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Bontang Mangrove Park Development Strategy In Kutai National Park Using GSTC-D

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ABSTRACT

Mangrove ecotourism requires a balance between environmental protection and sustainable destination management. However, the use of the Global Sustainable Tourism Council Destination Criteria (GSTC-D) for development planning remains limited. This study aims to assess the sustainability performance of the Bontang Mangrove Park in Kutai National Park and design guidelines based on identified sustainability gaps. A descriptive qualitative approach was employed, utilizing field observations, semi-structured interviews with stakeholders, document review, and a literature review. Sustainability performance was measured using a scoring system based on GSTC-D indicators, which include sustainable management, socio-economic sustainability, cultural sustainability, and environmental sustainability. The evaluation found that 70 indicators were fully met (45.75%), 36 were partially met (23.52%), and 47 were not met (30.71%). Furthermore, 21 indicators were marked as not applicable due to destination characteristics. The main deficiencies were in waste management, energy conservation, water use, accessibility, visitor management, and environmental education. These gaps were translated into recommendations for development, such as an inclusive circulation system, improved utility infrastructure, interpretation facilities, and a sustainable site management strategy. The findings indicate that Bontang Mangrove Park has great potential to become a sustainable ecotourism destination, but requires better management and infrastructure to meet GSTC-D standards. This study is unique in that it expands the use of GSTC-D beyond simply assessing sustainability by developing specific design guidelines for mangrove ecotourism based on the evaluation results.

Keywords: Bontang Mangrove Park, Design Guidelines, GSTC-D, Sustainable

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INTRODUCTION

Indonesia has the largest mangrove forest area, representing around 20–25% of the global mangrove coverage, with East Kalimantan as one of the regions with the most extensive mangrove ecosystems. Mangrove forests in the city of Bontang play an important role in coastal protection, carbon absorption, and biodiversity conservation that provide a habitat for various species of terrestrial and marine life. One of the mangrove conservation locations is Bontang Mangrove Park (BMP), which is located under the management of the Kutai National Park and has a potential to be developed into a sustainable ecotourism destination. Mangrove ecosystems are a form of one of the most powerful natural carbon sinks, with the ability to absorb three to five times more carbon than tropical terrestrial forests. Additionally, it works as natural barriers from coastal erosion and storms, maintaining the ecological balance, and purifying environmental pollutants. However, regardless of ecological and socio-economic importance, mangrove ecosystems are at the vulnerability to degraded by anthropogenic activities, which highlights the essentiality for a sustainable mangrove management, striking the conservation and utilization equilibrium. (Sinabang et al., 2022).

Sustainable mangrove management is highly related to achieving the Sustainable Development Goals (SDGs), especially in SDG 13 (Climate Action), SDG 14 (Life Below Water), and SDG 15 (Life

on Land). Numerous research has specified that mangrove conservation and restoration contribute to significant contribution for climate change reduction, biodiversity preservation, and improvement of coastal community welfare (Zhang et al., 2023). Additionally, community involvement has been identified as a crucial element for successful mangrove ecotourism development. A research conducted at Pantai Paluh Getah, North Sumatra revealed that local community involvement enhances the conservation, elevates the environmental awareness, and encourage the sustainable economic development via ecotourism activities (Harefa et al., 2024). In contrary, uncontrolled land conversion for settlements, aquaculture, industrial activities, and upstream resource exploitation is still posing the threat on mangrove sustainability in several regions of Indonesia (Harjanto et al., 2019).

Bontang Mangrove Park is operated by the Kutai National Park Authority (Balai Taman Nasional Kutai/BTNK) under the Ministry of Forestry. Based on the concept of institutional vision, BTNK aspires to be a leading center of biodiversity conservation, and sustainable ecotourism destination in Kalimantan with empowering in local communities (Balai Taman Nasional Kutai, 2026). Thus sustainable tourism principles should be applied to sustainability planning, development, and operational management which includes aspects of environmental conservation, socio-cultural preservation, and local economic empowerment. Although it is not clear whether those principles were applied with comprehensive implementation throughout the destination, it need to be systematically evaluated.

