ISM) based on pairwise comparisons and expert judgment. Data were collected through structured questionnaires and focus group discussions involving 14 purposively selected experts representing government agencies, tourism destination managers, local communities, farmers, tourism businesses, academics, and media practitioners. The ISM procedure comprised the development of the Structural Self-Interaction Matrix (SSIM), reachability matrix, level partitioning, and driver power–dependence analysis to identify the structural hierarchy among the factors. The findings reveal that social cohesion, community participation, institutional collaboration, environmental conservation, and local economic empowerment constitute the primary driving factors of community-based green tourism development. Government and academic institutions emerged as strategic institutional drivers, while the preservation of the Subak system, sustainable irrigation management, MSME empowerment, and cultural revitalization represent key outcomes of the development process. The study contributes theoretically by extending the community-based green tourism framework into a hierarchical ISM-based model that explains causal relationships among governance, environmental, socio-cultural, and economic dimensions. Practically, the proposed model provides a strategic framework for policymakers and destination managers to prioritize interventions that strengthen collaborative governance, community empowerment, and long-term sustainability in heritage tourism destinations.

Keywords: *Community-based green tourism; Interpretive Structural Modelling (ISM); sustainable tourism; stakeholder collaboration; collaborative governance; World Heritage.*

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1. INTRODUCTION

Tourism has become one of the most transformative sectors in the global economy, contributing significantly to income generation, employment, and foreign exchange earnings, particularly in developing countries. As an economic driver, tourism creates opportunities for regional development and improves local livelihoods. However, rapid tourism growth often generates environmental, social, and cultural pressures that challenge the long-term sustainability of destinations. Environmental degradation, biodiversity loss, waste accumulation, and cultural commodification increasingly emerge in destinations experiencing mass tourism. Consequently, sustainable tourism has gained attention as an essential strategy to balance economic benefits with environmental protection and social well-being (Jover & Díaz-Parra, 2022; Kelman, 2021; Mahiroh et al., 2024).

The concept of sustainable tourism emphasizes the responsible use of natural and cultural resources to ensure long-term benefits for stakeholders and tourists alike. Green tourism has emerged as a practical extension of sustainable tourism, focusing on environmentally friendly tourism practices that minimize ecological impacts while maintaining destination attractiveness. Green tourism integrates environmental conservation, responsible management, and community welfare into tourism operations. Increasing global awareness of climate change and environmental issues has encouraged tourism stakeholders to adopt greener approaches in destination planning and management (Lagodiienko et al., 2022; Mousavi, 2021).

Tourism development often emphasizes economic growth while neglecting environmental sustainability, leading to land conversion, habitat degradation, pollution, and pressure on local infrastructure. These challenges are particularly significant in destinations with fragile ecosystems and strong cultural identities, requiring sustainable planning strategies that balance tourism growth with environmental conservation and carrying capacity (Dauti et al., 2021; Talukder et al., 2024).

In response to these challenges, community-based tourism (CBT) has emerged as an alternative approach that emphasizes local participation in tourism planning, management, and benefit distribution. By involving communities in decision-making processes, CBT supports sustainable livelihoods, strengthens destination resilience, promotes inclusive governance, and helps maintain cultural authenticity and long-term sustainable tourism development (Matiku et al., 2020).

The development of green tourism has been linked to sustainable destination management and stakeholder collaboration. Green tourism has supported ecological conservation and community-based economic development. These cases highlight the importance of environmental awareness, local participation, and integrated planning in achieving sustainable tourism development (D'Alessandro, 2016; Singh & Mishra, 2004; Zhou & Ikeda, 2010). Building on these principles, the implementation of green tourism requires not only environmental commitment but also strong institutional support and collaborative governance among stakeholders.

Green tourism contributes to environmental protection and local empowerment when supported by strong governance, institutional capacity, and stakeholder collaboration. Green tourism initiatives often include ecotourism, eco-labeling, environmental education, and conservation-oriented tourism products. The integration of local communities into tourism activities creates opportunities to generate income while preserving cultural identities and traditional livelihoods. In addition, sustainable tourism infrastructure and environmentally responsible operations can increase visitor satisfaction and strengthen the competitiveness of destinations (Merli et al., 2019; Yekimov et al., 2021). However, the successful implementation of green tourism remains challenging, especially in World Heritage destinations that face increasing tourism development pressures and environmental vulnerability.

There are many studies have examined green tourism and community participation (Risfandini, 2024; Sobhnai et al., 2022; Tiwari et al., 2024), although previous studies have extensively discussed

sustainable tourism, green tourism, and community-based tourism, however limited research specifically addresses the development of community-based green tourism in World Heritage destinations that are experiencing increasing development pressure, there are three important research gaps remain. First is literature gap, the existing literature has primarily examined environmental conservation, community participation, stakeholder collaboration, and governance as independent or loosely connected dimensions of sustainable tourism. While these studies have generated valuable conceptual insights, they provide limited understanding of the hierarchical and interdependent relationships among the multiple factors shaping community-based green tourism development, particularly in heritage destinations.

Second is methodological gap, previous research has relied predominantly on descriptive, qualitative, or statistical approaches that identify influential factors but rarely explain their structural relationships or causal hierarchy. As a result, policymakers often lack evidence regarding which factors should be prioritized as fundamental drivers and which are consequential outcomes. Interpretive Structural Modelling (ISM) offers a systematic methodology to overcome this limitation by identifying contextual relationships, classifying driver and dependent variables, and constructing a hierarchical structure that supports strategic decision-making.

Third is contextual gap, limited empirical evidence is available regarding the structural drivers of community-based green tourism in UNESCO World Heritage cultural landscapes. Existing studies in Jatiluwih have mainly focused on specific issues such as land-use change, tourism development, environmental degradation, or stakeholder participation. However, none has integrated environmental, socio-cultural, institutional, governance, and economic dimensions into a comprehensive structural model capable of explaining how these factors interact to support sustainable destination development.

Therefore, this study aims to explore a community-based green tourism development model in Jatiluwih, a UNESCO-recognized cultural landscape known for its subak irrigation system and agricultural heritage, by identifying environmental, social, institutional, and tourism factors that influence the development of sustainable destinations.

This study addresses these three gaps by applying Interpretive Structural Modelling (ISM) to develop a hierarchical Community-Based Green Tourism (CBGT) model for the Jatiluwih Cultural Landscape, Bali. Specifically, the study identifies the key driving and dependent factors underlying sustainable tourism development, explains their structural interrelationships, and provides a theoretically grounded and policy-oriented framework for strengthening collaborative governance, community empowerment, and long-term sustainability in heritage tourism destinations. In Jatiluwih, Bali, issues such as land-use change (Dipayana & Sunarta, 2015; Sunarta et al., 2015), uncontrolled tourism infrastructure (Irwan, 2024), environmental degradation (Pangestika et al., 2019), and limited stakeholder engagement highlight the need for a more integrated and sustainable tourism framework (Arida et al., 2019).

The study emphasizes stakeholder participation, local empowerment, and environmental conservation to provide a more comprehensive understanding of green tourism implementation in heritage destinations, while offering practical recommendations for policymakers, tourism managers, and local communities. Finally establish the theoretical foundation for the proposed model, the following section reviews the concepts of Green Tourism, Community-Based Green Tourism, Collaborative Governance Theory, and the application of Interpretive Structural Modelling (ISM) in sustainable tourism research.

2. LITERATURE REVIEW

2.1. Green Tourism

Green tourism is the practice of individuals traveling outside of their normal environment to engage in outdoor activities, excluding developed coastal areas and ski resorts. Green tourism promotes travel that supports natural and cultural aspirations, while supporting the protection of limited community resources (Markose et al., 2022). In line with this concept, green tourism also emphasizes sustainable destination management and responsible tourism practices. Green tourism promotes sustainability through a selective process of developing marketing programs to attract environmentally conscious tourists, demonstrating a caring attitude towards the natural component, environmental sustainability, and local cultural sensitivity. As an alternative form of tourism, *green tourism* focuses on consideration of capacity, education, conservation of environmental resources, and regional development (Mahiroh et al., 2024).

Green tourism can be a significant advance for ecological sustainability and sustainable land management, as well as a strong economic foundation for rural areas. Green tourism can expand employment opportunities in rural areas, not only in the manufacturing sector but also in the service sector, so that it can diversify the local economy. This diversification helps reduce regional disparities and stimulate economic growth in disadvantaged areas (Redikultseva et al., 2022). The economic benefits of tourism, including job creation and increased income for local residents, are significant (Baig et al., 2024). However, the long-term economic benefits of green tourism can only be sustained when tourism development is balanced with environmental conservation and responsible resource management

Green tourism promotes the conservation of natural resources, environment and encourages sustainable practices that ensure the long-term preservation of ecological assets (Widawski et al., 2023). Green tourism is focused on sustainable environments in rural areas and is addressed by residents. The promotion of green tourism will result in a significant increase in visitors so that it can increase the income of rural households. However, the needs of all visitors may not be able to be met at once because they are different (Hong et al., 2003). For example, the integration of ecosystem services in rural tourism planning supports ecological sustainability and encourages rural revitalization (Wang et al., 2023). Effective management and regulation by state agencies is essential to prevent environmental degradation while promoting green tourism. This ensures that entrepreneurial activities do not damage the environment (Yekimov et al., 2021). Beyond environmental conservation, green tourism also plays an important role in strengthening community participation and preserving local cultural heritage.

