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Developing Sustainable Rural Tourism in Indonesia: A Cross-Impact Balance Analysis

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ABSTRACT

Rural tourism in Indonesia offers substantial potential to promote sustainable development, yet it faces multifaceted challenges spanning socio-economic, institutional, and technological domains. This study aims to identify optimal development scenarios for rural tourism using the Cross-Impact Balance (CIB) method to systematically assess key determinants and project potential trajectories for the growth of tourism villages in Bogor Regency, Indonesia. Five prospective scenarios were analyzed, focusing on village economic performance, stakeholder collaboration, government support, development strategy, information technology adoption, governance quality, and income distribution. The results indicate that the optimal scenario is characterized by autonomous economic growth, robust multi-stakeholder synergy, proactive government intervention, accountable governance, comprehensive digital innovation, and equitable income distribution. In contrast, scenarios marked by partial innovation or weak collaboration demonstrate lower sustainability and limited transformative capacity. These findings underscore the importance of adopting holistic and integrated policy approaches to strengthen governance, institutional capacity, and innovation ecosystems. This study contributes to strategic planning for sustainable rural tourism by providing a systems-based framework that aligns local initiatives with national development goals and emphasizes digital innovation and institutional strengthening as key enablers for enhancing competitiveness, resilience, and social equity in rural communities across Indonesia.

Keywords: Cross impact balance method, Digital innovation, Gorvenance and collaboration, Scenario analysis, Sustainable rural tourism.

JEL Classification: Z32, Q56, R11.

INTRODUCTION

Rural tourism is widely recognized as a key driver of economic development and community revitalization, particularly in countryside areas (Sharpley & Roberts, 2004). It can boost local welfare by creating jobs and generating additional income (Ariyani & Fauzi, 2023). By providing alternative revenue streams for communities that once relied mainly on agriculture, rural tourism also helps improve living standards through upgraded facilities and infrastructure (Almeida & Pinto Machado, 2021). In many developing countries, governments and

development agencies promote rural tourism as a solution to pressing socioeconomic problems such as high unemployment, poverty, and insufficient infrastructure (Acha-Anyi et al., 2021).

Globally, rural tourism has emerged as one of the fastest-growing tourism sectors, offering an authentic and environmentally responsible alternative to mass tourism, which often leads to environmental degradation and overexploitation (Hu et al., 2025). Although tourism brings substantial economic advantages, it has also significantly contributed to environmental degradation and pollution, while at the same time exerting negative pressures on the social and cultural fabric of local communities (Hajmásy, 2024); (Purwono et al., 2024). Thus, sustainability has become a central concern within the development of rural tourism, with increasing emphasis not only on enhancing economic benefits, but also on preserving local culture and protecting the environment (Lane & Kastenholz, 2015). Sustainable tourism is a challenge for current and future generations, requiring development approaches that maintain a balance between its fundamental pillars: economic viability, social equity, and environmental stewardship (Matijová et al., 2023).

Indonesia has substantial rural tourism potential, supported by vast countrysiderich in natural resources and a wide variety of local cultural and culinary traditions that attract visitors. The country formalizes this potential through "tourist villages"—rural communities designated as tourism destinations that integrate local life and wisdom (Nuryanti, 1993). Since 2021, the government has prioritized tourist villages in national tourism development to accelerate progress and raise rural welfare (Ministry of Tourism and Creative Economy of Indonesia, 2020). Villages are classified as pioneer, developing, advanced, or independent based on criteria such as visitor numbers, tourism industry growth, workforce readiness, product and activity diversity, and available amenities (Wirdayanti et al., 2021). Growing community awareness of local tourism assets has spurred rapid expansion: by 2024 over 6,019 tourist villages existed, mostly community-based initiatives with residents as primary actors (Hariyadi et al., 2024). Yet 75% remain in the pioneer category, facing ongoing quality and sustainability challenges (Deputy for Strategic Policy, 2024). The National Medium-Term Development Plan Ministry of Tourism and Creative Economy set a target to develop 244 advanced and independent tourist villages by 2024 (Ministry of National Development Planning of Indonesia, 2020).

The unmet target stems from several key challenges. First, many villages lack full authority over strategic assets, which remain under the control of other sectors or external institutions (Zamroni et al., 2015). Second, reliance on centralized, standardized policies prevents villages from capitalizing on their distinctive assets (Indonesian Parliamentary Design Center 2022, 2022). Third, economic leakage causes tourism revenues to flow out to other regions or sectors (Supradist, 2004). Finally, most village institutions are still too weak to manage tourism destinations professionally (Mustofa et al., 2024).

Numerous studies have confirmed these issues. Weak managerial capacity and limited local human resources (Wirdayanti et al., 2021), scarce product innovation (Amrullah et al., 2023), digital skills gaps (Mutmainah et al., 2025), and risks of cultural commodification (Nurhadi et al., 2022) continue to hinder sustainable development in most tourist villages. Uneven physical and digital infrastructure (Muhtar et al., 2023), along poor coordination between government, private sector, and communities, have produced reactive, fragmented rather than integrated management (Ariyani et al., 2022). Many villages rush into tourism without comprehensive planning and fail to sustain their destinations (Wibowo & Nur, 2024); (Mamonto et al., 2024). One of the central challenges in ensuring the sustainability of the tourism sector, particularly one as inherently fragile as community-based tourism (CBT)remains how local communities perceive the economic, socio-cultural, and environmental impacts of tourism and their personal satisfaction with those outcomes (Uslu et al., 2020). Collectively, these factors impede independent, sustainable growth and heighten the risk of socioeconomic instability. Therefore, a sustainability-oriented approach must move beyond simply reducing environmental impacts to driving systemic change through social, institutional, and economic innovation (Budke et al., 2025).

These challenges show that developing tourist villages in Indonesia is a complex, multidimensional task, prompting the central question: "What development strategies will secure growth, sustainability, and resilience amid multiple interacting challenges?"

Answering this requires a comprehensive method that systematically maps inter-factor dynamics rather than relying on linear models (Soták-Benedeková et al., 2025). As Weimer-Jehle (2009) argues, multidimensional problems need approaches that can comprehensively map and simulate interactions. Cross-Impact Balance (CIB) analysis fits this need by identifying key factors, charting their interrelations, and constructing adaptive, internally consistent scenarios(Zhao, 2023); (Kurniawan et al., 2022). This study applies CIB to identify the main drivers of tourist village development, analyze their relationships, and generate coherent adaptive scenarios. The findings aim to offer strategic recommendations for government and stakeholders to advance sustainable, resilient tourist villages.

