

SUNGAI TEMBELING'S IMPACT ON THE ORANG ASLI BATEK COMMUNITY IN KUALA TAHAN

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Abstract: This study was designed to determine the impact of the Sungai Tembeling ecosystem on the socio-economic and environmental sustainability of the Batek indigenous community in Kuala Tahan. Utilising a qualitative ethnographic research design, the study employs participant observation and interviews to gather primary data from the Batek people. The findings reveal that the Sungai Tembeling ecosystem plays a crucial role in providing employment opportunities, sustaining livelihoods, and offering essential resources such as water for domestic use. Additionally, it supports recreational and tourism activities, thereby enhancing the community's socio-economic well-being. However, the Batek community faces significant challenges, including environmental degradation and pressures from modern development, which threaten their traditional way of life. The study recommends the active involvement of the Batek community in decision-making processes regarding ecosystem management, the integration of traditional knowledge into conservation strategies, and the implementation of awareness campaigns to highlight the ecological and cultural significance of the river. Furthermore, it advocates for legal recognition of the Batek people's land rights and the promotion of sustainable agricultural and fishing practices to ensure the long-term sustainability of their environment.

Keywords: Socio-economic, ecological, environmental sustainability, Pahang, Malaysia.

Introduction

The nexus between the socioeconomic issues and ecosystem in the wellbeing of the rural communities has continued to emerge in response to the growing realisation of the need to balance economic and social progress with concern for the environmental sustainability and stewardship of natural resources (Sivapalan *et al.*, 2012; Troy *et al.*, 2015; Safilia & Nany, 2019; Ahmed *et al.*, 2020; Marylise *et al.*, 2021; Bertrand *et al.*, 2021). In recent times, the pressing issue of rivers in the global ecosystem has become more apparent and cannot be ignored. This may not be unconnected to the quintessence of rivers serving as a major source of food for humans, job opportunities, and raw materials for industrial purposes, together with being the mainstay of agricultural activities (Prakash, 2020; Simonovic & Breach, 2020). Water is an essential component of life (Anjana *et al.*, 2020). Surface water resources are the

most preferred locations for life settlements (Naiman *et al.*, 2002; Sivapalan *et al.*, 2012; Zalewski *et al.*, 2018).

Ecosystems are classified into aquatic and terrestrial ecosystems. The aquatic ecosystems are water-borne and the terrestrial ecosystems are land-based. Based on the quality of water involved, the aquatic ecosystems are further classified into freshwater and marine types. Being potable and pure, fresh water is mostly used for domestic, agricultural, and industrial consumption (Best, 2019; Xia *et al.*, 2021). In addition to natural water bodies, artificial reservoirs and dams are constructed to preserve freshwater, preventing it from entering seas or natural lakes. Freshwater ecosystems deal with both running and standing water bodies and their life (Xu *et al.*, 2018; 2019; Basak *et al.*, 2021).

Review of the Governance of the Resources and the Orang Asli in Malaysia

The essence of river in global ecosystem is also quite felt as a major driver in maintaining biological diversity, regulating the climate and improving the ecological environment as well providing necessary channels for the material cycle of the biosphere (Xie *et al.*, 2003; Zhao *et al.*, 2004; Basak *et al.*, 2021; Xie *et al.*, 2023). Essentially, the Millennium Ecosystem Assessment (MEA), a major UN-sponsored effort has identified and analysed the impact of ecosystems on human actions and well-being (Falkenmark, 2003; MEA, 2005). Among the significant impacts of ecosystems beyond the provision of food are the supply of trees, vegetables, fruits, livestock, and fish. In addition to providing services such as drinking water, natural gas, oils, wood fuel, timber, plants that can be made into clothes and other materials, and medicinal benefits, which are all regarded as the direct products of ecosystems and services provided by nature (Johnston, 2013; Krause & Strang, 2016; Maya *et al.*, 2017).

Not to mention, among the examples of basic functions and processes of ecosystems' elements undertaken in making life viable for humanity involve the plants, which filter water and clean the air, bees pollinate flowers, tree roots hold soil in place to prevent erosion and bacteria decompose wastes (Ntongani, 2014; Kabuye, 2015). All these processes and

phenomena of water purification, pollination, flood and erosion control, decomposition, as well as carbon storage and climate regulation, provided by ecosystems working together, not only make the ecosystems clean and functional but also sustainable for future generations (Braitto *et al.*, 2017). Likewise, the importance of ecosystems to culture and the human mind cannot be overstated, given their role in building knowledge and spreading ideas, fostering inherent ingenuity and creativity in humans through interactions with nature (art, craft, architecture, music), and providing recreation.