Green tourism encourages community engagement and helps preserve local culture and traditions. This involvement is essential for the social reproduction of local communities and their special forms of human-environmental involvement (Álvarez & Cortes-Vazquez, 2020). By integrating cultural elements into tourism, such as traditional practices, green tourism helps to preserve and promote the cultural heritage of rural areas (Apak & Gürbüz, 2023). Although green tourism has many benefits, it can also lead to environmental degradation if not managed properly. Therefore, strict regulations and sustainable practices are needed to mitigate these risks (Yekimov et al., 2021). The success of green tourism requires collaboration from a variety of stakeholders, including governments, businesses, and local communities. This collaboration ensures that tourism development is aligned with the Sustainable Development Goals (SDGs) (Gatto et al., 2024; Lee & Hsieh, 2016).

2.2. Community Based Green Tourism (CBGT)

Community Based Green Tourism (CBGT) is a sustainable approach that integrates local communities into tourism development, ensuring that economic, social, and environmental benefits are distributed equitably. The active involvement of local communities is essential for the successful development of CBGT. This participation fosters a sense of ownership and ensures that the benefits of tourism remain in the hands of the community (Islam et al., 2024; Monika et al., 2024; Pimid et al., 2024). In addition to strengthening community participation, CBGT also contributes to environmental conservation and local economic sustainability. CBGT promotes the conservation of natural resources and cultural heritage, which contributes to the sustainability of overall tourism practices (Duong et al., 2026; Matarrita-Cascante et al., 2010; Monika et al., 2024). By providing jobs and maintaining economic benefits for local communities, it can significantly improve living standards and reduce poverty in rural areas (Arief & Thahir, 2020; Pimid et al., 2024; Yfantidou et al., 2017).

Local communities often need motivation to participate effectively in the development of community-based green tourism. This includes tangible benefits such as economic incentives and intangible benefits such as social recognition (Islam et al., 2024). Effective governance and policy reform are essential to address infrastructure deficiencies, ensure consistent policy enforcement, and engage communities in sustainable tourism practices (Islahuddin & Tun Ismail, 2024; Roxas et al., 2020). Building the capacity of local communities through education, training, and support from the government and the private sector is critical to the successful implementation of CBGT (Duong et al., 2026; Helmi et al., 2024). Strong community interaction, open communication, and participation are key factors that enable communities to engage in sustainable tourism practices (Matarrita-Cascante et al., 2010). Demonstrating the initial benefits of tourism, strong leadership, and project legitimacy are critical to gaining community support and ensuring the success of the CBGT initiative (Pimid et al., 2024).

Sustainable tourism practices must balance environmental protection with economic and social well-being, which requires the active involvement of local authorities and governments. Synergy among business actors and supporting destination management partnerships can increase the sustainability of tourism destinations. The development of community-based green tourism depends on active community participation, effective governance, capacity building, and a balanced approach to sustainability. By addressing these factors, CBGT can generate significant economic, social, and environmental benefits for local communities (Papallou et al., 2024).

2.3. Theoretical contribution

Prior studies on community-based tourism and green tourism have largely offered descriptive or thematic accounts of community participation, without systematically modelling the hierarchical, cause-and-effect relationships among the social, institutional, environmental, and economic factors that drive tourism development in World Heritage destinations (Goodwin & Santilli, 2009; Murphy, 1985; Scheyvens & van der Watt, 2021; Timothy et al., 2003).

This study addresses that gap by applying Interpretive Structural Modelling (ISM) to derive a structural hierarchy of drivers and dependents specific to a UNESCO cultural landscape. The study offers three main theoretical contributions. First, it positions collaborative governance theory (Ansell & Gash, 2008) as an explanatory framework for the institutional layer of the model, linking academia and government as key drivers with tourism businesses, media, and local communities as more dependent actors within a single structural hierarchy. Second, it provides empirical evidence that social capital and community participation function as foundational, high-driving variables rather than peripheral outcomes, reinforcing a bottom-up rather than top-down conception of green tourism development. Third, it extends the descriptive community-based green tourism inventory developed by (Arismayanti

et al., 2020) into an explicit hierarchical model of causal influence, offering a replicable structural approach that can be applied to other UNESCO cultural landscapes facing similar governance and sustainability challenges (see Figure 1).

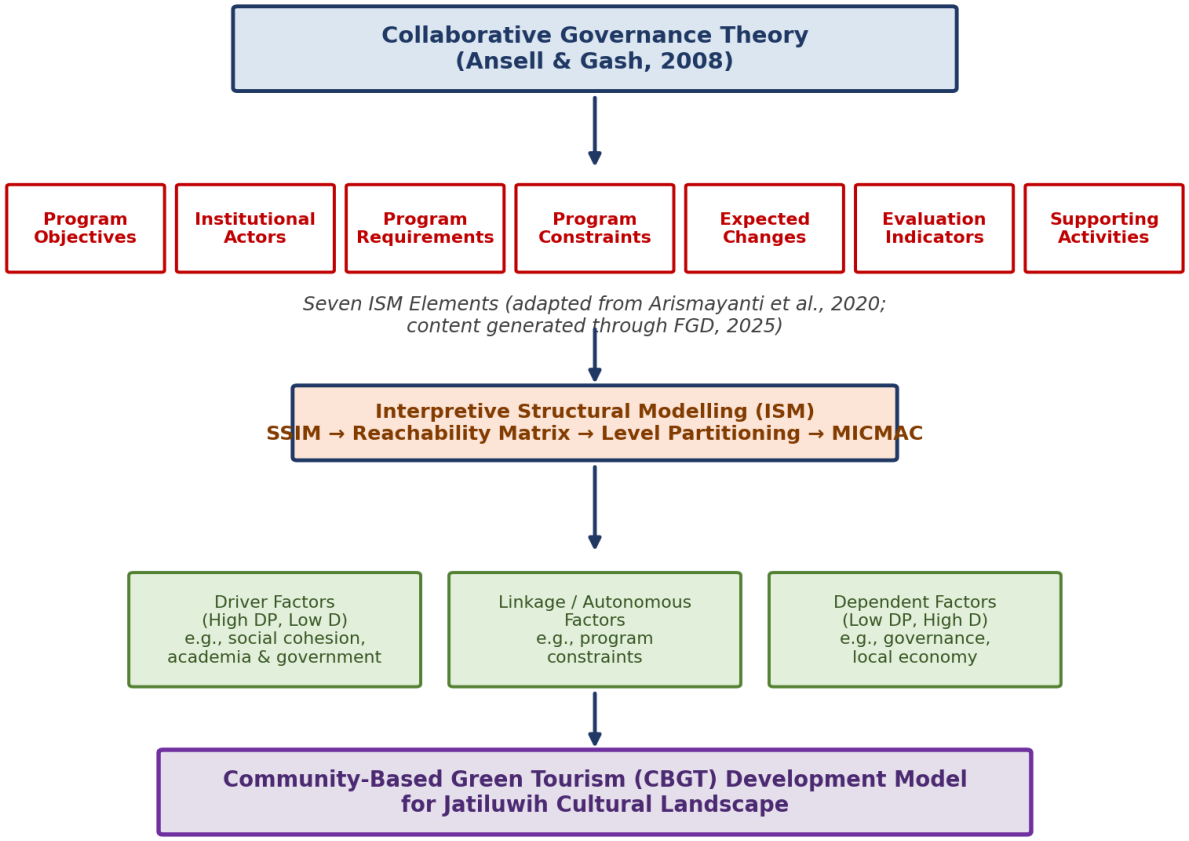

Figure 1. Conceptual framework for Community-Based Green Tourism (CBGT) model
Adapted from: Ansell and Gash, (2008); Arismayanti et al., (2020); and Warfield, (1974)

3. METHODOLOGY

3.1. Research design

This study employed a qualitative case study approach using Interpretive Structural Modelling (ISM) to examine the structural relationships among factors influencing community-based green tourism development in Jatiluwih, Bali. ISM was applied to identify and map the hierarchical relationships among seven key elements program objectives, institutional actors, program requirements, program constraints, expected changes, evaluation indicators, and supporting activities (Warfield, 1974). The seven ISM elements were adapted from Arismayanti et al., (2020) and Warfield, (1974), whereas all operational sub-elements were refined, modified, expanded, and validated through two rounds of FGD in 2025. These elements and their sub-elements were identified through literature review and expert discussions with tourism stakeholders in Jatiluwih (Table 1).

The qualitative case study design was considered appropriate because the study explored the complexity of stakeholder relationships, governance, environmental sustainability, and community participation within a UNESCO heritage destination. Through ISM, the study identified key driving and dependent factors that support sustainable green tourism development in Jatiluwih.

Table 1. Element and Sub Element of Community-Based Green Tourism in Jatiluwih

No	Element	Sub Element
1	Program Objectives	Social aspects; Community participation; Institutions and governance; Cultural diversity; Community-based economy; Environment and conservation; Political aspects; Water management systems.
2	Institutional actors	Academics; Tourism Industry; Government; Community; Media.
3	Program Requirements	Natural and cultural conditions; Quality and accessibility of transportation; Infrastructure and facilities; Community involvement; Preservation of UNESCO World Heritage sites; Product differentiation and diversification; Stakeholder collaboration; Rich tourism experiences.
4	Program Constrains	Economic inequality; Carrying capacity; Climate change; Marketing; Mismatch between regulations and policies; Environmental issues.
5	Expected Changes	Preservation of the subak system as a UNESCO World Heritage Site; Sustainable water management for irrigation; Reduction of chemical fertilizers; Protection of rice field ecosystems and biodiversity; Waste and wastewater management; Use of renewable energy.
6	Evaluation Indicators	Empowerment of local micro, small, and medium-sized enterprises (MSMEs); Job creation for the local community; Development of tourism products and services based on local wisdom; Improved market access for local products; Establishment of partnerships between the government, the private sector, and the community; Training and capacity building for local human resources.
7	Supporting Activities	Revitalizing local traditions and cultural arts; Integrating the Tri Hita Karana philosophy into tourism; Empowering the younger generation in Subak culture; Developing annual cultural festivals; Educating tourists about local culture.