LITERATURE REVIEW

The Concept of Rural Tourism Development in Indonesia

Rural tourism represents a strategic development paradigm that seeks to harness local natural resources, unique cultural assets, and the potential of rural human capital with the aim of enhancing community well-being while prioritizing environmental sustainability (Megha & Sarker, 2024). In the Indonesian context, this paradigm materializes primarily in the form of designated tourism villages—rural areas that are formally designated by local governments as tourism destinations and then developed and managed using participatory, community-based approaches (Arintoko et al., 2020). These villages are intimately connected to local traditions and indigenous knowledge systems. They not only serve as attractions for urban and international visitors but also act as platforms for driving economic diversification, supporting supplemental income generation, and fostering improvements in rural living standards (Arismayanti et al., 2019).

The Indonesian government has institutionalized the classification of tourism villages into four progressive stages: pioneering, developing, advanced, and independent. These levels are determined according to quantitative and qualitative indicators, including visitor arrivals, growth in tourism-related businesses, improvement in human capital, diversification of tourism products, and enhancement of infrastructure and public amenities (Ardani et al., 2025). As villages progress through these stages, the government's focus shifts from initial quantitative achievements toward more qualitative dimensions, placing growing emphasis on sustainability, resilience, and local empowerment (Hermantoro, 2024). This aligns with national policy as specified in Law No. 10/2009 on tourism, which underscores the need for integrated development across tourism destinations, core industries, supporting industries, marketing, and robust tourism institutions (Ministry of Law and Human Rights, 2009).

Nevertheless, the process of rural tourism development in Indonesia is far from straightforward. Multiple studies document a host of persistent barriers such as inadequate planning, weak leadership, lack of directional clarity, diverging aspirations among residents, and infrastructure deficits, all of which often lead to compromised landscape quality, limited product innovation, and unrealized economic benefits (Kantar & Svržnjak, 2017). Recent research increasingly highlights the crucial role of participatory scenario planning—employing collaborative, anticipatory approaches that include village leaders, government officials, local businesses, and academic experts. By integrating diverse stakeholder perspectives, rural tourism projects can be more adaptive, context-specific, and better suited to the evolving needs of rural communities (Ariyani & Fauzi, 2024). This growing body of literature establishes a foundation for analyzing complex leverage points and crafting effective, sustainable strategies for rural tourism development in Indonesia.

Cross-Impact Balance (CIB) Analysis

The Cross-Impact Balance (CIB) analysis has emerged as a pivotal technique for understanding complex systems, especially those involving multifaceted socio-economic and environmental interactions such as in rural tourism development. In Indonesia, where destination management requires balancing community-based initiatives with policy alignment and market forces, CIB offers a systematic method for mapping interconnections between influencing factors and simulating alternative futures (Zhao, 2023). Its value lies in enabling policymakers and planners to explore how various developmental factors may reinforce or counteract each other, thus helping design more evidence-based and anticipatory strategies (Lambe, 2018).

CIB is categorized as a semi-quantitative foresight method, bridging qualitative expert judgment with quantitative consistency analysis (Weimer-Jehle, 2006). Unlike purely statistical or econometric forecasting methods, CIB incorporates expert knowledge to construct internally consistent scenarios by defining "descriptors" (key influencing factors) and their potential "states" (future conditions). In this study, a morphological analysis-based approach is utilized, wherein the relationships among descriptors are formalized through a cross-impact matrix that captures how one factor's state affects others (Kurniawan et al., 2022). Descriptors often represent structural elements—such as governance quality, stakeholder collaboration, or IT adoption—while the states describe their possible qualitative outcomes.

The key strength of CIB lies in its ability to systemize diverse expert insights into coherent and logically consistent scenario frameworks (Kuru, 2015). Through iterative expert consultation, possible futures are explored by balancing the relationships between driving variables and assessing which combinations of states lead to feasible or contradictory outcomes (Weimer-Jehle, 2023). As a result, the method has become a cornerstone tool for anticipatory governance, particularly in contexts demanding sustainable and adaptive policy design.

From an operational standpoint, CIB integrates expert evaluations into a cross-impact matrix, where each cell quantifies the influence of one state on another. The CIB algorithm then computes consistent sets of states,

generating possible "scenarios"—each representing a plausible systemic configuration. For instance, scenarios of rural tourism development may vary from coordinated, innovation-driven growth to fragmented and policy-dependent models (Fuchs et al., 2008). Because of this flexibility, CIB has been applied broadly in fields such as climate adaptation, energy transition, and urban resilience (Weimer-Jehle, 2023).

When applied to complex systems like rural tourism, however, several methodological challenges arise. Large matrices increase analytical complexity, as descriptor weights and interaction hierarchies must remain consistent (Weimer-Jehle, 2023). Interdependencies among subsystems—for example, between local economies and national tourism policies—require hierarchical modeling to ensure consistency across scales. Studies have also emphasized that systems with elevated uncertainty levels must be evaluated iteratively to refine both descriptor significance and consistency thresholds (Govorukha et al., 2018).

Recent tourism research in Indonesia has adopted CIB to analyze interlinked socio-economic drivers affecting cultural preservation, stakeholder coordination, and environmental stewardship (Amiruddin et al., 2022); (Kaveh et al., 2022). Its application in tourism village studies has demonstrated that cross-impact evaluations not only facilitate strategic foresight but also strengthen community participation, enabling stakeholders to openly discuss and anticipate systemic consequences of their decisions before implementation.

Overall, the CIB framework offers a powerful methodological foundation for analyzing multidimensional tourism development issues. By formalizing expert logic and integrating diverse stakeholder perspectives, CIB helps identify critical leverage points, balances innovation and inclusivity, and supports the long-term vision of sustainable and resilient rural tourism systems in Indonesia.

METHODS

Study Site

This study was conducted in Bogor Regency, a regency located in West Java Province, Indonesia, which is one of the most dynamic and rapidly developing rural tourism regions in the country. The research took place between January to August 2025, coinciding with the local government's implementation of the updated Regent Regulation Number 26 of 2024 on Tourist Villages. This regulation provides a policy framework for accelerating the development of sustainable tourism villages and strengthening institutional governance at the regency level (Regency, 2024).

