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COMMUNITY, CULTURE AND CONSERVATION: MAPPING THE BIOCULTURAL LANDSCAPE RESOURCES OF SUNGAI TEMBUS, SEBERANG PERAI FOR TOURISM

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Abstract

Integrating biocultural resources into tourism development is vital to promote sustainable practices that benefit the local community and the environment. Biocultural landscape resources include biodiversity and cultural heritage, where natural and cultural attributes are interconnected and can affect the sustainability of one another. Hence, examining biocultural resources as a connected network between nature and culture is integral. This paper investigates the biocultural landscape resources of Sungai Tembus, Seberang Perai, as unique opportunities to leverage the ecological features of the area and the local cultural practices. Through a mixed-method approach, the study gathered on-ground data through semi-structured interviews with local community members to gather their insights and experiences, which were complemented by mapping the resources using Geographic Information System (GIS) and photographic documentation. The result of the study shows that the local community's livelihood and tourism activities depend on biocultural resources. The findings reveal that the cultural heritage is shaped by the ecological features, highlighting the importance of community engagement in conservation efforts and tourism planning.

Keywords: Bio-cultural, community, landscape, tourism

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INTRODUCTION

Biocultural diversity entails the interconnectedness of biological and cultural diversity (Maffi & Woodley, 2012). Biocultural resources are essential for sustainable development to preserve a place's natural and cultural ecosystem. According to Elyasi & Yamacli (2023), a society's tangible and intangible aspects shape cultural heritage, where preserving cultural heritage values is crucial to define a society's social and cultural fabric. In tourism, safeguarding these values is necessary to maintain community identity and environmental resilience because they shape the destination's attractiveness.

Several studies have drawn the correlations and causal connections between natural and cultural resources. The diversities of these resources create a dynamic that underpins biocultural diversity. O'Neill et al. (2017) emphasises that biodiversity studies are important in recognising cultural diversity and traditional knowledge in biodiversity conservation. Amo-Rodríguez et al. (2010) asserts the need for landscape planning that integrates biological and cultural aspects, where cultural resources' conservation, restoration and management are pertinent to the local population that drive conservation in rural areas.

Sungai Tembus is a rural mangrove area in Seberang Perai, Pulau Pinang. It is part of a Key Biodiversity Area of the Teluk Air Tawar – Kuala Muda corridor, where this area has been acknowledged to be one of the landing sites for migratory shorebirds. This paper aims to document and analyse the biocultural resources of Sungai Tembus. The objectives are (i) to identify and map Sungai Tembus' physical, natural and cultural resources, (ii) to gain insights from the local community as custodians of the area, and (iii) to examine the role of the biocultural landscape resources of Sungai Tembus. The significance of this study extends both locally and globally, as it provides an understanding of Sungai Tembus' unique biocultural landscape that is part of the migratory bird flyway.

LITERATURE REVIEW

Biocultural Resource

Biocultural resources comprise the biological and cultural diversity of communities. Recognising the local community and indigenous people's role as stewards of biocultural resources has gained significant attention globally and is supported by emerging research (Amo-Rodríguez et al., 2010; Nemogá, 2016; Newing et al., 2023). Local practices are a deep-rooted knowledge system that is pivotal in sustaining natural and cultural resources in an area. As such, biocultural conservation can serve as a tool for mitigating the decline of biodiversity and cultural diversity (Gavin et al., 2015). This approach recognises that biological and cultural diversities are interconnected, where they influence and sustain each other. Nature and culture are not separate entities. By integrating cultural practices and traditional knowledge with biodiversity conservation efforts,

biocultural approaches can enhance the resilience of ecosystems and communities to preserve natural and cultural heritage.

Local communities and indigenous people are important contributors to supporting biocultural resources. Newing et al. (2023) draws attention to these communities' role as biodiversity custodians. Management practices of biocultural sites should incorporate both traditional and scientific knowledge to foster a more comprehensive sustainable conservation effort. The Kunming-Montreal Global Biodiversity Framework (GBF) calls for active involvement of the local communities and indigenous people in decision-making and equitable sharing of benefits from biodiversity-based activities (David Cooper & Noonan-Mooney, 2013). The GBF contends sustainable tourism practices that minimise environmental impact, respect local cultures, and contribute to biodiversity conservation and local livelihoods.