Adapted from: Arismayanti et al., (2020) and Warfield, (1974)

3.2. Population and sample

Purposive sampling was employed to select experts with substantial knowledge and practical experience in tourism planning, environmental management, community development, and heritage conservation in Jatiluwih. The expert panel consisted of 14 stakeholders, including representatives from local government, destination management organizations, village authorities, farmers' associations, tourism entrepreneurs, homestay operators, MSMEs, academia, and the media. All participants had been directly involved in tourism development or environmental governance in Jatiluwih for a minimum of three years

The use of 14 experts is considered methodologically appropriate for Interpretive Structural Modelling (ISM), as the method emphasizes the quality, diversity, and relevance of expert knowledge rather than statistical representativeness (Attri et al., 2013; Warfield, 1974). Previous ISM studies have consistently relied on relatively small panels of domain experts. For example, Arismayanti et al., (2020) developed a sustainable tourism model using eight experts, while other ISM applications reported expert panels ranging from approximately 10 to 20 participants (Govindan et al., 2015; Jharkharia & Shankar, 2005). These studies demonstrate that ISM does not require statistical representativeness because expert judgment is used to establish contextual relationships among system variables. Consequently, expert panels comprising approximately 8–20 participants are widely regarded as sufficient to generate reliable structural models in ISM research (Attri et al., 2013; Govindan et al., 2015; Jharkharia & Shankar, 2005; Warfield, 1974).

3.2. Measurement and instruments

Primary data were collected through structured questionnaires and expert assessment forms designed specifically for ISM analysis. The instruments contained a series of pairwise comparison questions to assess the contextual relationships among variables influencing community-based green tourism development. Respondents were asked to determine whether one variable influenced another within the system.

The research instrument was developed based on previous sustainable tourism and green tourism studies, including variables related to environmental sustainability, governance, local participation, economic resilience, and cultural preservation. The identified variables and sub-elements were refined through literature review and preliminary discussions with experts. The instrument generated a structural self-interaction matrix (SSIM), which served as the basis for subsequent ISM analysis (Roy & Misra, 2016). Data collection was conducted directly by the researchers through field visits and stakeholder consultations in Jatiluwih.

3.3. Data collection procedure

Data collection was conducted in Jatiluwih, Bali, through direct stakeholder engagement and expert consultation sessions. The process began with identifying relevant stakeholders involved in tourism governance, environmental management, and community-based tourism activities. Respondents were approached personally by the researchers and invited to participate voluntarily in the study. Prior to participation, all respondents were informed about the objectives of the research and the confidentiality of their responses.

The data collection process involved distributing structured ISM questionnaires and conducting guided discussions to clarify the relationships among variables (Janssen et al., 2019). Respondents evaluated the influence of each variable on others using pairwise comparisons. To ensure data quality and consistency, the researchers provided detailed explanations regarding the ISM evaluation process and facilitated discussions when inconsistencies emerged in expert judgments. The use of expert stakeholders with substantial experience in tourism and environmental management enhanced the credibility and validity of the collected data (Pham et al., 2025).

3.5 Data analysis techniques

Data analysis was conducted using Interpretive Structural Modelling (ISM), a methodology designed to analyze complex systems by identifying contextual relationships among variables and arranging them into a hierarchical structure (Warfield, 1974). The analysis followed several systematic stages. First, expert judgments obtained from pairwise comparisons were used to construct the Structural Self-Interaction Matrix (SSIM). Second, the SSIM was transformed into an initial reachability matrix by converting symbolic relationships into binary values.

Third, transitivity analysis was applied to generate the final reachability matrix, which identified direct and indirect relationships among variables. Fourth, level partitioning was conducted to classify variables into different hierarchical levels based on their driving power and dependence. Finally, a driver power–dependence matrix analysis was performed to categorize variables into four quadrants: autonomous, dependent, linkage, and independent variables.

The ISM model was then interpreted to identify the key driving factors, structural relationships, and strategic priorities influencing community-based green tourism development in Jatiluwih. This analytical technique was selected because it provides a systematic framework for understanding interdependent factors within sustainable tourism systems and supports evidence-based policy recommendations (Attri et al., 2013).

4. FINDINGS AND DISCUSSIONS

Interpretive Structural Modeling (ISM) analysis is used in this study as a systematic approach to identify and map the relationships between key elements that influence the development of community-based *green tourism* in the Jatiluwih area. The seven elements are: (i) program objectives, (ii) institutions involved in program implementation, (iii) program needs, (iv) main obstacles to the program, (v) possible changes from the program, (vi) benchmarks for assessing each goal and (vii) activities needed (Arismayanti et al., 2020). Each development element in this study has several sub-elements obtained from the results of discussions with *experts* consisting of 14 stakeholders including the Tabanan Regency Tourism Office, the Jatiluwih Tourism Attraction Management Agency, entrepreneurs, village heads, environmental heads, homestay owners, and MSMEs representing the community, academics and the media.

To make the ISM analytical process transparent, the Final Reachability Matrix for each of the seven elements is presented in Tables 2–8 below, together with the resulting Driver Power (DP), Dependence (D), and Level Partition (L) values used to derive the hierarchical structures and driver–dependence classifications discussed in this section.

4.1. Program objectives as the foundational layer of Green Tourism Development

The Interpretive Structural Modeling (ISM) analysis identified eight key elements that make up the goals of community-based green tourism development in Jatiluwih: social aspects (1), community participation (2), institutional governance (3), cultural diversity (3), community-based economy(4), environmental conservation (5), political support (6), and water management systems (7).

Table 2. Final Reachability Matrix – Program Objectives

No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	DP
PO1	1	1	1	1	1	1	1	1	**8**
PO2	0	1	1	1	1	1	1	1	**7**
PO3	0	0	1	1	1	1	1	1	**6**
PO4	0	0	1	1	1	1	1	1	**6**
PO5	0	0	1	1	1	1	1	1	**6**
PO6	0	0	1	1	1	1	1	1	**6**
PO7	0	0	1	1	1	1	1	1	**6**
PO8	0	0	1	1	1	1	1	1	**6**
D	1	2	8	8	8	8	8	8	
L	3	2	1	1	1	1	1	1	

Note: DP = Driver Power; D = Dependence; L = Level Partition (Level 1 = top/outcome level; higher L values indicate more foundational/driving position).
Source: Authors' field data processing, (2025)

Table 2 shows the Final Reachability Matrix for the Program Objectives element. The matrix reflects the finalized contextual relationships among all sub-elements after transitivity checking. It also provides the driving power and dependence values required for the subsequent level partitioning and hierarchical model development (Figure 2 dan Figure 3). Among these elements, the social aspect and the participation of local communities emerged as the strongest driving variables, characterized by high drive and low dependence. These findings show that social cohesion, beliefs, collective values, and environmental awareness form the foundation of a sustainable tourism system. Strong social relationships and community solidarity play a crucial role in strengthening destination resilience.

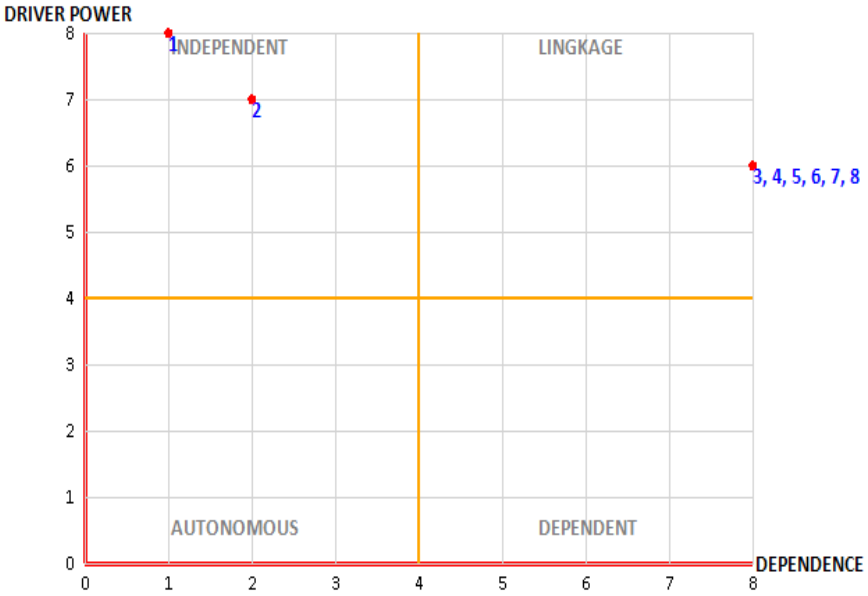

Figure 2. Driver Power–Dependence Matrix – Program Objectives
Source: Authors' field data processing, (2025)