Bogor Regency is strategically situated around 60 kilometers south of Jakarta and serves as a transitional ecological zone between urban and rural environments. The regency consists of 40 districts (sub-regencies) and 417 villages, of which 49 have officially been designated as tourist villages under local government programs. All selected villages at the time of research remained classified as pioneering tourism villages, which means that they were still in the early developmental phase and required substantial institutional, financial, and infrastructural support. These villages serve as testing grounds for community-based tourism initiatives and sustainable tourism governance models led by both village administrations and local cooperatives.

Methodologically, the site selection for this study was aligned with the government's classification of tourism village status, focusing on villages that represented varying levels of readiness, accessibility, and digital innovation adoption. The research primarily involved collecting both qualitative and secondary quantitative data, including policy documents, official tourism statistics, and field observations. Data collection also benefited from the use of the E-Kabo Application, a digital platform launched by the Department of Culture and Tourism of Bogor Regency in 2023 to digitally map tourism potential and facilitate stakeholder participation.

Overall, Bogor Regency provided an ideal setting for this study because of its proactive policy interventions, diversified tourism potential, and ongoing efforts to establish an integrated governance model for sustainable rural tourism development in Indonesia. The region's ecological diversity, economic growth trajectory, and participatory tourism governance made it an exemplary microcosm for understanding how rural tourism policies are translated into community-level practices.

Data Collection and Processing Steps

Rural tourism development is recognized as an inherently complex process that interweaves diverse socio-economic, cultural, and technological elements while simultaneously requiring robust governance and effective community participation at the local level. This study adopts the Cross-Impact Balance (CIB) methodology to systematically analyze and envision pathways for transformational change. The CIB method, established as a robust and empirically tested framework, enables comprehensive mapping of interrelationships among key drivers and supports the formulation of coherent and actionable development scenarios.

Following the standard CIB protocol outlined by (Weimer-Jehle, 2006), data collection was implemented through a structured four-step process: (1) identification of key system factors (descriptors), (2) specification of descriptor states, (3) evaluation of cross-impact relationships, and (4) consistency analysis and scenario generation.

Step 1: Descriptor Identification and Validation

The initial phase concentrated on identifying and validating systemic variables (descriptors) that critically influence tourism village development trajectories in Bogor Regency. A mixed-methods approach was employed, combining structured surveys and semi-structured interviews with a purposive sample of village managers, local tourism actors, and community stakeholders. Concurrently, an extensive literature review was conducted to catalog relevant variables and best practices documented in previous rural tourism studies.

To ensure comprehensive validity, this phase included multiple rounds of focus group discussions (FGDs) involving local policymakers, tourism development experts, and community leaders. Expert feedback was also solicited from academic specialists and practitioners familiar with community-based tourism and rural governance. Through this multistage validation process, twenty-one key variables were identified and systematically organized into seven descriptor domains: local economic performance, stakeholder collaboration, governance quality, government support mechanisms, innovation and digital adoption, development strategy, and equity of income distribution (Table 1).

Step 2: Descriptor State Specification

Each descriptor was assigned specific qualitative states representing plausible future conditions within a five-year planning horizon. For instance, the economic performance descriptor included states such as "independent rapid growth," "moderate tourism-led growth," and "stagnant economic conditions." This specification process was refined through iterative stakeholder consultations to ensure contextual relevance and analytical precision.

Table 1. List Descriptors, Variables and End States Value

Variables	**End State**
A. Village Economy	
A1. Village economy was stagnant or grew minimally	-1
A2. Moderate economic growth occurred due to tourism villages	-1
A3. Village economy is becoming independent and grew rapidly	+2
B. Multi-Stakeholder Collaboration	
B1. No collaboration or very minimal collaboration	+1
B2. Limited collaboration existed among some stakeholders	+2
B3. Synergistic and integrated collaboration among all parties	+3
C. Government Support	
C1. Minimal or inconsistent support was provided	-1
C2. Moderate and regular government support was provided	+1
C3. Strong support with proactive policies and incentives was provided	+2
D. Development Approach	
D1. A partial and poorly integrated approach was adopted	+1
D2. A community-based and participatory approach was adopted	+3
D3. A holistic and sustainable approach was adopted	+2
E. Information Technology (IT) Adoption	
E1. Almost no IT adoption or very minimal adoption	-1
E2. Moderate IT adoption with some digital systems present	+1
E3. Comprehensive and innovative adoption IT	+2
F. Governance	
F1. Informal or unstructured governance	-1
F2. Semi-formal and documented governance	+1
F3. Formal, transparent, and accountable governance	+2
G. Community Income	
G1. Income was low and unevenly distributed	+1
G2. Income increased, but disparities remained	+2
G3. Income was high and relatively evenly distributed	+3

Source: FGD, Bogor Tourist Village, 2025.

Step 3: Cross-Impact Assessment And Matrix Construction

Cross-impact evaluation was conducted through a structured Focus Group Discussion (FGD) involving sixteen multidisciplinary participants: six experienced tourism village managers, two senior officers from the Bogor

Regency Tourism Office, four village administration representatives, and two academic experts specializing in rural tourism development.

The FGD sessions were conducted face-to-face over approximately four hours. Participants were systematically introduced to the CIB methodology and scoring criteria to ensure consistent interpretation. Each descriptor pair was evaluated using the standard CIB nine-point bipolar scale: +3 (strongly encouraging), +2 (encouraging), +1 (slightly encouraging), 0 (no direct influence), –1 (slightly inhibiting), –2 (inhibiting), and –3 (strongly inhibiting). A trained moderator supported by a co-facilitator guided the consensus-building process, ensuring comprehensive deliberation while minimizing individual bias. Upon completion, all assessments were digitally recorded and independently validated by two subject matter experts not participating in the initial session. The aggregated results were then systematically encoded into a Cross-Impact Matrix using the CIB ScenarioWizard software, available at https://www.cross-impact.org/english/CIB_e_ScW.htm.

Table 2. Cross Impact Matrix of Rural Tourism in Bogor Regency.