In this manner, the cradle of human civilisations began with the drawing of pictures of plants, animals, and weather patterns on cave walls. This has contributed immensely to the cultural advancement and development of people across the board, be it locally, nationally, and internationally. It is reasonable to say that all these ecosystem functionalities cannot be made possible and sustainable outside the confines of the following natural processes such as the water cycle, nutrient cycling, photosynthesis, and soil creation (Chivian & Bernstein, 2008; Bartholomew *et al.*, 2021). The underlying framework illustrates a linear relationship between social, economic, and environmental sustainability, as well as the impact on Orang Asli Batek and river ecosystems (Figure 1).

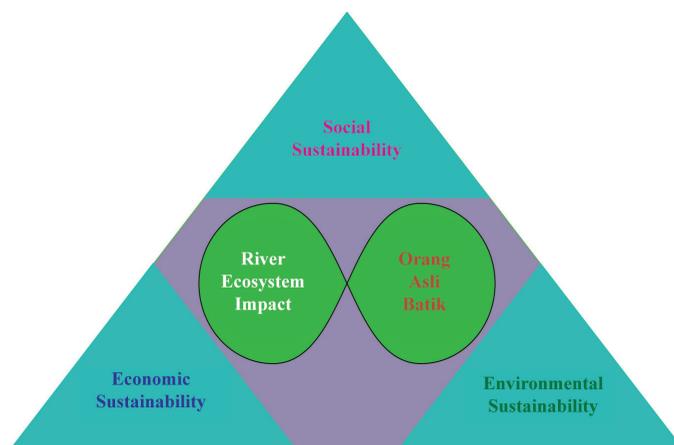


Figure 1: Governance

The Study Community: Orang Asli Batek at a Glance

The study was carried out among the Batek indigenous people, an Orang Asli community from the Negrito tribe. These indigenous people form a community in Malaysia, with their population residing in rural areas. They are the smallest and oldest tribe in the integral peninsula of the country. Nevertheless, it is important to note that the people in this study community occupy six settlements, all of which are located near Kuala Tahan. These settlements comprise Kuala Atok, Sungai Yong, Teresek, Jeram Dedari, Jeram Kuala Terenggang, and Kuala Keniam. The interval of this settlement-cum-hinterland to the entryway of the National Park and the Office of the Department of Wildlife Protection and National Parks (PERHILITAN) is approximately 20 kilometres (Ramle *et al.*, 2016; Asmawi *et al.*, 2023).

The Batek tribe who had wandered from the African continent to Southeast Asia are closely related to the Hoabinhians (Andaya, 2001; Keng *et al.*, 2020). They presently reside around the Sungai Tembeling in Kuala Tahan, around the National Park area in Peninsular Malaysia. Their total population is 1,447 individuals, approximately 0.81% of the total Orang Asli populace in the country (Ramle *et al.*, 2016). The Sungai Tembeling, which serves as a cornerstone for tourism activities in the National Park, also leverages the historical, social, cultural, and economic development of

the people to the present day. This ecological environment not only provides locals with access to diverse natural resources but more importantly, plays a significant role in shaping and determining their socioeconomic activities and cultural aspects, including beliefs, taboos, lifestyle, and education. Similarly, due to their strategic location, the people are also involved in ecotourism activities (Figure 2).

By the same token, if the dynamics are used to identify the multiple opportunities the Sungai Tembeling offers the Batek people, the river ecosystem has great potential for the sustainability of the society, environment, and economy. Besides, the land surrounding Sungai Tembeling is predominantly made up of 66% forests, 12% of oil palm plantations, 9% of lakes, rivers, and marshes, and 13% is covered by rubber plantations. According to Kuchikura (1986), Malaysia's Tropical Rain Forest is considered the oldest and most complex ecosystem in the world, characterised by high growth rates and an unparalleled diversity of species. In the meantime, from the north to the south direction and finally discharging into the South China Sea, the water from the river serves to provide all the necessities for the survival and developmental needs of the local people at riverside settlement towns such as Kuala Lipis, Jerantut, and Temerloh (MEA, 2005; Kapinga *et al.*, 2015). Figure 3 shows the map of study area.