The biocultural approach investigates the dynamic relationship between ecological and cultural processes, linking nature and culture at various scales (Maffi & Woodley, 2012; Nemogá, 2016). This approach highlights the need to respect the rights and worldviews of the local communities while acknowledging their role as stewards of the area. Amo-Rodríguez et al. (2010) introduces the Biocultural Resource Management Model, a conceptual framework that integrates biological and cultural resources for sustainable management. The model recognises the interdependence between nature and culture through a community-centric approach and interdisciplinary collaboration. The sustainability of the biocultural resources must balance ecological, economic and socio-cultural dimensions. For instance, sustainable tourism can become a potential means to promote biocultural conservation while generating economic opportunities for the local communities.

Biocultural Tourism

Biocultural tourism is the intersection of biodiversity, culture and tourism. The concept of biocultural tourism illuminates the role of local communities in sustainable development, as it can support the conservation of local ecosystems and local practices (Kaulen-Luks et al., 2022). It includes a range of tourism branches, such as ecotourism, nature-based tourism and rural tourism, and is closely linked to the local and indigenous communities and their traditional knowledge (Luković et al., 2022). The concept of biocultural diversity is central to understanding the dynamics between nature-based tourism and the role of the local community (Gavin et al., 2015). The safeguarding of traditional ecological knowledge (TEK) is crucial in reducing the loss of biocultural diversity, as local communities are the custodians of the area and hold valuable knowledge (La Rosa et al., 2021). Their involvement in tourism planning is essential for sustainability and respect for culture and nature.

The intersection of biodiversity, culture and tourism are pertinent to environmental conservation, community well-being and sustaining local cultural practices. Biodiversity is a fundamental component of many cultural practices (Gavin et al., 2015), since much of the traditional local food, building materials, traditional medicine, agriculture and fishery, and crafts derive from natural materials. Using natural materials and softscapes, particularly in natural areas, can contribute to a better quality of the surrounding environment (Sani et al., 2020). The interdependence of biodiversity and culture is undeniable and essential for protecting the place's cultural heritage and economic development. The biodiversity of an area also serves as a key attraction for nature-based tourism, ecotourism and biocultural tourism, with potential income generation for the local economy. There needs to be an integrated approach that consider the ecological, cultural and socioeconomic dimensions of tourism development. Through biocultural landscape resource planning, holistic conservation and development strategies can address ecological and cultural aspects, achieving broader sustainability goals.

Community, Culture and Conservation

Local communities are pivotal in balancing ecological conservation and the preservation of cultural practices, as these two aspects are often interconnected. Ecological conservation focuses on protecting ecosystems and biodiversity, while local cultural practices encompass traditional knowledge and customs related to the environment. This connection is increasingly recognised as essential for sustainable development, with communities' deep understanding of their natural surroundings offering valuable insights into maintaining ecological health (Reyes-Garcia et al., 2013; Sudiasmo & Muspita, 2020). However, several challenges hinder the effective integration of these elements. The loss of traditional ecological knowledge (TEK) due to urbanisation and generational shifts poses a significant threat to environmental sustainability and cultural identity (Muhumuza & Balkwill, 2013). External pressures, including economic development, climate change and tourism, further exacerbate these issues, complicating the balance between ecological preservation and cultural needs (Ruiz-Mallén & Corbera, 2013). To overcome these challenges and leverage local knowledge for ecological and cultural conservation, several strategies have been proposed. One key approach is community-based conservation (CBC), where the local community actively participate in managing their natural resources. Successful examples of Community Conserved Areas (CCAs) in countries like India and Kenya demonstrate how local customs and knowledge can inform conservation decisions, allowing for the coexistence of ecological protection and cultural practices (Brooks et al., 2012). These programs preserve the environment and foster a sense of ownership and pride within communities, contributing to

social cohesion and cultural resilience (Salerno et al., 2021; Teressa, 2022). Participatory planning and policy development are also crucial for the success of community-driven conservation efforts as involving local communities in decision-making ensures that ecological and cultural considerations are incorporated into conservation policies (Ghayoumi et al., 2023; Robinson & Makupa, 2015).

RESEARCH METHODOLOGY

This study's methodology employed a mixed-method approach, integrating resource mapping using a Geographic Information System (GIS), photographic documentation, and semi-structured interviews. This approach aimed to capture the spatial distribution of biocultural landscape resources in Sungai Tembus and the insights of local respondents regarding their cultural practices, local knowledge, and perspectives.