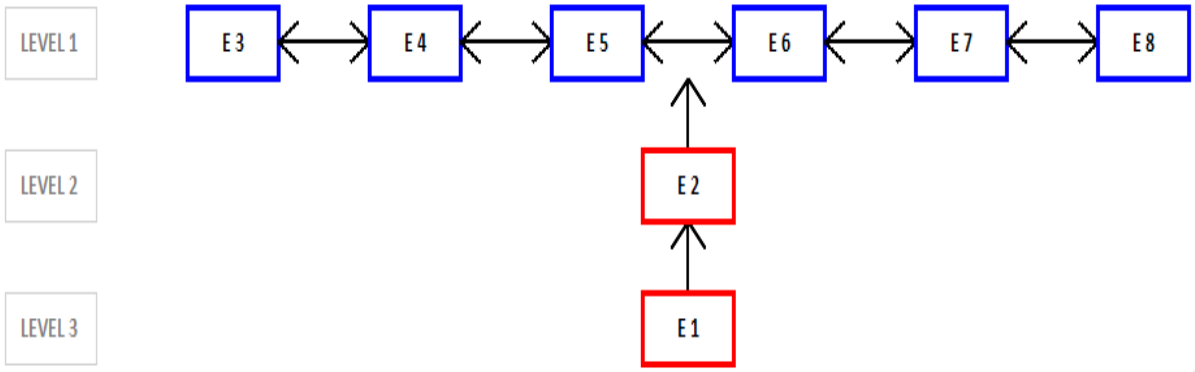

Figure 3. Hierarchical Level Structure – Program Objectives
Source: Authors' field data processing, (2025)

In Jatiluwih, local cooperation, shared cultural identity, and collective responsibility support tourism practices that align with environmental preservation and local welfare. This result supports previous studies emphasizing that social capital and local empowerment are essential for sustainable tourism governance (Latip et al., 2018; Matiku et al., 2020). According to Ginting et al., (2023), active participation creates stronger social legitimacy and improves long-term sustainability outcomes. Community participation further functions as an intermediary mechanism that transforms social values into practical action through involvement in tourism planning, decision-making, and resource management.

The remaining elements governance, cultural diversity, local economy, environmental conservation, political support, and water management were identified as dependent variables. Their effectiveness largely depends on strong community engagement and social cohesion. Institutional governance becomes more inclusive when local stakeholders contribute to policy and management processes. Likewise, environmental conservation and water management require collective awareness and shared responsibility. These findings are consistent with research by Widiartanto et al., (2022), which argues

that successful governance structures in tourism villages are highly dependent on local legitimacy and social relations.

The ISM hierarchy demonstrates that social aspects occupy the foundational level, while community participation serves as a bridge connecting social values to institutional and environmental outcomes. This confirms that sustainable green tourism development in Jatiluwih should follow a bottom-up approach, where local communities act as primary drivers rather than passive beneficiaries. This finding aligns with the framework promoted by the United Nations World Tourism Organization, which highlights community involvement as a core principle of sustainable tourism development. Therefore, strengthening local participation and social cohesion is essential for maintaining ecological sustainability, preserving cultural heritage, and improving destination governance.

4.2. Institutional actors and multi-stakeholder governance

The Interpretive Structural Modeling (ISM) analysis identified five key institutional actors involved in community-based green tourism development in Jatiluwih: academia (1), tourism businesses (2), government (3), local communities (4), and media (5). To examine the structural relationships among these actors, a Final Reachability Matrix was developed by applying the transitivity principle to the Initial Reachability Matrix. The matrix captures both the direct and indirect relationships among institutional actors and provides the basis for calculating their driving power and dependence values, which are subsequently used for level partitioning. Table 3 presents the Final Reachability Matrix for the institutional actors.

Table 3. Final Reachability Matrix – Institutional Actors

No	IA1	IA2	IA3	IA4	IA5	DP
IA1	1	1	0	0	1	**3**
IA2	0	1	0	0	1	**2**
IA3	0	0	1	1	1	**3**
IA4	0	0	0	1	0	**1**
IA5	0	0	0	0	1	**1**
D	1	2	1	2	4	
L	3	2	3	2	1	

Note: DP = Driver Power; D = Dependence; L = Level Partition (Level 1 = top/outcome level; higher L values indicate more foundational/driving position).
Source: Authors' field data processing, (2025)

Based on the Final Reachability Matrix, the driver power and dependence values were calculated to classify each institutional actor according to its level of influence within the system. The results indicate that academia and government occupy the independent quadrant, reflecting their strong driving power and relatively low dependence on other actors (Figures 4 and 5).

These actors' function as primary drivers by providing scientific knowledge, policy direction, regulatory frameworks, and institutional support. Their strategic position confirms that sustainable tourism governance requires strong coordination between research institutions and public authorities to guide planning and environmental management (Bramwell & Lane, 2008; Warfield, 1974). Media was classified as a dependent stakeholder, reflecting its role as an intermediary that disseminates information and shapes public awareness rather than directly influencing governance decisions.

Tourism businesses and local communities occupied intermediate positions, showing moderate influence but high reliance on institutional guidance. Tourism businesses contribute through operational implementation and market-oriented tourism products, while local communities play a central role in maintaining cultural heritage, environmental stewardship, and tourism activities.

However, their effectiveness depends on access to policy support, infrastructure, and collaborative governance mechanisms (Font et al., 2016; Murphy, 1985).

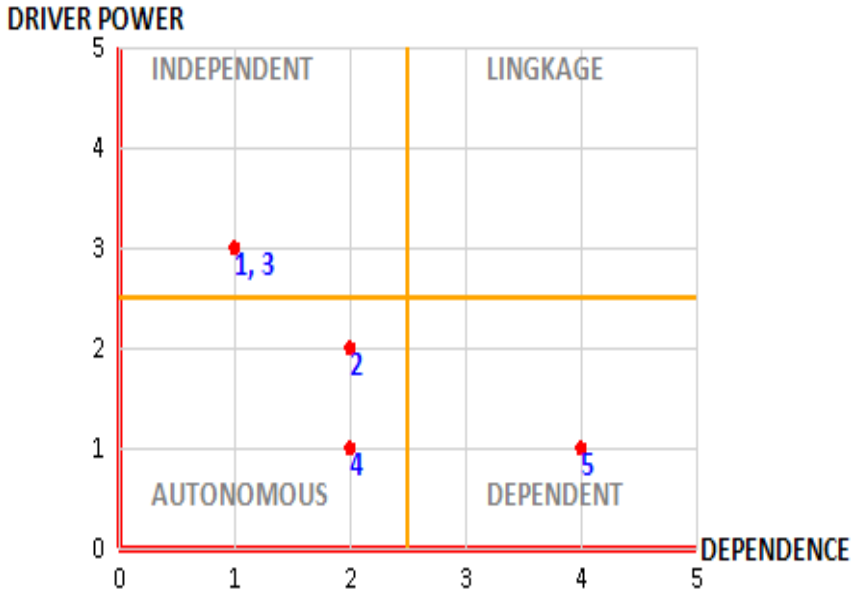

Figure 4. Driver Power–Dependence Matrix – Institutional Actors
Source: Authors' field data processing, (2025)

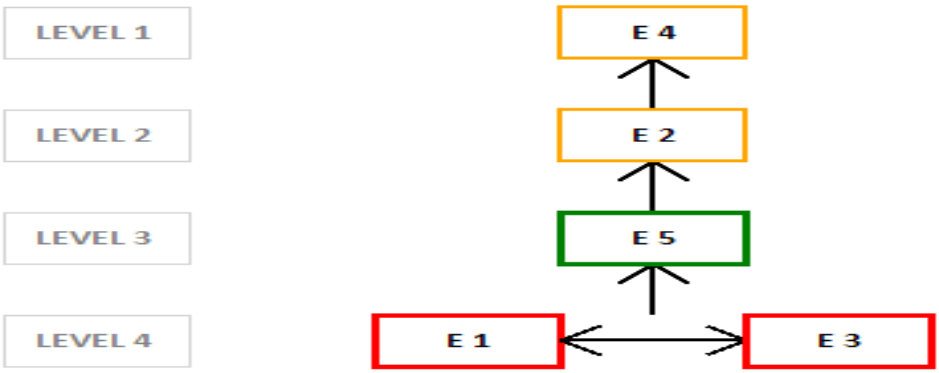

Figure 5. Hierarchical Level Structure – Institutional Actors
Source: Authors' field data processing, (2025)

The ISM hierarchy further demonstrated that academia and government form the foundational level of the system, media acts as a communication bridge, tourism businesses operate as implementation actors, and local communities occupy the highest level as end users and practitioners of green tourism. This structure highlights that successful green tourism development in Jatiluwih follows a collaborative governance model, where institutional synergy supports local participation and sustainability outcomes. These findings align with collaborative governance theory, emphasizing that long-term tourism sustainability depends on coordinated stakeholder relationships and community empowerment (Ansell & Gash, 2008; Vangen et al., 2015).

These findings support collaborative governance perspectives, emphasizing that effective green tourism requires coordinated interactions among multiple institutions. Rather than functioning independently, stakeholders form an integrated governance network where institutional support, knowledge exchange, and local implementation are mutually dependent.

4.3. Program requirements and existing system strengths

The ISM analysis of program requirements for community-based green tourism development in Jatiluwih identified three dominant supporting elements: natural and cultural conditions (1), tourism product differentiation and diversification (6), and stakeholder collaboration (7). These elements demonstrate strong driving influence within the system and are considered the most established components in current implementation practices (Table 4).