	A			B			C			D			E			F			G		
	A1	A2	A3	B1	B2	B3	C1	C2	C3	D1	D2	D3	E1	E2	E3	F1	F2	F3	G1	G2	G3
A.Village Economy																					
A1 Village economy was stagnant or grew minimally				2	1	-2	-3	1	2	-2	2	1	-1	2	1	-1	2	1	2	-1	-2
A2 Moderate economic growth occurred due to tourism villages				-2	3	2	-2	3	1	-1	3	2	-2	3	2	-2	3	2	-1	3	2
A3 Village economy is becoming independent and grew rapidly				-3	2	3	-1	2	3	-3	2	3	-3	1	3	-3	1	3	-3	1	3
B. Multi-Stakeholder Collaboration																					
B1 No collaboration or very minimal collaboration	1	-1	-2				-1	1	2	1	-1	-2	1	2	-1	1	-1	-2	1	-1	-2
B2 Limited collaboration existed among some stakeholders	-2	3	2				-2	3	1	-2	3	2	-2	3	2	2	3	1	-1	1	2
B3 Synergistic and integrated collaboration among all parties	-3	2	3				-3	2	3	-3	2	3	-3	1	3	-3	2	3	-3	2	3
C. Government Support																					
C1 Minimal or inconsistent support was provided	1	2	-3	-2	2	1				-2	2	1	-2	2	1	-1	2	1	-2	3	2
C2 Moderate and regular government support was provided	-2	3	1	1	3	2				-1	3	2	-1	3	2	2	3	2	-1	2	1
C3 Strong support with proactive policies and incentives was provided	-3	2	3	-3	1	3				-3	1	3	-3	1	3	-3	1	3	-3	1	3
D. Development Approach																					
D1 A partial and poorly integrated approach was adopted	-1	2	1	-2	2	1	-3	2	1				-1	2	1	-1	2	1	-1	2	1
D2 A community-based and participatory approach was adopted	-3	3	2	-1	3	2	-1	3	2				-2	3	2	-2	3	2	-2	3	2
D3 D3. A holistic and sustainable approach was adopted	-2	1	3	-3	1	3	-2	1	3				-3	1	3	-3	1	3	-3	1	3
E. IT Adoption																					
E1 Almost no IT adoption or very minimal adoption	3	2	1	-1	1	2	-2	1	2	-1	2	1				-1	2	1	-1	2	1
E2 Moderate IT adoption with some digital systems present	-2	3	2	-2	3	1	-1	3	1	-2	3	2				-2	3	2	-2	3	2
E3 Comprehensive and innovative adoption IT	-3	1	3	-3	2	3	-3	2	3	-3	1	3				-3	1	3	-3	-1	3
F. Governance																					
F1 Informal or unstructured governance	-1	2	1	-1	2	1	-1	2	1	-1	2	1	-1	2	1				-1	2	1
F2 Semi-formal and documented governance	-2	3	2	-2	3	2	-2	1	2	-2	3	2	-2	3	2				-2	3	2
F3 Formal, transparent, and accountable governance	-3	1	3	-3	1	3	-3	-1	3	-3	1	3	-3	1	3				-3	2	3
G. Community Income																					
G1 Income was low and unevenly distributed	-2	2	-1	-1	2	1	-1	1	2	-1	2	1	-1	2	1	-1	2	1			
G2 Income increased, but disparities remained	-1	3	1	-2	3	2	-2	3	1	-2	3	2	-2	3	2	-2	3	2			
G3. Income was high and relatively evenly distributed	-3	-1	3	-3	1	3	-3	2	3	-3	1	3	-3	-1	3	-3	1	3			

Source: FGD, Bogor Tourist Village, 2025.

Step 4: Consistency Analysis and Scenario Generation

The completed Cross-Impact Matrix served as the analytical foundation for automated consistency analysis and scenario identification. The CIB algorithm evaluated all possible variable state combinations, retaining only those configurations that demonstrated internal logical coherence according to expert assessments. This process generated five distinct scenarios representing alternative pathways for rural tourism development, each characterized by specific consistency scores, total impact scores, and index values. This systematic CIB implementation ensured that the scenario analysis was grounded in empirical evidence, local stakeholder knowledge, and established methodological rigor, providing a robust foundation for strategic planning and policy development in Bogor's rural tourism sector.

Data Analysis

Following the completion of data collection and initial preprocessing, the study proceeded to the data analysis stage, which operationalized the Cross-Impact Balance (CIB) methodology as the principal analytical framework. The overarching goal of this stage was to systematically map and interpret scenario configurations derived from the Cross-Impact Matrix. This matrix illustrates the interdependencies and bidirectional influences among the twenty-one key variables previously identified as determinants of rural tourism development in Bogor Regency. By transforming qualitative expert judgments into semi-quantitative network structures, the CIB approach enables the exploration of plausible future states of rural tourism systems, thereby informing strategic planning and evidence-based policymaking (Weimer-Jehle, 2006).

Scenario Configuration and Analytical Framework

Scenario configuration analysis constituted the central analytical process in this study. It was designed to identify, compare, and interpret alternative pathways of rural tourism transformation through the identification of consistent and logically robust patterns of variable interactions. Each scenario represents a distinct combination of variable states or "descriptors", corresponding to potential long-term outcomes within the systemic context of rural tourism development. The Analytical focus was placed on scenarios that were simultaneously realistic, internally consistent, and of high strategic relevance for sustainable policy interventions.

This analytical framework aligns with the fundamental logic of the CIB method, in which a cross-impact matrix serves as the core component for determining mutual reinforcements or inhibitions among factors. In this study, the modeling process applied the ScenarioWizard software developed by Wolfgang Weimer-Jehle. The software computed the consistency, impact balance, and plausibility of each scenario, allowing the emergence of scenarios that exhibit structural equilibrium and minimal logical contradiction (Weimer-Jehle, 2023). Each row and column of the matrix represented directional interactions, capturing how specific variable states promote, inhibit, or remain neutral to one another.

Three principal quantitative indicators were used to evaluate and compare scenarios:

1. Consistency score: this indicator measured the internal coherence of variable interactions across each scenario. Scenarios with higher consistency scores demonstrated stability, indicating that state combinations mutually reinforced one another and thus reflected higher logical plausibility.
2. Total Impact Score (TIS): the TIS quantified the combined strength, scope, and directionality of influence relationships within the system. This measure served as a diagnostic index for identifying systemic leverage points — factors with the greatest capacity to induce widespread structural change across the tourism village network.
3. Index value: this integrative measure provided a synthetic evaluation of overall systemic quality. Scenarios with superior index values were recognized as optimal pathways for policy orientation, while lower-index cases were considered indicative of potential early-stage or vulnerable configurations in need of capacity-building interventions.