The GIS map effectively visualises and analyses the distribution of natural, cultural and physical attributes found in Sungai Tembus. GIS-integrated spatial data was collected through fieldwork mapping to identify significant site resources. The collected data were processes and analysed using QGIS software. Mapping was done using the Lat Lon Tool QGIS Phyton based on the photos taken on-site. The points were categorised into three main resource types: physical, natural, and cultural resources. After the points were created by using Lat Lon Tools XY Coordinate Feature, a point displacement legend was used to show the concentration of several overlapped resources, making it easier to identify areas with high resource density. This approach ensures a clear and comprehensive understanding of the site's diverse characteristics and facilitates informed decision-making for preservation and development purposes.

The selection of respondents for the semi-structured interview was purposive, and they comprised a community leader, a local fisherman, and a boatman, who are all actively engaged in management and activities at Sungai Tembus. The interviews followed a flexible format, allowing the respondents to elaborate on their experiences and perspectives. The interview responses were then analysed according to common themes and patterns, allowing insights of the cultural dimensions of biocultural resources in the study area.

ANALYSIS AND DISCUSSION

Case Study Area: Sungai Tembus, Seberang Perai

Sungai Tembus is a mangrove-rich riverine area located in Penaga, within the North Seberang Perai District of Pulau Pinang, Malaysia. It is surrounded by paddy fields and rural settlements, where most of the locals are paddy farmers and fishermen. The river, Sungai Tembus, flows out to the Straits of Malacca, shaping an estuary of mudflats. Sungai Tembus is part of the Teluk Air Tawar –

Kuala Muda flyway site for migratory birds that migrate through the East Asian-Australasian Flyway ("300 Mangrove Saplings Planted along Sg Tembus," 2024). It was reported that an estimation of more than 15,000 migratory birds from northeast Asia stop at this area, while at least 3,000 local shorebirds inhabit Sungai Tembus. The mangrove forests along Sungai Tembus have been gazetted as permanent reserved forests to protect the rich biodiversity of the area and promote sustainable ecotourism (*Penang Gazettes Eight Mangrove Forests as Permanent Reserved Forests*, 2023). Among the sighted birds are Asian openbills (*Anastomus oscitans*), storks and herons. The birds would nest in the mangroves and search for food in the mudflats and waters.

Biocultural Landscape Resource Mapping

Figure 1 shows the distribution of three attributes: natural resources, cultural resources, and physical infrastructure. The natural resources (marked with 'N') are mainly distributed along the river, estuary, and sea, primarily because Sungai Tembus' significant land cover is mangrove forest. The cultural resources (marked with 'C') are mainly concentrated near the rural settlements in the Nypa palm area. The physical infrastructure (marked with 'P') is concentrated in the jetty area of Sungai Tembus since this is where the operation hub is located.

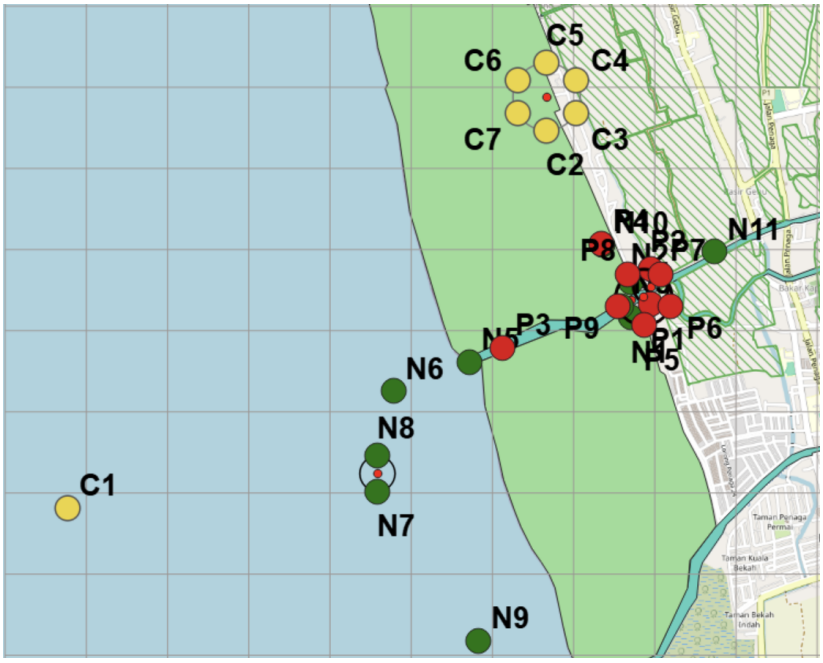


Figure 1: Distribution of biocultural resources (refer to Table 1-3 for photos)