Table 4. Final Reachability Matrix – Program Requirements

No	PR1	PR2	PR3	PR4	PR5	PR6	PR7	PR8	DP
PR1	1	1	0	0	0	0	0	0	**2**
PR2	0	1	0	0	0	0	0	0	**1**
PR3	0	0	1	0	0	0	0	0	**1**
PR4	0	0	0	1	0	0	0	0	**1**
PR5	0	0	0	0	1	0	0	0	**1**
PR6	0	0	0	0	0	1	0	1	**2**
PR7	0	0	0	0	0	0	1	1	**2**
PR8	0	0	0	0	0	0	0	1	**1**
D	1	2	1	1	1	1	1	3	
L	3	2	3	3	3	3	3	1	

Note: DP = Driver Power; D = Dependence; L = Level Partition (Level 1 = top/outcome level; higher L values indicate more foundational/driving position).
Source: Authors' field data processing, (2025)

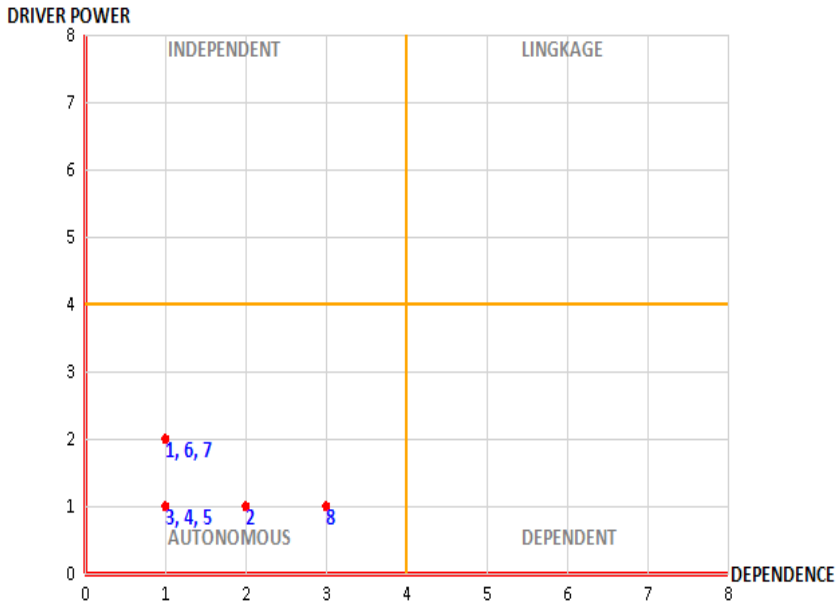

Figure 6. Driver Power–Dependence Matrix – Program Requirements
Source: Authors' field data processing, (2025)

The driver power–dependence matrix (Figure 6) showed that these variables play a central role in influencing other program requirements, indicating that Jatiluwih already possesses a strong foundation for green tourism development. Such findings highlight that successful sustainable tourism often depends on the availability of environmental assets, diversified tourism experiences, and institutional cooperation (Mousavi, 2021). The hierarchical ISM structure (Figure 7) further positions these three elements at the foundational level, meaning that other supporting factors depend on their strength and continuity. Jatiluwih's natural landscape, including terraced rice fields and the UNESCO-recognized Subak irrigation system, represents a significant ecological and cultural asset that

strengthens destination identity. At the same time, diversified tourism products such as trekking, agricultural education, culinary experiences, and spiritual tourism contribute to destination resilience by reducing dependence on a single attraction. Previous studies suggest that product diversification enhances competitiveness and visitor satisfaction while supporting sustainable local economies (Merli et al., 2019; Yekimov et al., 2021).

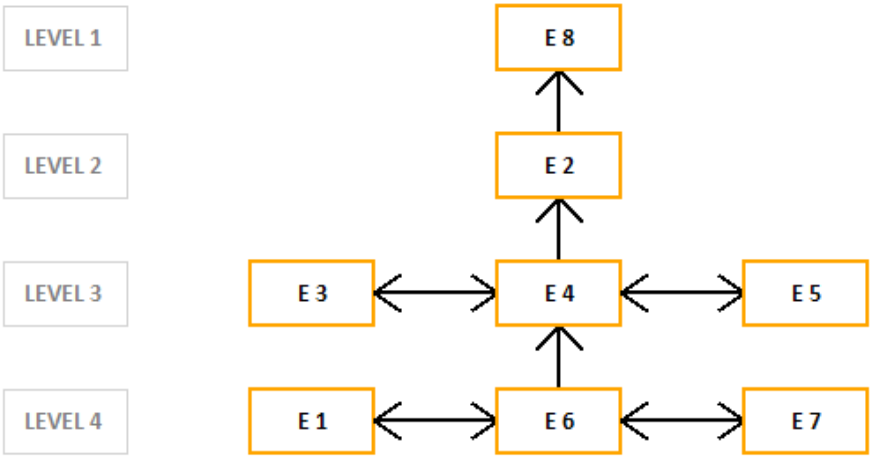

Figure 7. Hierarchical Level Structure – Program Requirements
Source: Authors' field data processing, (2025)

Stakeholder collaboration also emerged as a critical foundation, reflecting cooperation among local communities, government institutions, tourism businesses, NGOs, and academics. Collaborative governance strengthens tourism planning, resource management, and long-term sustainability outcomes (Ansell & Gash, 2008).

The findings indicate that Jatiluwih does not require a completely new tourism system; instead, future development should focus on strengthening existing advantages and integrating complementary elements such as infrastructure, accessibility, community engagement, and heritage conservation. This strategy supports a more efficient and context-based transition toward an ideal green tourism model. The results suggest that future development strategies should prioritize strengthening and integrating these established assets rather than creating entirely new systems. This finding aligns with destination resilience frameworks emphasizing the importance of leveraging endogenous resources.

4.4. Program constraints and structural challenges

The ISM analysis of the main constraints affecting community-based green tourism development in Jatiluwih indicates that no single element dominates the system. The six identified constraints economic inequality (1), environmental carrying capacity (2), climate change (3), marketing limitations (4), regulatory inconsistency (5), and environmental problems (6) are mostly positioned within the autonomous quadrant, suggesting relatively low driver power and low dependence.

The final results of the reachability matrix for the constraining factor economic inequality (1) showed that it has the highest driver power and the lowest dependence (the strongest sub-element with the lowest dependence). This indicates that economic inequality is the primary constraining sub-element for the community-based green tourism development program in the Jatiluwih region, as shown in Table 5.

The distribution implies that barriers operate collectively rather than through one dominant factor (Figure 8). Although individually these elements appear weak, their combined interaction creates a complex network of challenges that may hinder sustainable tourism implementation if not addressed

systematically (Attri et al., 2013). Among these constraints, economic inequality emerged as the foundational issue within the ISM hierarchy. Positioned at the lowest level, it acts as a root cause influencing other barriers.

Table 5. Final Reachability Matrix – Program Constraints

No	PC1	PC2	PC3	PC4	PC5	PC6	DP
PC1	1	0	1	0	0	0	**2**
PC2	0	1	0	0	0	0	**1**
PC3	0	0	1	0	0	0	**1**
PC4	0	0	0	1	0	0	**1**
PC5	0	0	0	0	1	0	**1**
PC6	0	0	0	0	0	1	**1**
D	1	1	2	1	1	1	
L	2	2	1	2	2	2	

Note: DP = Driver Power; D = Dependence; L = Level Partition (Level 1 = top/outcome level; higher L values indicate more foundational/driving position).
Source: Authors' field data processing, (2025)

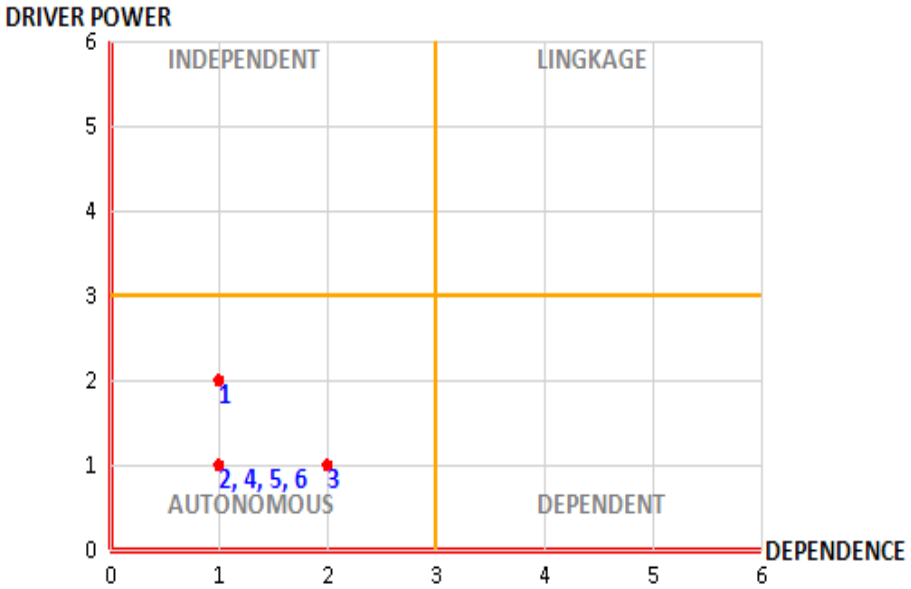

Figure 8. Driver Power–Dependence Matrix – Program Constraints
Source: Authors' field data processing, (2025)