Global Sustainable Tourism Council Destination Criteria (GSTC-D) is available as an internationally recognized sustainability assessment system for tourism through a assessment dimensions such sustainable management, socio-economic sustainability, cultural sustainability, and environmental sustainability. (Ganna Gorina and Tetiana Kozhukhova, 2025) explained that the Global Sustainable Tourism Council Destination Standard (GSTC-D) is provided as a comprehensive assessment framework for destination sustainability, which includes four pillar main disciplines through sustainable management, social economic sustainability, cultural sustainability, and environmental sustainability. Each pillar containing particular criteria and measurable indicators, providing a systematic assessment of sustainability performance and gap identification that requires development intervention and enhancement. Within the socio-economic sustainability dimension, the role of social inclusion had an important part in ensuring that tourism development delivers benefits to all members of society. The objective of social inclusion is to eradicate inequality and discrimination by ensuring all people have equal access to resources, opportunities, and services independent of physical ability, gender, age, or social background. Thus, sustainable tourism development are expected to encourage to inclusive infrastructure and equitable participation amongst stakeholders (Tanuwidjaja et al., 2024).

Several previous studies had proven the applicability of GSTC-D on destination assessment. The GSTC Destination Assessment Report Of The Islands of Tahiti conducted an assessment with observations, interviews, document reviews and indicator based assessment based on GSTC-D at indicator, criteria, and pillars. Deficiencies of visitation management, sustainability monitoring and engagement, environmental management, and stakeholder engagement are identified through the assessment results, and the assessment has being a basic as input for determining the sustainability(GSTC, 2025). However, this study cannot be generalize, as the study only focus on sustainability assessment and important performance analysis without extending the assessment result as an architectural or spatial planning guidance recommendation.

Similarly, (Hamimah et al., 2022) have evaluated the sustainability of mangrove ecotourism of Nanamun River, Kota Belud, Sabah, Malaysia, with an approach utilizing the criteria provided by Global Sustainable Tourism Council (GSTC) through qualitative in depth interview among government agencies, local community, and tourism operator. The study identified some sustainable management and economic benefit indicators were relatively could be applied, while some other indicator required an institutional strengthening and formalize. Although the found gaps were used as a basis for developing the recommendation, the study did not have a systematic approach to

transfer the sustainability assessment results to architecture based design intervention, or spatial planning guideline to make the sustainability gap assessment performance became target for sustainable tourism development intervention of the ecotourism site.

Likewise, the research conducted by Anis et al. (2023) have used the criteria of the Global Sustainable Tourism Council (GSTC), for assessing the sustainable tourism planning in the Silokek Geopark, Indonesia. Those criteria were applied to assess the environmental sustainability pillar through qualitative observation, interview and indicator-based assessment approach. The study conclude that the destination has fulfilled most criteria proposed by GSTC Dc for the environmental sustainability pillar, and the main conclusion of the research was the effort provided by the Government and Local Community on critical importance to sustain the sustainable tourism practice. However, the research still under focus on level of compliance to GSTC indicators, without extending the sustainability assessment to architecture-based design strategy and spatial planning intervention as enabler for the sustainable tourism based Tourism Development.

Those previous research that using the GSTC-D has mainly developed as the evaluation instrument to determining the sustainability performance of the destination and found management deficiencies. Although there are still the research that systematic translate the sustainability assessment results as sustainability gap into the architectural and spatial on the development strategy in the sustainability planning, the research in conservation based ecotourism destination like mangrove ecosystem that use the GSTC-D on the assessment to determine the architectural intervention with the sustainability aspect is still limited. In the conservation-based of ecotourism destination with mangrove ecosystem, physical planning and design intervention is an important part to developed in this destination that aim to improve the accessibility, the circulation system of visitor, the environmental education facility, the utility system, and the ecosystem protection. Thus the integration of sustainability assessment with architectural planning is expected to strengthen the practical application of sustainable tourism principles.