Natural Resources

The natural resources of Sungai Tembus are connected to the mangrove and river ecosystems (refer to Table 1). From the jetty area, even without going far down the river, visitors can see birds that fly through the area and rest on top of the mangrove trees. The abundance of the birds was visible, and it was evident that the mangrove forest was their habitat. Smaller shore birds were observed feeding on the mud flats. Then, towards the sea, birds gathered at mangrove structures.

Table 1: Natural Resources at Sungai Tembus

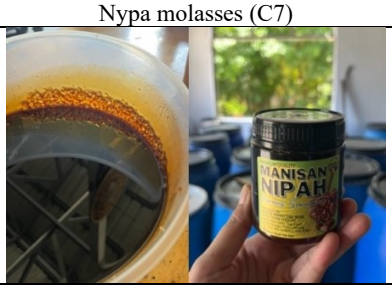
Mangrove forest (N10)	River – Sungai Tembus (N2)
	
Local birds and migratory birds (N3)	Mudflat area (N5)
	
Bird habitat at the mangrove (N9)	View towards Gunung Jerai (N6)
	
Sea snails harvesting area (N7)	Paddy field and watering channel (N11)
	

Cultural Resources

Fishery activities are the main cultural resources of Sungai Tembus. The Sungai Tembus Jetty is one of the jetties for fishermen in this area, other than the one in Kuala Muda. Aside from the mangrove forest, Sungai Tembus is abundant in

Nypa palms (*Nypa fruticans*) (refer to Table 2). The locals could harvest Nira from the Nypa palms, a sweet sap made into a drink, jelly, vinegar and molasses. One of the locals named Pak Man developed the Nypa products as an attraction for visitors to visit the area.

Table 2: Cultural Resources at Sungai Tembus

Fishing activities (C1)	Kebun Nipah Pak Man (C2)
	
Nypa palm farm (*Nypa fruticans)* (C3)	Nira harvesting from the Nypa palms (C4)
	
Nira drink and nira jelly (C5)	Nypa vinegar (C6)
	
Nypa molasses (C7)	Local community selling Nypa products
	

Physical Infrastructure

Sungai Tembus has the basic facilities for a fishermen's area, such as a jetty for them and visitors, a centre for their association with a meeting hall, a prayer room, a toilet, and a space that they see the potential to transform into a gallery in the

future (refer to Table 3). This area is also equipped with interpretive signage that explains the area's status as a biodiversity Area and provides information on migratory birds.

Table 3: Physical Infrastructure at Sungai Tembus

Fishermen jetty	Sungai Tembus Unit Fishermen Association
	
Proposed gallery area	**Interpretive signage**
	

Biocultural Landscape Resource Network

The resource mapping and photographic documentation revealed that the natural resources and cultural resources are interconnected, supported by the physical infrastructure. Figure 2 visualises the biocultural landscape resource network, which illustrates the relationships and outcomes of the interactions of the various resources. Natural resources, such as rivers, mangroves, and the sea, have become avenues for local people to support their livelihoods. The biodiversity of the area is crucial to maintaining the ecosystem. Even without tourism activities, these natural resources are essential to their daily life. With the potential of tourism activities, such as boating, bird watching, experiencing local food and the rural area, and buying local products, the locals could generate another income stream to support their off-season fishery and paddy farming activities. Additionally, tourism can become the means to develop Sungai Tembus sustainably, as the biocultural resources are assets to the local community.