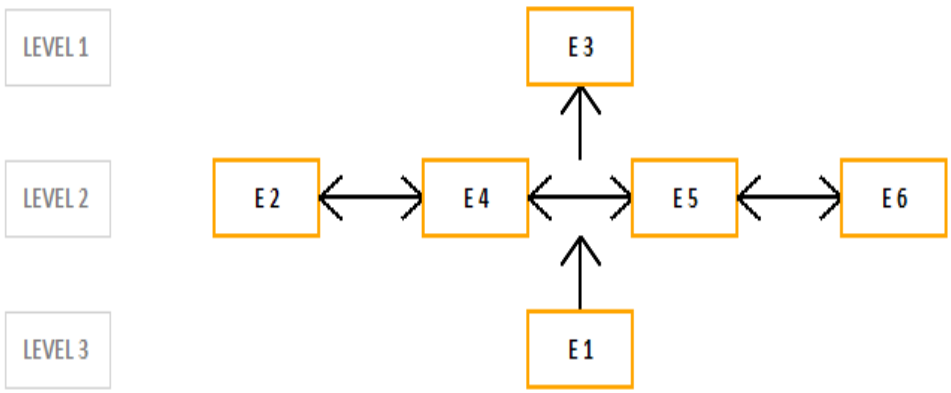

Figure 9. Hierarchical Level Structure – Program Constraints
Source: Authors' field data processing, (2025)

Unequal distribution of tourism benefits can reduce community participation, create social dissatisfaction, and weaken local support for green tourism initiatives. Previous studies highlight that community-based tourism succeeds when economic benefits are distributed fairly among stakeholders, ensuring social legitimacy and long-term participation (Jackson, 2025; Nazzirulah et al., 2023). In Jatiluwih, inequitable access to tourism opportunities may undermine collective engagement and reduce the effectiveness of sustainability programs.

The second hierarchical level (Figure 9) includes environmental carrying capacity, marketing challenges, policy inconsistency, and environmental degradation, all of which interact dynamically. Excessive tourism pressure may exceed ecological limits, while ineffective marketing can attract visitor segments incompatible with green tourism principles.

Inconsistent regulations further complicate implementation across institutional levels. Climate change appears at the highest level as an outcome of unresolved systemic challenges, indicating that environmental vulnerability increases when governance, economic equity, and ecological management remain weak (UNEP, 2021). Green tourism barriers in Jatiluwih should be addressed through integrated and simultaneous interventions, particularly by reducing economic inequality as the foundational constraint.

4.5. Desired program changes and environmental sustainability priorities

The ISM analysis of desired program changes in community-based green tourism development in Jatiluwih reveals a structured hierarchy of environmental sustainability priorities. Six sub-elements (Table 6) were examined which are preservation of the Subak system (1), sustainable irrigation management (2), reduction of chemical fertilizers (3), ecosystem and biodiversity protection (4), tourism waste management (5), and renewable energy adoption (6).

Table 6. Final Reachability Matrix – Expected Changes

No	EC1	EC2	EC3	EC4	EC5	EC6	DP
EC1	1	0	1	0	1	1	**4**
EC2	0	1	1	1	1	1	**5**
EC3	0	0	1	0	0	0	**1**
EC4	0	0	0	1	1	1	**3**
EC5	0	0	0	0	1	0	**1**
EC6	0	0	0	0	0	1	**1**
D	1	1	3	2	4	4	
L	4	4	2	3	1	1	

Note: DP = Driver Power; D = Dependence; L = Level Partition (Level 1 = top/outcome level; higher L values indicate more foundational/driving position).
Source: Authors' field data processing, (2025)

The driver power–dependence matrix indicates that Subak preservation and sustainable water management occupy the independent quadrant, meaning they possess strong influence while remaining relatively independent from other variables (Figure 10). These findings confirm that environmental sustainability in Jatiluwih is strongly rooted in traditional ecological systems and community-based resource management (Abramson, 2020; Rusadi et al., 2023).

The hierarchical ISM structure (Figure 11) positions sustainable irrigation management as the foundational element, emphasizing the critical role of water governance in supporting agricultural productivity and ecological resilience. Preservation of the Subak system and ecosystem protection occupy intermediate foundational levels, reinforcing the relationship between cultural heritage, biodiversity conservation, and tourism sustainability. Previous studies emphasize that traditional irrigation systems such as Subak represent socio-ecological institutions that integrate environmental

stewardship, spirituality, and collective governance (Abdullah, 2023). These elements create the ecological base necessary for sustaining green tourism landscapes and maintaining UNESCO heritage value.

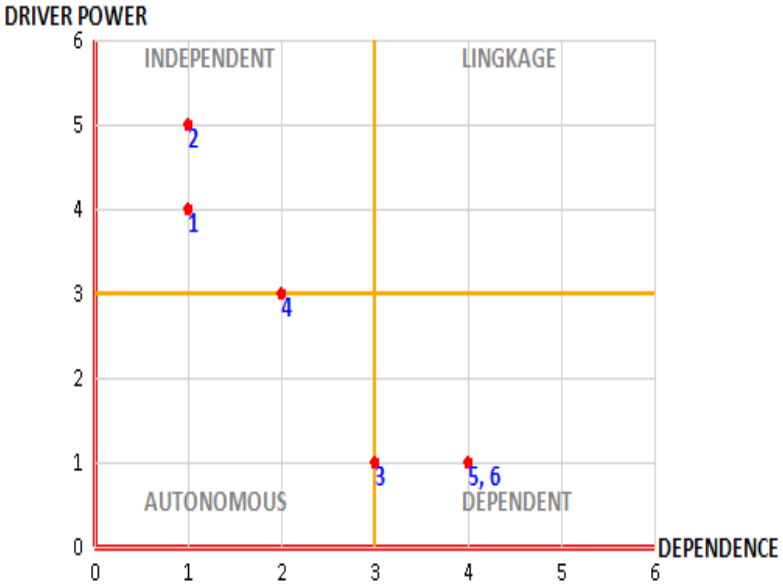

Figure 10. Driver Power–Dependence Matrix – Expected Changes
Source: Authors' field data processing, (2025)

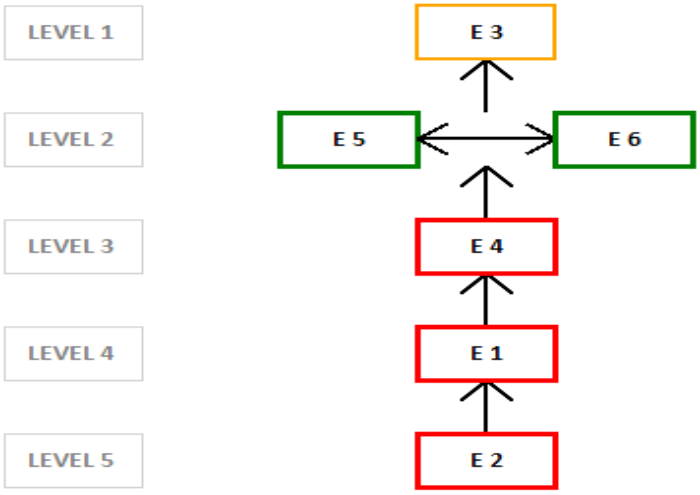

Figure 11. Hierarchical Level Structure – Expected Changes
Source: Authors' field data processing, 2025

At higher levels of the hierarchy, waste management, renewable energy adoption, and reduction of chemical fertilizers function as dependent sustainability outcomes. Their successful implementation relies on the stability of foundational ecological systems. This indicates that technological and environmental innovations cannot operate effectively without strong conservation practices already in place.

The findings suggest that Jatiluwih's green tourism strategy should prioritize strengthening water sustainability and cultural landscape preservation before expanding toward advanced environmental initiatives. Such an integrated conservation approach aligns with sustainable tourism frameworks that emphasize local participation, ecological balance, and long-term environmental resilience (Dewantara et al., 2024). The hierarchy indicates a gradual transition from foundational environmental stewardship

toward applied sustainability practices. This pattern highlights the importance of preserving ecological integrity before implementing advanced environmental innovations.

4.6. Indicators for evaluating development outcomes

The ISM analysis of evaluation indicators for assessing green tourism objectives in Jatiluwih reveals a structured hierarchy focused on improving local economic welfare. Six indicators (Table 7) were analyzed which are empowerment of local micro, small, and medium enterprises (MSMEs) (1), job creation (2), development of tourism products based on local wisdom (3), market access expansion (4), stakeholder partnerships (5), and local human resource capacity building (6).

Table 7. Final Reachability Matrix – Evaluation Indicators

No	EI1	EI2	EI3	EI4	EI5	EI6	DP
EI1	1	1	1	1	1	1	**6**
EI2	0	1	1	0	1	1	**4**
EI3	0	0	1	0	1	1	**3**
EI4	0	0	0	1	1	1	**3**
EI5	0	0	0	0	1	0	**1**
EI6	0	0	0	0	0	1	**1**
D	1	2	3	2	5	5	
L	4	3	2	3	1	1	

Note: DP = Driver Power; D = Dependence; L = Level Partition (Level 1 = top/outcome level; higher L values indicate more foundational/driving position).
Source: Authors' field data processing, 2025

The driver power dependence matrix identifies MSME empowerment as the strongest independent element, indicating high influence with low dependence (Figure 12). This finding suggests that local enterprises form the economic foundation of community-based green tourism by generating income, supporting entrepreneurship, and creating employment opportunities (Mehta, 2013).