On that base our assumption, the purpose of this study is evaluating sustainability performance the Bontang Mangrove Park based on the Global Sustainable Tourism Council Destination Criteria (GSTC-D), and formulate the architecture-based development guideline based on the found sustainability gaps. With that, the underlying assumption is that the transferring of the assessment result of the GSTC-D as spatial and architectural recommendation will provide a more comprehensive approach to developing sustainable ecotourism than conventional assessment only. The novelty of this study is the systematic approach to develop the methodology that integrate the sustainability assessment, the gap, and the translation of the sustainability gap results to an architectural design. It show that the application of GSTC-D have extend from performance evaluation to project planning and design intervention process that can follow by the future.

METHOD

This research applied a descriptive qualitative methodology with an evaluative research layout to evaluate the sustainability performance of Bontang Mangrove Park and establish architecture-based development guidelines. A descriptive qualitative method was chosen because the research goal is to comprehensively understand the implementation of sustainable tourism principles via observations, perspectives, as well as stakeholders and analyses of documents rather than statistics generalization. On the other hand, the evaluative research layout was implemented as a means for contrasting existing destinations with international recognized sustainable performance standards and exploring the existing development gaps to be translated into spatial and architectural recommendations.

The research site was located at Bontang Mangrove Park (BMP), which was found in Kutai National Park, East Kalimantan, Indonesia. This location for study was chosen since mangrove conservation represents a protected mangrove ecosystem which also plays a dual role as a

conservation region and an ecotourism destination managed by the Kutai National Park Authority (Balai Taman Nasional Kutai/BTNK). From an institutional aspect, the concept of BTNK is with a vision for the development of sustainable ecotourism within and in the face of biodiversity conservation so this location is suitable for an appropriate case study to investigate the implementation of sustainable tourism principles and how is integrated into the architectural planning process. Data gathering took place throughout 2025–2026 using field investigations and institutional document review.

The research was based on the evaluation of destination sustainability calculated using Global Sustainable Tourism Council Destination Criteria (GSTC-D) as the primary assessment matrix. There were four sustainability pillars as the evaluation variables to be consists of sustainable management, socio-economic sustainability, cultural sustainability, and environmental sustainability that are further elaborated into criteria and measurable indicators. There were some indicators that were not related to the characteristics of Bontang Mangrove Park, such as those that refer the preservation of cultural artifacts or the managed wildlife facilities which were determined as not applicable and were eliminated from the performance calculation so as to prevent bias on the assessment results.

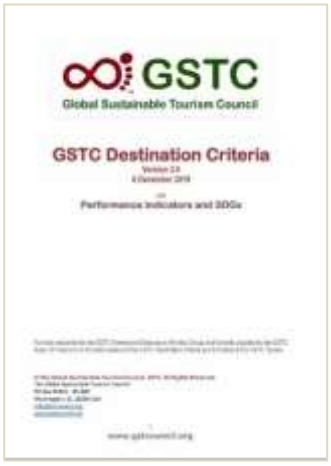


Figure 1. Global Sustainable Tourism Council Destination Criteria

Data were collected from both primary and secondary data sources. Primary data consisted of direct observations done in the fields and photographic documentation, as well as semi-structured interviews from selected key informants based upon purposive sampling, that comprised representatives of the Kutai National Park Authority who act in managing of Bontang Mangrove Park, personnel who were engaged in activities of tourism management and conservation, and the relevant stakeholders that have the knowledge concerning operating and planning of the destination. Further, secondary data were collected from management plans, institutional reports, government regulations, spatial planning documents, previous research and others literature related to mangrove conservation, ecotourism, and sustainable tourism assessment.