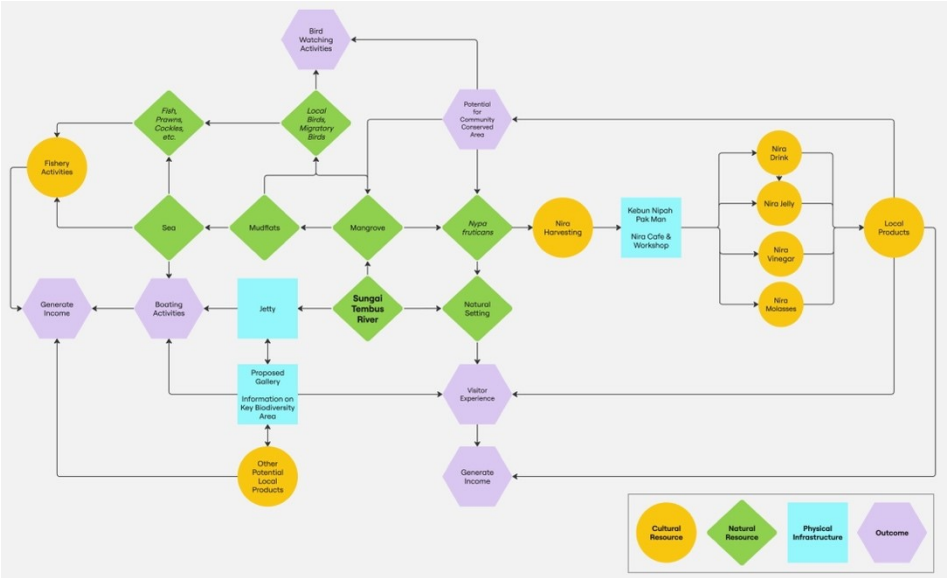


Figure 2: Biocultural Landscape Resource Network of Sungai Tembus

Community Insights

Each of the respondents from the local community were asked about the past and current conditions of Sungai Tembus, activities that have been conducted in the area, their respective views on the challenges and potentials of Sungai Tembus, and their aspirations for the community. Respondent 1 is the Chairman of the Sungai Tembus Unit Fishermen Association, Respondent 2 is a part-time fisherman and boatman, and Respondent 3 is a full-time fisherman. The findings from the interviews are analysed thematically in Table 4.

Table 4: Community insights on the resources of Sungai Tembus

Themes	Sub-Themes
Mangrove conservation and threats	**(i) Mangrove replantation efforts** - Importance of mangrove conservation, community-led initiatives and NGO involvement in mangrove planting and nurseries. - Respondent 1: programs from local people to replant the mangrove trees in Sungai Tembus **(ii) Environmental Challenges** - Aquaculture and sedimentation were major threats. - Respondent 1: concerns about waste from aquaculture - Respondent 2: river sedimentation hindered boat navigation; river widening program and desiltation that is done every 2 to 5 years **(iii) Biodiversity** - Mangrove serve as habitats for birds and marine life.

Themes	Sub-Themes
	- Respondent 1: the area is rich with local birds and migratory birds; about 200 Spoonbills seen in the area. - Respondent 2: concerns over the illegal hunting of baby birds
Biocultural resources	**(i) Local products and crafts** - Respondent 1: community relies on traditional resources such as Nypa products and dried fish; hoped for a grant to build a workshop to process dried fish as local products; challenges is to sustain the business to the younger generation. - Respondent 3: fish curry and coconut pancake is also a specialty for the area; challenge to find the youth to work **(ii) Traditional knowledge** - Community understands the local ecology - Respondent 1: calling for collaboration between researchers and locals for better project outcomes. - Respondent 2: routine of the fishermen's community, where the ones who catch fish go out at 4:30 in the morning, while the ones who catch prawn go out at 7:00 in the morning.
Ecotourism potential	**(i) Tourism activities** - Respondent 2: current tourism activities include bird watching, cockle harvesting and boat tours. - Respondent 3: visitors can go to explore Penang and Rimau Islands. **(ii) Infrastructure and development needs** - Respondent 1: proposed creating a gallery and workshop for visitors - Respondent 3: suggested a 'visitor adoption program'; there are around 50 families in Sungai Tembus. **(iii) Opportunities for modernisation** - Respondent 3: hopes for changes and improvements in the community's livelihood, including becoming 'modern fishermen' and leveraging tourism for economic growth. From September until November, it is usually high tide, and they do not go to the sea.
Socioeconomic challenges	**(i) Youth engagement** - Respondent 3: lack of interest among youth in traditional fishing **(ii) Economic barriers** - Respondent 3: high cost of fishing boats and the need for external support (e.g., grants) to improve facilities.

The perspectives from the respondents collectively highlight the challenges and aspirations of the Sungai Tembus community in balancing fisheries, conservation and tourism development. Fisheries is one of the primary livelihoods, with fishermen navigating changing environmental conditions. They all acknowledge the community's role in conservation, mainly through mangrove replantation programs, protecting local biodiversity and keeping the area in good condition. Tourism development is seen as an opportunity for economic

diversification, which could promote Sungai Tembus as a sustainable community-driven tourism.