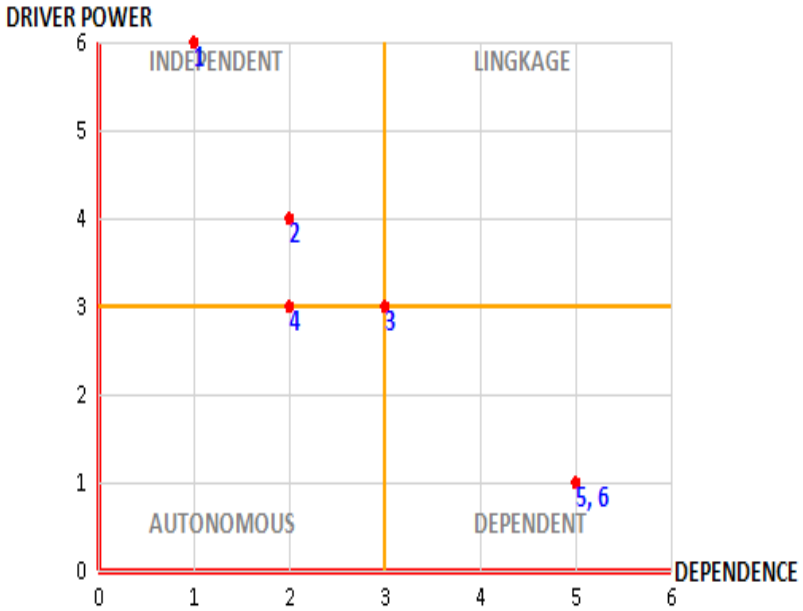

Figure 12. Driver Power–Dependence Matrix – Evaluation Indicators
Source: Authors' field data processing, 2025

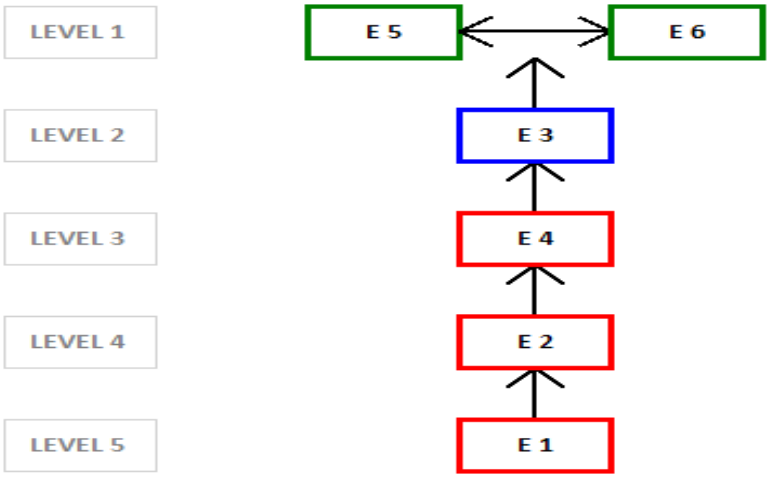

Figure 13. Hierarchical Level Structure – Evaluation Indicators
Source: Authors' field data processing, 2025

Job creation, local product development, and market access occupy transitional positions, demonstrating their role as intermediary drivers that connect community economic activities with broader tourism markets. Local tourism products based on cultural heritage and traditional knowledge enhance destination authenticity while increasing visitor engagement. This result showed that rural tourism destinations benefit significantly from locally produced goods and services, which strengthen cultural identity and diversify community income sources (Fafurida & Mulyaningsih, 2023; Putri et al., 2024). Market access further strengthens this system by expanding opportunities for local businesses to reach tourists and external partners.

Stakeholder partnerships and human resource development are positioned within the dependent quadrant, indicating that their effectiveness relies on the prior existence of strong local enterprises and economic activities. The ISM hierarchy places MSME empowerment at the foundational level, followed by job creation, local product development, and market access, while partnerships and training occupy the highest level as advanced outcomes (Figure 13). These findings suggest that sustainable economic growth in Jatiluwih should begin with strengthening community enterprises before expanding collaboration and skill development initiatives. This phased approach aligns with community-based tourism and sustainable development frameworks emphasizing local empowerment, inclusive participation, and long-term economic resilience (Mtapuri et al., 2022).

4.7. Activities supporting cultural preservation

The ISM analysis of cultural preservation activities in Jatiluwih highlights a structured relationship among five key elements supporting community-based green tourism (Table 8) which are: revitalization of local traditions and arts (1), integration of the Tri Hita Karana philosophy (2), youth empowerment in Subak culture (3), annual cultural festivals (4), and tourist education on local wisdom (5). The driver–dependence matrix indicates that all elements fall within the autonomous quadrant, meaning they have relatively low influence and dependence within the system (Figure 14). However, revitalization of local traditions and arts (1) and youth empowerment regarding Subak culture (3) demonstrate comparatively stronger positions, suggesting their importance as foundational cultural drivers (Figure 14). These findings emphasize that preserving local identity begins with strengthening internal community awareness and cultural continuity. Studies show that youth involvement is essential for maintaining cultural heritage and ensuring intergenerational transmission of traditional knowledge (Soler-Masó et al., 2025; Yulianingsih, 2020).

Table 8. Final Reachability Matrix – Supporting Activities

No	SA1	SA2	SA3	SA4	SA5	DP
SA1	1	1	0	0	0	**2**
SA2	0	1	0	0	0	**1**
SA3	0	0	1	1	0	**2**
SA4	0	0	0	1	0	**1**
SA5	0	0	0	0	1	**1**
D	1	2	1	2	1	
L	2	1	2	1	1	

Note: DP = Driver Power; D = Dependence; L = Level Partition (Level 1 = top/outcome level; higher L values indicate more foundational/driving position).
Source: Authors' field data processing, 2025

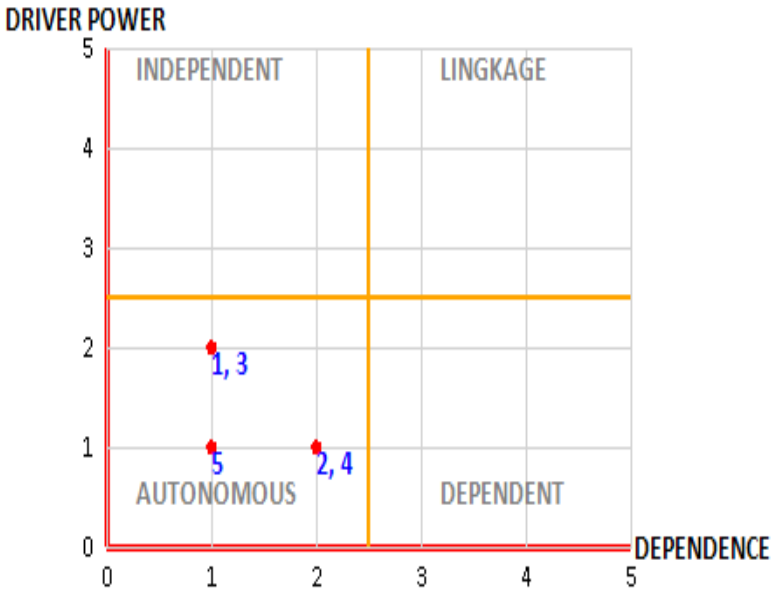

Figure 14. Driver Power–Dependence Matrix – Supporting Activities
Source: Authors' field data processing, 2025

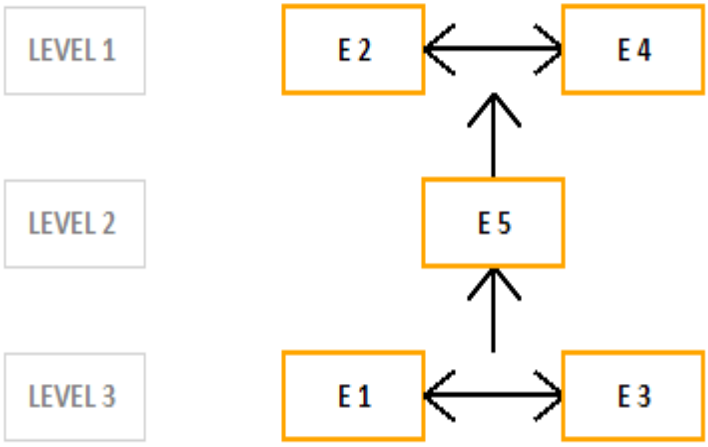

Figure 15. Hierarchical Level Structure – Supporting Activities
Source: Authors' field data processing, 2025

The hierarchical ISM structure further clarifies the sequence of cultural preservation activities. At the foundational level, revitalization of traditions and youth empowerment function as the core mechanisms sustaining cultural resilience (Figure 15). These activities rebuild cultural awareness and encourage younger generations to actively engage in preserving Subak heritage. At the intermediate level, tourist education serves as a bridge between local communities and visitors, promoting cultural understanding and responsible tourism behavior. Research suggests that cultural education enhances visitor appreciation, encourages respectful interactions, and supports community-based tourism experiences (Anindhita et al., 2024; Lin et al., 2021).