The assessment process implemented the GSTC-D indicators structure, by assessing each indication based upon the available evidences that have been collected through observations, interview, and documentation. Each indicator has been classified into one of three performance levels, comprising of fulfilled, partial fulfilled, or unfulfillment. A score of 3 was given to the indicators that fully implemented and sufficiently supported with adequate evidences, 2 to the indicators that only have an implementation yet remained partial or insufficiently documentation, and 1 to the indicators that has not been implemented or not found any supporting evidences. There were some indicators that were identified as being not applicable from aspect of the characteristics of destinations, so these indicators have been excluded from the scoring calculation. Scores of the indicators level have been aggregated to see the performance of criteria, and was further summarized into four pillars of GSTC-

D, so that the strengths and deficiencies that is identified as sustainability were seen on each levels of assessments.

To make the assessment valid, data triangulation has been performed, by comparing the results obtained from field observations, the result of interviews, institutional documents, and supporting literature. Fulfillment of the indicators has been determined only if there is sufficient evidences through different sources available in order to reduce the subjective interpretation in scoring process, and morever qualitative results from interviews, have been used to validate factual evidence of document and also to explain institutional or operational condition that is related with every result of assessment in the following.

At the end of evaluation stage, the sustainability gaps were identified and was analyzed with approach of gap analysis in order to identify the existing deficiencies between the existing condition of every destination and the standards of GSTC-D. In contrast to only taking place at the measure of performances, this research was extended into further analysis process by translating every existing sustainability gaps into its corresponding spatial requirements and the responses for architectural designs. The translated elements were considered with aspects of functional objectives of every indicators and also those of the physical characteristics of the study area, and result in the development guidelines that address the accessibility, flow of visitors, environmental interpretation, utility systems, waste management, environmental education facilities, and supporting infrastructures of conservation.

Eventually, the results of research have been shown descriptively through table of sustainability performances in indicator, criteria, and pillar levels, with the narrations to explain the deficiencies that were found and the existing causes. The translated design guidelines were also then assembled into the development recommendations that are architecture-based which are intended to support the implementation of sustainable ecotourism principles that strengthens with the long-term goal of the conservation at Bontang Mangrove Park.

FINDING AND DISCUSSION

Finding

Bontang Mangrove Park is a mangrove ecotourism destination located within Kutai National Park and managed by the Kutai National Park Authority. The area functions primarily as a mangrove conservation site while simultaneously serving as an educational and nature-based tourism destination. Ecologically, the site is dominated by mangrove vegetation that plays an essential role in coastal protection, biodiversity conservation, and carbon sequestration. Existing tourism facilities include boardwalks, observation towers, trekking paths, and visitor reception areas that support recreational and educational activities.



Figure 2. Map of Bontang Mangrove Park

Despite its ecological importance and tourism potential, the existing development has mainly focused on basic conservation functions. Several supporting facilities and management systems required for sustainable tourism implementation have not yet been comprehensively developed. Therefore, an evaluation based on internationally recognized sustainability criteria is necessary to identify existing conditions and formulate appropriate development strategies.

Assessment Based on GSTC-D

The sustainability performance of Bontang Mangrove Park was evaluated using the Global Sustainable Tourism Council Destination Criteria (GSTC-D), which consists of four pillars: sustainable management, socio-economic sustainability, cultural sustainability, and environmental sustainability. The assessment was conducted through field observations, semi-structured interviews, documentation, and literature review using a scoring system that classified each indicator as fulfilled, partially fulfilled, or unfulfilled.