The assessment process involved not only numerical computation but also iterative triangulation with expert feedback to ensure that the scenario outputs accurately reflected contextual realities. Visual and tabular representations of resulting scenarios were prepared to aid comparative interpretation and validation (Tables 3 and 4). The methodological emphasis was placed on scenario plausibility rather than probability, ensuring rigorous attention to systemic coherence rather than singular cause-effect relationships.

Table 3. Scenario Configuration of Rural Tourism Development in Bogor Regency

Scn no. 1 Index: 20	Scn no. 2 Index: 14	Scn no. 3 Index: 16	Scn no. 4 Index: 16	Scn no. 5 Index: 17
A.Village Economy: A3 Village economy is becoming independent and grew rapidly	A.Village Economy: A2 Moderate economic growth occurred due to tourism villages	A.Village Economy: A3 Village economy is becoming independent and grew rapidly	A.Village Economy: A2 Moderate economic growth occurred due to tourism villages	A.Village Economy: A3 Village economy is becoming independent and grew rapidly
B. Multi-Stakeholder Collaboration: B3 Synergistic and integrated collaboration among all parties	B. Multi-Stakeholder Collaboration: B2 Limited collaboration existed among some stakeholders			
C. Government Support: C3 Strong support with proactive policies and incentives was provided	C. Government Support: C2 Moderate and regular government support was provided			
D. Development Approach: D3 D3. A holistic and sustainable approach was adopted	D. Development Approach: D2 A community-based and participatory approach was adopted			
E. IT Adoption: E3 Comprehensive and innovative adoption IT	E. IT Adoption: E2 Moderate IT adoption with some digital systems present		E. IT Adoption: E3 Comprehensive and innovative adoption IT	
F. Governance: F3 Formal, transparent, and accountable governance	F. Governance: F2 Semi-formal and documented governance			
G. Community Income: G3. Income was high and relatively evenly distributed	G. Community Income: G2 Income increased, but disparities remained	G. Community Income: G3. Income was high and relatively evenly distributed		

Source: CIB, Rural Tourism, 2025.

Beyond numerical results, the cross-impact matrix served as an interpretive map that captured the complexity of inter-variable dynamics across socio-economic, technological, and governance dimensions. The analysis focused on identifying the relative strengths of enabling and constraining factors, the clustering of compatible variable states, and the potential progression trajectories within the system. Scenarios exhibiting both high consistency and high TIS scores were categorized as optimal or transformative, representing strategic development directions that align with sustainability and local empowerment objectives. Conversely, scenarios with low consistency or weak systemic interactions were interpreted as baseline or stagnating models, offering insights into barriers to policy implementation and institutional coherence.

Through these cumulative analytical stages, the CIB-based scenario modeling provided an empirically grounded yet flexible lens for strategic foresight in rural tourism planning. The structured interpretation of results

ensured that the derived scenarios could guide decision-makers in anticipating long-term challenges and opportunities for collaborative and sustainable rural tourism transformation.

Table 4. Scenario Consistency, Total Impact, and Index Values of Rural Tourism Developmnet.

Scenario no. 1	
Consistency score: 4 Total impact score: 121 Index value: 11	
A.Village Economy	A2 Moderate economic growth occurred due to tourism villages
B. Multi-Stakeholder Collaboration	B2 Limited collaboration existed among some stakeholders
C. Government Support	C2 Moderate and regular government support was provided
D. Development Approach	D2 A community-based and participatory approach was adopted
E. IT Adoption	E2 Moderate IT adoption with some digital systems present
F. Governance	F2 Semi-formal and documented governance
G. Community Income	G2 Income increased, but disparities remained
Scenario no. 2	
Consistency score: -1 Total impact score: 94 Index value: 13	
A.Village Economy	A2 Moderate economic growth occurred due to tourism villages
B. Multi-Stakeholder Collaboration	B2 Limited collaboration existed among some stakeholders
C. Government Support	C2 Moderate and regular government support was provided
D. Development Approach	D2 A community-based and participatory approach was adopted
E. IT Adoption	E3 Comprehensive and innovative adoption IT
F. Governance	F2 Semi-formal and documented governance
G. Community Income	G3. Income was high and relatively evenly distributed
Scenario no. 3	
Consistency score: -2 Total impact score: 94 Index value: 13	
A.Village Economy	A3 Village economy is becoming independent and grew rapidly
B. Multi-Stakeholder Collaboration	B2 Limited collaboration existed among some stakeholders
C. Government Support	C2 Moderate and regular government support was provided
D. Development Approach	D2 A community-based and participatory approach was adopted
E. IT Adoption	E2 Moderate IT adoption with some digital systems present
F. Governance	F2 Semi-formal and documented governance
G. Community Income	G3. Income was high and relatively evenly distributed
Scenario no. 4	
Consistency score: -2 Total impact score: 92 Index value: 14	
A.Village Economy	A3 Village economy is becoming independent and grew rapidly
B. Multi-Stakeholder Collaboration	B2 Limited collaboration existed among some stakeholders
C. Government Support	C2 Moderate and regular government support was provided
D. Development Approach	D2 A community-based and participatory approach was adopted
E. IT Adoption	E3 Comprehensive and innovative adoption IT
F. Governance	F2 Semi-formal and documented governance
G. Community Income	G3. Income was high and relatively evenly distributed
Scenario no. 5	
Consistency score: 10 Total impact score: 126 Index value: 16	
A.Village Economy	A3 Village economy is becoming independent and grew rapidly
B. Multi-Stakeholder Collaboration	B3 Synergistic and integrated collaboration among all parties
C. Government Support	C3 Strong support with proactive policies and incentives was provided
D. Development Approach	D3 D3. A holistic and sustainable approach was adopted
E. IT Adoption	E3 Comprehensive and innovative adoption IT
F. Governance	F3 Formal, transparent, and accountable governance
G. Community Income	G3. Income was high and relatively evenly distributed

Source: CIB, Rural Tourism, 2025.

RESULT

Scenario Analysis and Interpretation

The scenario evaluation process, grounded in the Cross-Impact Balance (CIB) framework, yielded five alternative configurations that collectively represent potential trajectories for rural tourism transformation in Bogor Regency. Each scenario encapsulates a distinct constellation of variable states that describe interactions between economic, governance, technological, and social dynamics operating within tourism villages. The comparative analysis of these scenarios allowed for the identification of both strengths and systemic vulnerabilities, offering crucial insights for policy development and regional planning. These scenarios are described below to illustrate contrasting developmental trajectories and their implications for sustainable rural transformation.