Figure 2: Orang Asli Batek

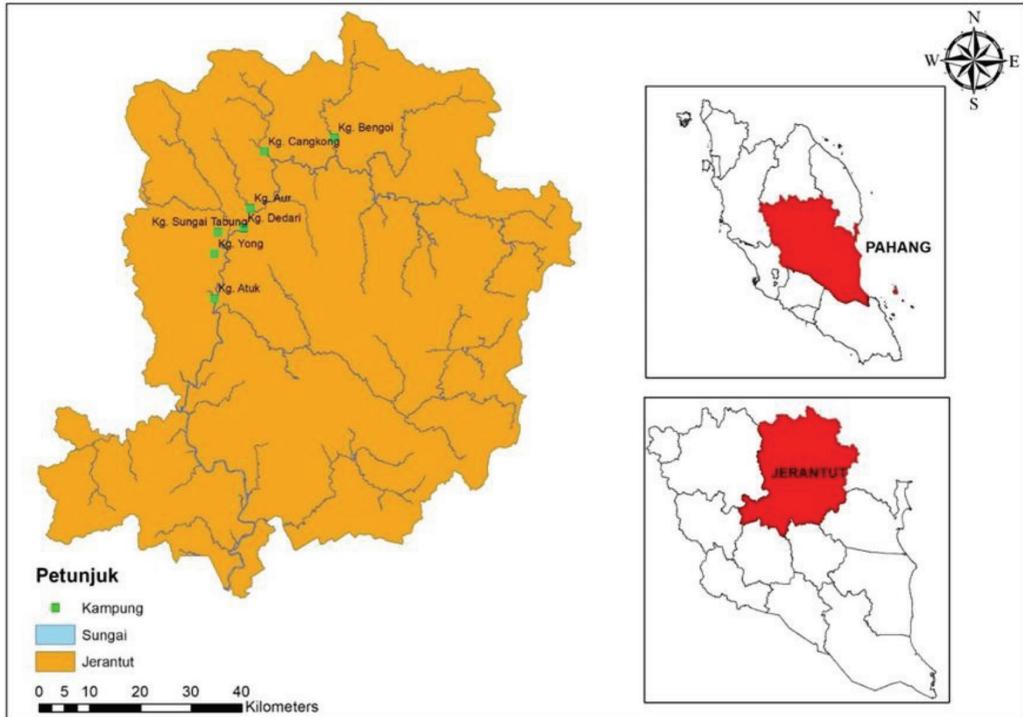


Figure 3: Map of study area

Source: Ahmad *et al.*, 2024

Methodology

The present research study employed a qualitative approach to help understand the impact of the Sungai Tembeling ecosystem on the socio-economic and environmental sustainability of Batek indigenous people. The use of qualitative methods in this study is very appropriate because it helps the researcher obtain comprehensive, more accurate, and clear data and allows the researcher to produce a descriptive study regarding the aspect being studied (Hakim, 2000; Ramle *et al.*, 2013). The research method used is an ethnographic study, both in the process of data collection and analysis, which explores information about a person, social setting, event, or group to understand the process and functions (Cai *et al.*, 2003). Similarly, in a qualitative research approach, researchers can use their own abilities and skills to explore, identify, and collect data through related techniques (Palys, 2008; Oppong, 2014).

Data Collection

Data collection was done using participatory observation techniques, in-depth interviews, and document analysis. However, the primary data collection process was mainly through fieldwork. The main instruments used to gather primary data in this study were participant observation and interviews (Figure 4). The fieldwork was carried out over six months and was organised into several phases. In the early stages, the researcher focused on building relationships with the community and identifying key informants. The next phase involved participatory observation and in-depth interviews with informants related to the community's daily activities, economic activities, and social interactions, followed by a preliminary analysis to identify patterns and main themes. In the final phase, the researcher checked and verified the findings with key informants to ensure the accuracy and reliability of the information obtained.