Table 1. Sustainability Performance Score of Bontang Mangrove Park

Pillar	Score Achieved	Maximum Score	Achievement (%)
Sustainable Management	125	150	83.3
Socio-economic Sustainability	50	81	61.7
Cultural Sustainability	32	69	46.4
Environmental Sustainability	122	186	65.6
Total	329	486	67.7

The evaluation results indicate that Bontang Mangrove Park has generally demonstrated good implementation of sustainable tourism principles, particularly in environmental conservation and institutional management. Of the 153 applicable indicators, 70 indicators (45.75%) were fulfilled, 36 indicators (23.52%) were partially fulfilled, and 47 indicators (30.71%) were not fulfilled. In addition, 21 indicators were classified as not applicable because they relate to cultural assets, managed wildlife, or destination characteristics that are absent from the study area.

Table 2. Bontang Mangrove Park GSTC Destination Criteria and Pillars' Performance Scores

CRITERION	CRITERION NAME	CRITERION SCORE	PILLAR SCORE
A1	Destination management responsibility	**3**	**2,48**
A2	Destination management strategy and action plan	**2,2**	
A3	Monitoring and reporting	**2,75**	
A4	Enterprise engagement and sustainability standards	**1,8**	
A5	Resident engagement and feedback	**1,6**	
A6	Visitor engagement and feedback	**3**	
A7	Promotion and information	**2,67**	
A8	Managing visitor volumes and activities	**2,6**	

CRITERION	CRITERION NAME	CRITERION SCORE	PILLAR SCORE
A9	Planning regulations and development control	**2,83**	
A10	Climate change adaptation	**2,4**	
A11	Risk and crisis management	**2,5**	
B1	Measuring the economic contribution of tourism	**1,3**	
B2	Decent work and career opportunities	**2,3**	
B3	Supporting local entrepreneurs and fair trade	**2**	**1,83**
B4	Support for community	**2,3**	
B5	Preventing exploitation and discrimination	**2**	
B6	Property and user rights	**0**	
B7	Safety and security	**1,3**	
B8	Access for all	**1,67**	
C1	Protection of Cultural Assets	**0**	
C2	Cultural artefacts	**0**	
C3	Intangible heritage	**0**	
C4	Traditional access	**0**	
C5	Intellectual Property	**3**	**2,53**
C6	Visitor management at cultural sites	**1,6**	
C7	Site interpretation	**3**	
D1	Protection of sensitive environments	**2,67**	
D2	Visitor management at natural sites	**2,3**	
D3	Wildlife interaction	**2,16**	
D4	Species exploitation and animal welfare	**1,85**	
D5	Energy Conservation	**1**	**1,89**
D6	Water stewardship	**1,2**	
D7	Water Quality	**2**	
D8	Wastewater	**1,75**	
D9	Solid waste	**2**	
D10	GHG emissions and climate change mitigation	**1,2**	
D11	Low-impact transportation	**2,67**	
D12	Light and noise pollution	**0**	
	Average Score	**2,14**	**2,18**

The performance of each criterion is determined by the average value of all indicators in that criterion. Using average values helps give a clearer picture of how sustainability is being implemented for each criterion. This method shows not just how many indicators have been met but also the overall level of achievement for each criterion. The results of this assessment help identify which criteria have been implemented well and which need improvement. This information serves as the basis for gap analysis and the development of regional development guidelines.

Overall, the gap analysis results show that Bontang Mangrove Park has strong ecological and institutional potential as an ecotourism area. However, it still needs improvement in tourism management, cultural integration, community empowerment, and the provision of facilities and spatial elements that align better with sustainable ecotourism principles. These gaps will serve as the foundation for developing design and management guidelines for the area in the next chapter.

Discussion

Gap Analysis and Development Needs

The assessment identified several priority gaps affecting the overall sustainability performance of the destination. The most significant deficiencies include solid waste management, energy conservation, water stewardship, visitor management, accessibility, environmental interpretation, climate change mitigation, and risk management. Although conservation activities have been implemented successfully, several operational and supporting systems remain insufficient to fully comply with GSTC-D standards.