The Way Forward

Community-Led Conservation

Community participation is crucial in ensuring the continuity of conservation efforts. The interviews' findings highlight the local residents' critical role in maintaining the mangrove ecosystems, protecting biodiversity and sustaining local products. Community-led conservation initiatives, supported by various agencies' collaboration, show the locals' commitment and environmental stewardship. However, as Sungai Tembus develops further as an ecotourism site, there needs to be stronger community governance supported by local policies and partnerships with conservation and sustainable tourism organisations. Establishing Community Conserved Areas (CCAs) could encourage more participatory decision-making platforms among the community to further support the resilience of Sungai Tembus' biocultural landscape.

Enhancing Biocultural Landscape Resources

The biocultural landscape resources of Sungai Tembus show the interdependency between the mangrove ecosystem and traditional livelihood activities, such as fishing and Nypa palm harvesting. Though these activities may not seem big in scale, they underscore the need to be sustained through targeted conservation and value-added initiatives. Local products, such as Nypa-based food and crafts, can be further developed through capacity-building programs and financial support and linked with the larger tourism products of Seberang Perai. The sustainable commercialisation of biocultural resources into biocultural products can position Sungai Tembus as a unique attraction in Seberang Perai. More efforts are needed to document and promote these resources to ensure that traditional ecological knowledge can be transmitted to the younger generations. Knowledge-sharing programs such as workshops and events can become the starting point for fostering collaborations between local communities, researchers, and policymakers.

Biocultural Tourism Development

Biocultural tourism has significant potentials to pave a sustainable economic development for Sungai Tembus. There are already well-known tourism activities, such as birdwatching, boat tours and customised rural experiences. To further develop the resources in Sungai Tembus, the community's and local government's approach should be done strategically and focus on low-impact and community-driven tourism initiatives. Training is crucial and this could be supported hand-in-hand with relevant NGOs, commercial entities and academic

institutions. Integrating edutourism into biodiversity and cultural heritage can generate supporting tourism products for the area and create awareness of the importance of biocultural resources for the younger generations. The infrastructure needs to be continuously improved while minimising environmental degradation to facilitate and enhance the quality of the visitor experience. However, it is vital that tourism development is not over-commercialised and over-developed and that equitable local benefits are ensured.

Investment in Training and Infrastructure

For Sungai Tembus to develop sustainably, tourism, conservation and economic progress must be community-centred. Investments should focus on ecotourism infrastructure, skills training for youth, and financial support for fishermen and Nypa producers. Grants for visitor centres, workshops for nature-based products and cultural tourism programs could help integrate biocultural resources into conservation strategies, ensuring economic resilience and environmental sustainability are achieved.

CONCLUSION

This study has explored the intricate relationship between community, conservation, and culture through the biocultural landscape resources of Sungai Tembus. The findings delineated integrating natural and cultural resources that serve essential roles in the local community and the need to sustain and enhance these resources. Local communities are the custodians of biodiversity and cultural heritage, making their participation in conservation and tourism essential. The mapping of the biocultural landscape resources of Sungai Tembus illustrated the area's interconnected ecological and cultural assets. The natural resources such as mangrove forests, migratory bird habitats and aquatic life are already an ecotourism attraction of the site, which could be further supported by traditional rural cultural heritage. However, collective efforts are needed to overcome the challenges of declining interest among the younger generations in traditional activities and economic barriers and to sustain the area's environmental quality. Integrating local knowledge, conservation efforts, and responsible tourism initiatives is imperative.

To preserve the ecological and cultural integrity of Sungai Tembus, a balanced approach is needed to promote biocultural tourism. Community-driven conservation programs and tourism business training can support the local community and foster economic growth. Any long-term sustainable development needs policy support, financial assistance and multi-stakeholder collaborations. Policies must empower local communities, ensuring conservation and tourism development efforts align with their traditional knowledge and aspirations. In conclusion, this study contributes to the broader discourse on biocultural resource

conservation and tourism by illuminating the roles and aspirations of the local community. Future studies could explore deeper community governance, resource management and tourism product development in rural areas. Integrating biodiversity, cultural heritage, and economic growth in Sungai Tembus can exemplify how biocultural landscape resources are intertwined and how they seek to balance preservation and progress.

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