At the highest level of the hierarchy, the integration of Tri Hita Karana and annual cultural festivals strengthen destination identity and cultural sustainability. Tri Hita Karana provides a philosophical framework emphasizing harmony among humans, nature, and spirituality, while cultural festivals create platforms for cultural expression, community participation, and destination branding. Previous studies confirm that festivals play a critical role in preserving traditions, enhancing destination image, and supporting cultural tourism development (Botti et al., 2018; Correia et al., 2022; Özdemir, 2016). Overall, the findings suggest that sustainable cultural preservation in Jatiluwih requires a gradual process beginning with community-based cultural strengthening before expanding toward tourism integration and public cultural promotion.

These findings suggest that cultural sustainability is not achieved through isolated events but through long-term community investment in heritage transmission. The results further indicate that tourism activities become sustainable when cultural practices remain embedded within local social systems.

4.8. Community-Based Green Tourism development strategy in Jatiluwih

The Interpretive Structural Modelling (ISM) analysis identified seven core elements that form the foundation of community-based green tourism development in Jatiluwih, including program objectives, institutional actors, implementation requirements, key constraints, desired environmental changes, evaluation indicators, and supporting cultural activities. Strong driver elements consist of social aspects, community participation, government and academic involvement, natural and cultural conditions, stakeholder collaboration, sustainable irrigation, Subak preservation, MSME empowerment, local job creation, and cultural revitalization. Together, these components create an interconnected framework where social empowerment and ecological preservation become the primary drivers of sustainable tourism development.

The conceptual model positions social cohesion and local participation as the central pillars of green tourism. Community members are not merely beneficiaries but active actors responsible for balancing environmental conservation, cultural preservation, and local economic growth. Government institutions function as facilitators and regulators, while academia contributes through research and technical support. Tourism businesses, media, and stakeholders collaborate to strengthen promotion, innovation, and knowledge-sharing. Economic sustainability is achieved through diversification of tourism products, empowerment of local MSMEs, and employment generation, reducing economic inequality while strengthening local resilience.

Environmental sustainability is reinforced through Subak conservation, sustainable water management, biodiversity protection, and preservation of rice terrace ecosystems. Cultural sustainability is supported by revitalizing traditions, empowering youth participation in Subak culture, and integrating the philosophy of Tri Hita Karana into tourism experiences. The CBGT development model is shown in Figure 16 presents the conceptual framework of Community-Based Green Tourism Development (CGBT), illustrating the interrelationships among governance, community empowerment, environmental conservation, cultural preservation, and sustainable tourism outcomes.

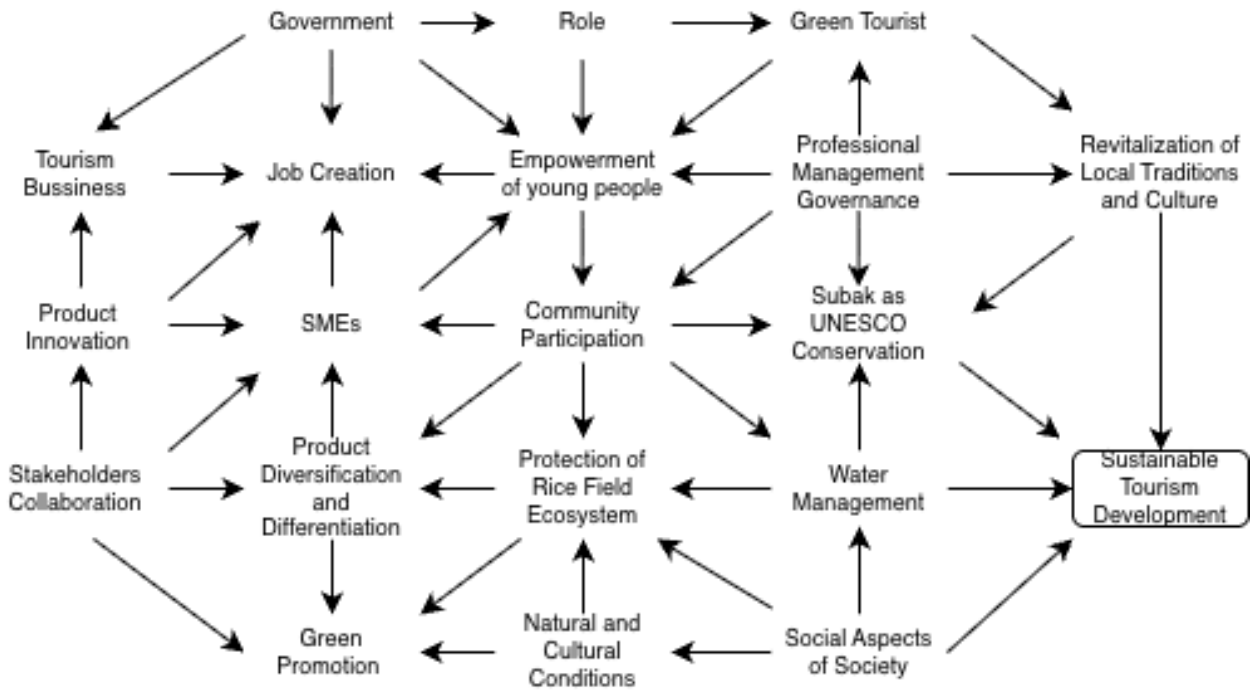

Figure 16. Model of Community-Based Green Tourism in Jatiluwih
Source: Author's own Elaboration, 2026

This framework offers not only a theoretical contribution but also a practical policy model that can guide sustainable tourism planning in UNESCO heritage destinations. Its implementation relies on consistent community participation, cross-sector policy integration, and the combination of local wisdom with scientific knowledge to enhance destination resilience against environmental, social, and economic pressures. The model suggests that successful CGBT depends on a balanced relationship between local stakeholders, natural resource management, cultural preservation, and inclusive governance, ensuring long-term benefits for both the community and the destination.

5. CONCLUSIONS

The findings demonstrate that social cohesion and community participation constitute the most fundamental driving factors underlying the development of community-based green tourism. These social dimensions provide the foundation upon which institutional governance, environmental conservation, and economic development can be effectively strengthened. At the institutional level, government and academic institutions emerged as the principal strategic drivers responsible for facilitating collaborative governance, knowledge transfer, and policy coordination. Meanwhile, environmental conservation, particularly the preservation of the Subak irrigation system and sustainable water management, together with local economic empowerment through MSME development and cultural revitalization, represent the principal outcomes of an integrated community-based green tourism system. Collectively, these findings confirm that sustainable tourism development in heritage destinations should follow a bottom-up collaborative governance approach, where community capacity serves as the foundation for long-term destination resilience.

From a theoretical perspective, this research extends previous studies on community-based green tourism by moving beyond descriptive identification of success factors toward a hierarchical structural model that explains the causal relationships among governance, environmental, socio-cultural, and

economic dimensions. By integrating Collaborative Governance Theory with Interpretive Structural Modelling, the study proposes a replicable CBGT framework that can be adapted to other UNESCO World Heritage destinations and heritage tourism contexts facing similar sustainability challenges.

The study also offers several practical implications for policymakers and destination managers. The ISM hierarchy suggests that development interventions should be implemented according to the priority structure identified by the model. Initial policy efforts should focus on strengthening social cohesion and community participation through participatory planning, community empowerment, and capacity-building programs. These should be followed by reinforcing institutional collaboration among government agencies, academia, tourism businesses, and local communities to improve governance effectiveness. Subsequent priorities include enhancing environmental conservation, particularly through sustainable irrigation management and ecosystem protection, while promoting local economic empowerment by supporting MSMEs, community-based enterprises, cultural revitalization, and sustainable tourism products. Such a phased approach enables more effective allocation of resources while improving the long-term sustainability and resilience of heritage tourism destinations.

This study has several limitations, first, the research was conducted as a single case study in the Jatiluwih Cultural Landscape, which may limit the generalizability of the findings to other tourism destinations with different socio-cultural and governance characteristics. Second, the ISM analysis relied on the judgment of fourteen experts, reflecting the methodological emphasis of ISM on expert knowledge rather than statistical representativeness. Consequently, the hierarchical relationships identified in this study should be interpreted as context-specific and may evolve under different institutional settings.

Therefore, future research is encouraged to validate and extend the proposed CBGT model through complementary analytical approaches. Integrating ISM with MICMAC analysis would provide a more comprehensive understanding of driver–dependence classifications, while combining ISM with DEMATEL could reveal the strength and direction of causal relationships among variables. In addition, future studies may incorporate Structural Equation Modelling (SEM) to empirically test the causal pathways identified by the ISM hierarchy using larger stakeholder samples across multiple heritage destinations. Such methodological integration would contribute to a more robust theoretical understanding of sustainable tourism governance and enhance the generalizability of community-based green tourism models.

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AUTHOR CONTRIBUTIONS (CRediT)

Dewa Ayu Made Lily Dianasari: Conceptualization, Methodology, Investigation, Data Curation, Formal Analysis, Writing – Original Draft, Visualization, Project Administration, Supervision, Corresponding Author.

Luh Yusni Wiarti: Validation, Investigation, Resources, Writing – Review & Editing, Data Curation.

I Gede Gian Saputra: Formal Analysis, Software, Validation, Visualization, Writing – Review & Editing.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest regarding the publication of this article. The research was conducted ethically and responsibly, without any form of plagiarism, data manipulation, or unethical research practices. All authors listed in this manuscript have made significant academic contributions to the research, analysis, and writing process. In addition, this study did not involve animal testing or clinical human experimentation requiring special ethical consent. Any parties who provided support without direct contribution to the manuscript preparation have been appropriately acknowledged.

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