Table 3. Summary of GSTC Destination Assessment of Bontang Mangrove Park

GSTC Pillar	Sustainable Management	Socio-Economic Sustainability	Cultural Sustainability	Environmental Sustainability	Total # (%) Indicators
Unfulfilled	**7**	**11**	**3**	**26**	**47 (30,71)**
Partially fulfilled	**13**	**9**	**1**	**13**	**36 (23,52)**
Fulfilled	**31**	**7**	**9**	**23**	**70 (45,75)**
Not relevant in the destination	**0**	**5**	**13**	**3**	**21** *(considered not to influence the assessment)*
TOTAL	**51**	**32** *(5 indicators not relevant to the destination)*	**26** *(13 indicators not relevant to the destination)*	**65** *(3 indicators not relevant to the destination)*	**153 (100)** *(21 indicators not relevant to the destination)*

A number of indicators were deemed not applicable due to their inconsistency with the characteristics of the destination. For instance, indicators related to the preservation of cultural heritage were deemed not applicable due the lack of significant cultural artifacts or traditional heritage assets in the site. Similarly, indicators comparing to the management of wildlife were classified as not applicable, as Bontang Mangrove does not take care of captive wildlife or the main collections for managed animals, with conservation primarily emphasised on the protection of habitats.

The results of the study are in line with earlier GSTC-based studies in Tahiti and Sabah, where the environmental conservation is usually satisfactory, management systems and facilities in need of enhancement. However, in contrast to the elements of sustainability evaluation which are mainly emphasised in earlier studies, the current study used the identified deficiencies as foundations of determining spatial development needs.

Table 4. Summary of GSTC Destination Assessment of Bontang Mangrove Park

GSTC-D Gap	Spatial Requirement	Architectural Design Direction
Inadequate solid waste management	Integrated waste management system	Segregated waste collection points integrated with the site
Limited accessibility	Universal circulation	Accessible boardwalk with ramps and handrails
Weak environmental interpretation	Educational infrastructure	Interpretive signage and visitor education center
Poor visitor management	Visitor flow control	One-way circulation and zoning system
Lack of energy conservation	Energy-efficient facilities	Natural ventilation and photovoltaic panels
Weak water management	Water conservation system	Rainwater harvesting and eco-drainage
Limited wildlife management	Habitat protection	Controlled observation routes and buffer zones
Limited local community support	Community facilities	Local product kiosks and community spaces
Weak disaster preparedness	Safety infrastructure	Evacuation routes and assembly points
Limited conservation education	Interpretation facilities	Mangrove visitor center and educational exhibits
Lack of climate mitigation	Low-carbon infrastructure	Pedestrian-oriented circulation and reduced motorized vehicles

Based on the gap analysis of the Global Sustainable Tourism Council Destination Criteria (GSTC-D), Bontang Mangrove Park has demonstrated a considerable commitment to implementing sustainable tourism principles. However, several indicators across all sustainability pillars remain either partially fulfilled or unmet. In general, the identified gaps are primarily associated with governance, documentation, monitoring systems, data transparency, and the absence of structured mechanisms to ensure the consistent implementation of sustainability practices. Therefore, the proposed recommendations extend beyond physical interventions and emphasize strengthening management systems and institutional capacity as the foundation for sustainable destination development.

Within the sustainable management pillar, the primary priorities involve enhancing transparency and accountability through the preparation of supporting documents, the establishment of systematic monitoring and evaluation frameworks, regular publication of management information, and greater involvement of local communities and tourism stakeholders in planning and decision-making processes. Furthermore, visitor management, climate change communication, and risk management systems require further improvement to ensure that destination management is more adaptive and responsive to environmental challenges and stakeholder needs. For the socio-economic sustainability pillar, the assessment indicates the need to strengthen tourism economic data collection systems, support local micro, small, and medium enterprises (MSMEs), improve market access, expand employment opportunities, and establish mechanisms that encourage visitor contributions to local communities and sustainability initiatives. In addition, issues related to safety, security, and accessibility remain significant, highlighting the necessity of developing inclusive standards, facilities, and policies that ensure equitable and safe tourism experiences for all visitors.