Figure 4: Interview session

The researcher carried out participatory observation of certain activities that reflect the practices, beliefs, and social dynamics of the community. Observed activities in the study areas included community gatherings, cultural ceremonies, daily economic activities, and social interactions in their natural environment. Through this observation, the researcher gained insight into how community norms and values are applied in daily life, particularly the role Sungai Tembeling plays in shaping their overall lives.

In addition to participatory observation, the researcher also used interview techniques in the data collection process. According to Bryman and Bell (2015), interviews are the most important data collection technique used by ethnographers. To a large extent, interviews are also considered an important source of data to provide a clear picture and complete description of things observed, accompanied by things that the researcher does not understand (Wafaa, 2019). The researcher established an interview theme guide, using it to facilitate the interview process and ensure its smooth execution. The themes were developed based on initial concepts derived from research problems, key findings from previous studies, and the characteristics of the phenomenon under study.

Selection of Informants

The selection of study informants was done by purposive sampling based on certain criteria related to the objectives of the study. Informants were selected based on their knowledge, experience, and role in the community being studied. Throughout the study, a total of 15 key informants were involved, representing various backgrounds in the community. The key informants consisted of community leaders, including *Batin* (community leader) and respected members of the Orang Asli Village Development and Security Committee (JPKKOA), as well as residents (local champions) who were active, particularly in ecotourism activities and hunting and gathering forest products. These key informants had experience and in-depth knowledge of the aspects being studied. Table 1 below shows the description of the key informants.

Data Analysis

Qualitative data analysis usually explores the relationship between important categories related to things, people, or events and the properties and values that characterise those elements (Merriam *et al.*, 2015). The qualitative data is the result of participant observation notes, interviews, documents, videos, audio, and pictures that can help the researcher understand

Table 1: Demographic information of the informants

Informants	Category	Position	Years of Residence
Informant 1	<i>Batin</i>	Community leader	55
Informant 2	Respected member	Decision maker	62
Informant 3	Respected member	Decision maker	55
Informant 4	Respected member	Decision maker	41
Informant 5	Respected member	Decision maker	52
Informant 6	Respected member	Decision maker	57
Informant 7	Respected member	Decision maker	64
Informant 8	Respected member	Decision maker	43
Informant 9	Respected member	Decision maker	44
Informant 10	Respected member	Decision maker	45
Informant 11	Respected member	Decision maker	53
Informant 12	Respected member	Decision maker	61
Informant 13	Respected member	Decision maker	58
Informant 14	Local champion	Resident	43
Informant 15	Local champion	Resident	39

Source: Authors (2025)

the phenomenon being studied. After the data collection process is completed, the main analysis of the study is done using QSR NVivo computer software. The software aids not only in storing, coordinating, transcribing, code (coding), and making research themes systematically, but also helps in managing the data so that it can be easily interpreted and understood.

Results

The Impacts of Sungai Tembeling Ecosystem on Sustainability

The participants explained the essence and impacts of the Sungai Tembeling ecosystem on the Orang Asli Batek in the Kuala Tahan settlement. Some participants responded that their socio-economic and environmental sustainability depend on the river ecosystem. The research findings clearly revealed that employment opportunities, sources of income, and livelihood sustenance have a significant impact on communities.

Provision of Employment

Healthy river ecosystems support fisheries and agriculture, providing direct livelihoods and employment opportunities for local communities engaged in these activities. The result clearly shows that one of the socio-economic sustainability impacts of the Sungai Tembeling ecosystem is the provision of employment opportunities for the local communities. These job opportunities, including boat riders, anglers, fishermen, and craftsmen serve as avenues for earning income. In the interviews conducted, participants explained how employment opportunities from the Sungai Tembeling ecosystem are beneficial to their livelihood. One participant commented:

"...We, the Batek people, accomplish a lot from Sungai Tembeling, giving us opportunities to engage in an ample range of jobs..."

(Informant 2)

It is important to note that these earnings help in lessening the rate and effect of poverty

in this settlement as well as deterring criminal and violent acts, especially among the youth. Consequently, the river ecosystem, apart from being a fount of primary economic activities in employment generation for the locals, also helps in mitigating restiveness in the community (Ahmed *et al.*, 2021; Ahmad *et al.*, 2023).