Scenario 1: Synergistic Rapid Economic Growth with Inclusive Income Distribution

Scenario 1 describes a rural economy entering a period of rapid, self-sustained growth supported by strong multi-stakeholder collaboration. The village economy demonstrates robust synergy across community, private sector, and governmental actors, resulting in coordinated policy responses and shared strategic vision. Government institutions are proactive, providing regulatory incentives and technical support that catalyze tourism-related entrepreneurship. The implementation of a holistic development approach ensures that economic, social, and environmental considerations remain balanced. Advanced digital technologies are fully integrated into governance and service systems, improving accountability, responsiveness, and transparency. Governance is characterized as formal, structured, and participatory, creating a high-trust environment conducive to collaborative decision-making. Strong income equality accompanies the growth process, reducing social disparities and reinforcing collective well-being. The results of the CIB analysis indicated that this scenario yields high consistency and systemic impact scores, marking it as a viable and desirable model for sustainable rural transformation.

Scenario 2: Moderate Tourism-Led Growth with Persistent Income Gaps

Scenario 2 reflects a rural economy experiencing moderate growth primarily driven by tourism expansion but constrained by limited stakeholder engagement and uneven resource distribution. Government support exists but remains routine and insufficient to stimulate large-scale structural transformation. The village demonstrates progress in governance and sustainability awareness; however, the diffusion of innovation, particularly in digital and managerial capacity, remains partial. While community income rises moderately, persistent inequalities between tourism actors and non-participants weaken inclusive development outcomes. The CIB consistency measure identifies this scenario as moderately stable but less transformative due to underdeveloped multi-sector synergy and structural limitations in value distribution mechanisms. Policy responses under this condition would require targeted interventions to address inequality and encourage broader participation in tourism value chains.

Scenario 3: Rapid Independent Growth with Limited Collaboration

Scenario 3 depicts a pattern of rapid yet fragmented economic acceleration, primarily fueled by localized entrepreneurial initiatives. The independence of village economies under this scenario fosters creativity and bottom-up innovation, but the limited scope of organizational collaboration reduces scalability and impact. Government involvement is supportive but irregular, with insufficient institutional reinforcement to promote integration across administrative and economic layers. Governance tends to be semi-formal, ensuring efficiency but lacking mechanisms of transparency and external accountability. Although technological adoption is high—particularly in marketing and management systems—the absence of a structured governance framework impedes policy synchronization. The CIB analysis situates this scenario as one of dynamic potential yet moderate systemic coherence, emphasizing the necessity of enhancing inter-stakeholder connectivity to achieve sustainable equilibrium.

Scenario 4: Moderate Growth, Participatory Approach with Technological Strengths

Scenario 4 introduces a distinct configuration marked by steady economic growth and strong adoption of digital technologies that improve efficiency in tourism service delivery. The participatory nature of development supports active local engagement; however, institutional coordination across actors remains inconsistent. Government involvement continues at a moderate level, providing administrative support but lacking the transformative impetus to consolidate broader systemic integration. Formalization of governance remains incomplete, limiting transparency despite operational documentation and local initiative. Income levels increase

substantially, and digital innovations enhance accessibility and productivity. Nonetheless, the scenario's overall systemic consistency remains low due to structural fragmentation and suboptimal collaborative frameworks. While technologically advanced, the system under Scenario 4 underperforms in long-term stability as indicated by its moderate Total Impact and Consistency Scores.

Scenario 5: Optimal Transformation with Full Institutional Integration

Scenario 5 constitutes the most desirable and strategically stable configuration, presenting an optimal model for sustainable rural transformation. It describes a fully matured village system characterized by rapid and independent economic growth underpinned by strong institutional integration and coordinated cross-sector collaboration. In this configuration, government policies are highly proactive, ensuring comprehensive alignment between strategic planning, local execution, and community aspirations. A balanced development paradigm addresses economic prosperity, social equity, and environmental preservation simultaneously. Technological innovation is deeply embedded in both governance and business systems, enhancing service transparency, efficiency, and adaptability to external market conditions. Governance frameworks are fully formalized, with strong mechanisms for accountability and participatory oversight. The distribution of community income is equitable, virtually eliminating structural inequality and ensuring inclusive growth. CIB matrix evaluations revealed that Scenario 5 achieves the highest Consistency and Total Impact scores among all configurations, designating it as the benchmark scenario for guiding rural policy formulations in tourism governance and digital transformation.

4.2. Scenario Mapping and Strategic Pathways

To elucidate prospects and transitional dynamics among scenarios, this study employs scenario mapping to visualize relative positions, systemic linkages, and transformation potentials using metrics such as impact, consistency, and index values. This map serves as an essential visual tool for policymakers, allowing for the identification of strategic options, prioritization of interventions, and anticipation of potential risks. This approach helps steer rural tourism development towards optimal and sustainable futures.

The scenario map displays each scenario's performance and relation within a two-dimensional space: the vertical axis represents scenario consistency, and the horizontal axis captures the Total Impact Score (TIS). This layout clarifies which scenarios combine high stability and systemic influence—essential for policy targeting. Quadrant positioning yields this overview:

- Upper right: scenarios with high consistency and impact, recommended as key policy priorities.
- Upper left: scenarios with strong consistency but limited systemic impact.
- Lower right: scenarios with significant impact but low stability, typically transition models.
- Lower left: scenarios with low consistency and impact, serving best as baselines for transformation.

Scenarios higher on the vertical axis have greater stability; those further right deliver greater impact and policy potential. The map helps decision-makers maximize positive and sustainable development outcomes.

Figure 1 illustrates these dynamics. Red squares correspond to scenarios; the blue dot indicates an alternative variant. Through quadrant division, the map highlights diverse strategic positions and degrees of integration. Scenarios that are closer together point to feasible, incremental policy shifts, while more distant scenarios suggest main intervention targets.