Regarding cultural sustainability, most criteria were identified as not applicable due to the nature of Bontang Mangrove Park as a natural tourism destination without tangible or intangible cultural assets. Nevertheless, visitor management strategies for potential cultural sites should still be considered through structured monitoring systems, visitor behavior guidelines, and strengthened codes of conduct for tour guides to ensure that future tourism activities do not negatively affect cultural values that may emerge within the area. The environmental sustainability pillar exhibits the most extensive development needs. Key gaps include visitor management in environmentally sensitive areas, wildlife protection, energy conservation, water stewardship, wastewater and solid waste management, greenhouse gas emission reduction, low-carbon transportation, and the control of light and noise pollution. These findings suggest that improving resource management systems and environmental protection measures should become a strategic priority, considering the park's primary function as a mangrove conservation area that must maintain its ecological integrity while supporting sustainable tourism activities.

Directions for Strengthening and Fulfilling GSTC-D Indicators

The development of Bontang Mangrove Park should prioritize conservation principles as the fundamental basis for all planning and development processes. Any addition of facilities, tourism activities, or spatial elements must ensure the preservation of the mangrove ecosystem while minimizing intervention to the natural environment within the area managed by Kutai National Park Authority. Accordingly, future development should adopt environmentally adaptive design approaches, including the use of lightweight, modular, and demountable structures that reduce permanent impacts on the site.

Circulation within the destination should be developed through elevated boardwalk systems to protect mangrove vegetation and maintain natural hydrological flows. In addition, spatial zoning should clearly distinguish conservation areas, educational spaces, tourism zones, and supporting facilities to regulate visitor intensity and minimize ecological disturbance. From an architectural perspective, facilities should incorporate ecological design principles by utilizing environmentally friendly materials, maximizing natural ventilation and daylighting, and adapting building forms and structural systems to the local climate and tidal conditions of the coastal environment. The provision of interpretive elements, such as educational signage, information centers, observation points, and environmental learning trails, is also essential to strengthen the destination's educational value and enhance visitor awareness of mangrove conservation.

As the destination continues to evolve, new tourism products and activities that remain compatible with conservation objectives may be introduced, including wildlife observation and photography areas, mangrove flora and fauna educational experiences, and environmental interpretation spaces. Therefore, the overall development strategy should remain flexible and adaptive, allowing the destination to accommodate future tourism demands while preserving its primary function as a protected mangrove conservation area.

CONCLUSIONS

The outcomes of this study shows that Bontang Mangrove Park possesses a great possibility to play a potential sustainable mangrove ecotourism destination, but the the implementation of sustainability principles was not balance in four pillars of Global Sustainable Tourism Council Destination Criteria (GSTC-D).The assessment results showed that 70 indicators (45.75%) were completed, 36 indicators (23.52%) were partially completed and 47 indicators (30.71%) not completed, but 21 indicators were not applicable, because there were no cultural assets, indigenous traditional use nor has managed wildlife at the destination.The outcomes show that the ecological conservation of the area has relatively been established with the management of Kutai National Park, but several aspects on destination management, resource efficiency, accessibility, visitor management

and environmental monitoring require further improvement to be completed in the more integrated implementation of sustainable tourism principles.

The main contribution of this research is to extend the application of GSTC-D from its traditional playing as an assessment framework, by translating systematically the results sustainability assessments to the development guidelines based on architecture, by integrating the results of gap analysis with the spatial and design aspects, this study suggests practical planning directions react directly to the identified weakpoints, e.g.inclusive circulation system, sustainable utility infrastructure, environmental facilities of interpretation, and management strategy with low impact at site, this based on the concept of sustainability assessment with the integration to the process architectural decision-making that provides a framework that can be a replication for conservation-based tourism planning, that provide the theoretical progress and guide the practical application about the development process of the mangrove ecotourism destination in the future.

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