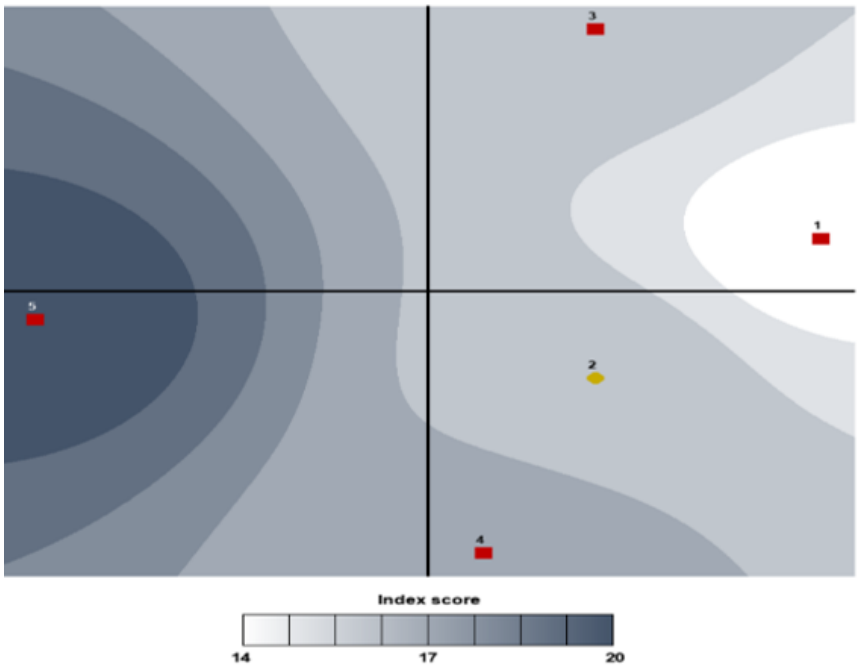

Figure 1. Scenario Distribution on The Index Score–Consistency Plane.
Source: CIB, Rural Tourism 2025.

Scenario 1 occupies the upper right quadrant, demonstrating the highest combination of consistency and impact. This means Scenario 1 is the optimal scenario, exemplifying a development pathway that delivers strong stability along with broad systemic benefits. It is the critical reference for strategic policy formulation, reflecting a highly integrated, innovative, and sustainable approach to rural tourism development. Prioritizing Scenario 1 allows policymakers to set ambitious, yet achievable, goals for the sector.

Scenario 5 is found in the upper left quadrant—embodies exceptional consistency and strong integration of critical variables, highlighting its outstanding internal consistency and optimal arrangement of key variables—especially stakeholder collaboration, robust government support, holistic planning, advanced IT adoption, and equitable income distribution. However, with slightly less overall impact compared to Scenario 1. It remains an aspirational benchmark with robust stakeholder collaboration, government support, and holistic strategy. Scenarios 2, 3, and 4, positioned in other parts of the map, represent varying levels of impact, consistency, and readiness. They serve as alternative development pathways or reference points for alternative development trajectories or policy baselines. guiding possible incremental or targeted improvements.

The spatial arrangement and distance among scenario points indicate the policy effort and strategic design needed to move from basic to optimal scenarios. Scenarios that cluster together present realistic incremental change, whereas those farther apart—especially Scenario 1 as the best scenario—demand comprehensive, long-term strategies. Overall, this scenario map offers policymakers and stakeholders a vivid, actionable framework for evaluating strategic options and prioritizing interventions, thereby expediting progress toward desirable and sustainable future states in rural tourism development.

4.3. Total Impact Map

The total impact map serves as a strategic visualization tool that represents the potential and effectiveness of various scenario combinations in the complex rural tourism system. By using this map, decision-makers can more efficiently plan and manage interventions for integrated and sustainable village development.

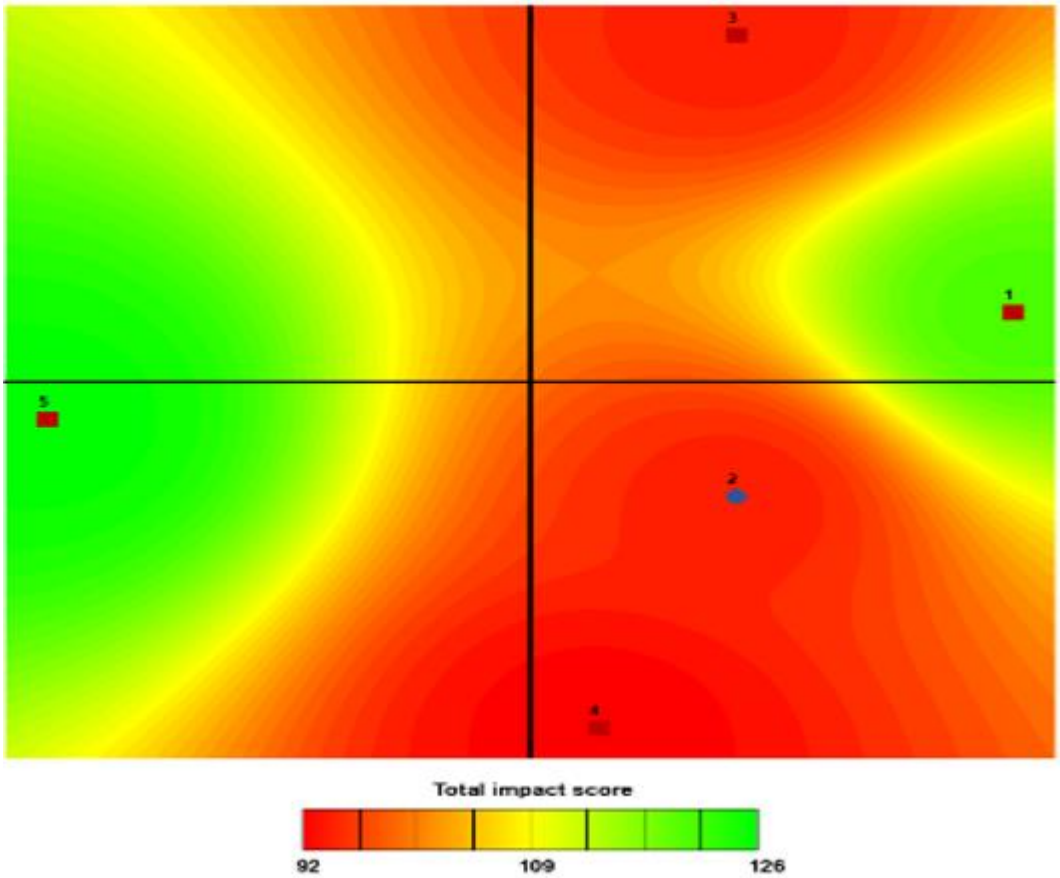

Figure 2. Positioning of Scenarios According to Total Impact Score.
Source: CIB, Rural Tourism 2025.

Figure 2 presents a contour map plotting five different scenario combinations according to their Total Impact Score (TIS), as determined through CIB modeling. The color gradient ranges from red (low TIS, around 92), passing through yellow and orange (medium TIS, near 109), to light green (high TIS, up to 126). The four quadrants offer a comparative grouping of development parameters, while numbered points correspond to each scenario, allowing for clear identification of both optimal configurations (in the green zone) and baseline situations (in the orange or red zones). This visual layout directly supports the prioritization of interventions and pathways toward more sustainable rural tourism outcomes.

4.4. Impact Tree Analysis

The impact tree diagram serves as a central analytical tool that visualizes hierarchical and causal relationships among key variables within the rural tourism development system. By mapping these connections, it reveals system priorities, leverage points, intervention pathways, and feedback mechanisms that define long-term transformation strategies.

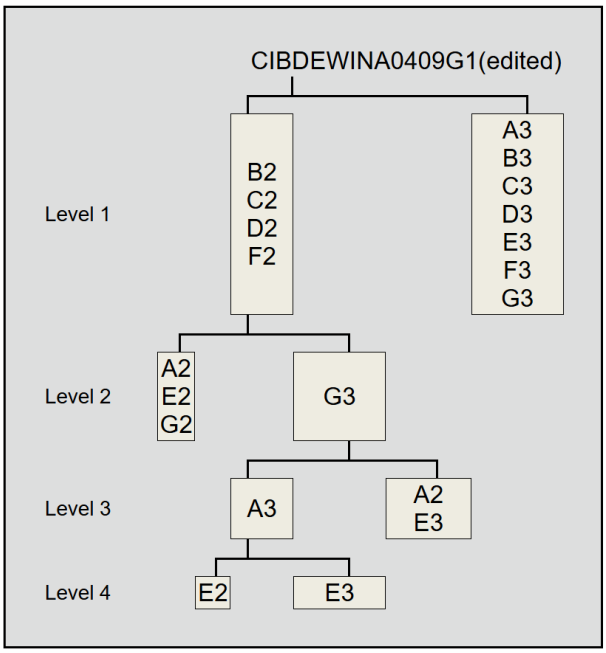

Figure 3. Hierarchical Impact Tree Illustrating Scenario Pathways
Source: CIB, Rural Tourism, 2025

As illustrated in Figure 3, the diagram is structured across multiple levels to capture the logical dependencies among system components. Level 1 anchors the foundational variables—multi-stakeholder collaboration (B2), government support (C2), development approach (D2), and governance (F2). These serve as critical enablers of systemic transformation. Their collective strength determines the capacity for participatory planning, resource mobilization, and policy coherence essential to sustainable rural tourism governance.

Level 2 represents intermediary progress, where economic potential (A2), IT adoption (E2), and income status (G2) form a transitional baseline depicting stable but sub-optimal conditions. At this stage, community income (G3) emerges as a pivotal outcome linking foundational investments to broader social and economic advancement.

Level 3 captures the pathways for scaling transformation. One trajectory stems from strong institutional foundations leading toward an advanced village economy (A3), while another proceeds through digital innovation (E3) and enhanced entrepreneurship, highlighting alternative yet complementary routes to accelerated growth. Level 4 depicts end-states, where sustained innovation and high IT adoption (E3) unlock optimal and resilient development scenarios.

The hierarchical logic of the diagram underscores a defining principle: sustainable progress depends on reinforcing foundational capacities—governance, collaboration, and participatory planning—before advancing to higher-level interventions. Overemphasis on income generation or digital transformation without such groundwork risks inconsistent or reversible progress, manifested as stalled branches in the diagram. In contrast, when foundational variables are strong, stakeholders can adaptively pursue multiple pathways—leveraging IT growth, community initiatives, or economic diversification—to sustain systemic resilience.

A distinguishing strength of the impact tree lies in its depiction of feedback loops. For instance, higher community income (G3) promotes stronger governance, greater participation, and enhanced collaboration, reinforcing the initial enablers that triggered growth. This cyclical dynamic illustrates how successful interventions perpetuate long-term systemic learning and self-reinforcement.

From a policy perspective, the impact tree supports strategic sequencing and adaptive policymaking. It clarifies which interventions are prerequisites and how future efforts—such as digital expansion, entrepreneurial capacity building, and equitable income distribution—should evolve as cumulative steps toward transformation. Moreover, the visual structure enhances the communication of strategy across stakeholders, fostering shared understanding and coordinated action. By embracing feedback, interconnection, and adaptive entry points, the impact tree establishes a robust foundation for sustainable, inclusive, and resilient rural tourism development in dynamic local contexts.

CONCLUSION

This study affirms that rural tourism village development in Bogor Regency is characterized by multidimensional, dynamic interdependencies. By applying the Cross-Impact Balance (CIB) method, twenty-one

key variables were systematically identified and analyzed, enabling the construction of five plausible development scenarios. These scenarios range from less integrated, incremental pathways to an optimally mature configuration.

The analysis finds that sustainable competitiveness and equitable community welfare can be achieved only when core dimensions—transparent governance, robust stakeholder collaboration, institutional capacity, technological innovation, and comprehensive economic strategies—are advanced in tandem.

Scenario 5 emerges as the benchmark model: it demonstrates the highest internal consistency and systemic impact, integrating strong governance, multi-sector partnerships, agile innovation, and broad digital adoption. As such, it should serve as a reference framework for both local and broader national policies aiming to accelerate rural tourism transformation.

Other scenarios highlight transition states where progress may be hindered by fragmented collaboration, limited digitalization, or incomplete institutional support. These underscore the need for sequenced interventions—especially capacity building in governance, promotion of adaptive innovation, and policy designs that foster inclusive, participatory planning.

The research further concludes that prioritizing the foundational pillars of the optimal scenario: good governance, strategic collaboration, and institutionalized innovation—is essential to ensure resilient, inclusive, and adaptive rural tourism development. When implemented through integrated, stakeholder-driven strategies anchored in Scenario 5's logic, Indonesian tourism villages can become resilient engines of rural economic growth and models for sustainable, community-driven development. This approach enables rural tourism not only to generate local prosperity, but also to foster ongoing social innovation and adaptability in the face of evolving global and local challenges.

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