Source of Income and Livelihood Sustenance (Aquatic Resources)

The Batek people's habitat and ambience with Sungai Tembeling bring about good fortune for livelihood sustenance and benefit to the people as regards a source of income. One of the participants claimed:

"...Village people sell various fish caught from the river; of particular interest is kelah fish, which has a very expensive price in the market, which is RM200 per kilogram..."

(Informant 15)

It is providing direct livelihoods and employment opportunities for local communities engaged in these activities. The relationships the local societies share with the river have thus provided a good source of income and help support their socio-economic sustainability. The locals not only enjoy the unique aquatic resources of the river but also derive economic benefits, which in turn generate a good return on investment. Rivers support the fishing industry, offering a means of transportation for fishermen to access different areas with abundant fish

populations, contributing to local food security and livelihoods. Additionally, the rivers often play a vital role in sustaining ecosystems, contributing to the overall well-being and livelihoods of the community (Figure 5).

Rejuvenating Floral Resources

Rejuvenating flora resources is vital for sustainability as it promotes biodiversity, improves ecosystem resilience, and contributes to environmental balance. Healthy flora provides habitat for diverse species, supports pollination for agriculture, helps in carbon sequestration, and enhances soil fertility. Preserving and restoring flora resources is key to sustaining ecosystems, mitigating climate change impacts, and ensuring long-term benefits for both the environment and human communities. Along the Sungai Tembeling, various types of flora grow and shade the river, creating a very interesting scene.

By way of explanation, the presence of this river ecosystem helps in terms of reviving different species of flora, including resource-based species, species with different parts harvested, premium species, wilderness species, and regional species. These, therefore, provide higher livelihood opportunities for the locals in particular and multiple opportunities for their environment in general. The following statements from the participants confirm this:

"The river water is crucial for local agriculture, enabling irrigation to support crop growth. This, in turn,



Figure 5: Marine and ecological scene

contributes to food security and sustains the local economy. Local communities often rely on rivers to provide water for livestock, ensuring the health and well-being of animals essential for agriculture and livelihoods”

(Informant 7)

The river fosters the sustainability of numerous flora resources, supporting environmental restoration and mitigating the impact of ecological loss. Effecting and achieving environmental restitution had so far been hinged on the sustainability of floral resources (Asmawi & Ahmed, 2022). The flora is often integral to cultural practices and aesthetics. Preserving and rejuvenating plant life contributes to the overall cultural heritage and aesthetic appeal of landscapes. Many medicinal resources are derived from plants. Rejuvenating flora ensures the availability of natural remedies and pharmaceutical resources. Healthy flora provides essential habitats for wildlife. Rejuvenation efforts contribute to the conservation of diverse animal species. In summary, the rejuvenation of flora resources is paramount for sustainability as it directly impacts ecological balance, environmental health, economic activities, and cultural values.

River Water for Domestic Use

In terms of its prominence for their domestic use, Sungai Tembeling water encompasses the necessities of existence for the Batek people. The river serves as the fountain that provides drinking water and other sustenance for the local community in their settlement. Some of the participants said:

“Rivers often serve as the primary source of freshwater for domestic use, providing communities with a reliable supply for drinking, cooking, and basic household needs. For instance, local communities have the habit of washing and bathing on the banks of the river, not because of the unavailability of infrastructure in their houses...”

(Informant 13)

“The local communities often rely on rivers to provide water for livestock, ensuring the health and well-being of animals essential for agriculture and livelihoods. Local people avail this river in particular for drinking and for other domestic utility in general...”

(Informant 9)

Their existence and linkage with the river will blend with the environment and provide a positive reciprocal effect. The importance of river water for domestic use in terms of sustainability lies in its role as a renewable resource. Rivers contribute to sustainable water supply for communities, reducing dependence on finite groundwater sources. Proper management and conservation of river water ensure its availability for future generations, supporting long-term environmental and social sustainability. Additionally, relying on rivers for domestic use encourages responsible water use practices to maintain a balance between human needs and ecosystem health.

Facilitates Recreational and Tourism Activities

Tourism facilitates cultural exchange as visitors immerse themselves in local traditions, art, and cuisine, fostering a deeper understanding and appreciation for the community. The findings of the study demonstrate that in the broad view of the community, Sungai Tembeling is a major facilitator for tourism expeditions in Kuala Tahan settlement. For instance, if tourists come to Kuala Tahan by water from Kuala Tembeling, they will be able to behold the beauty of the river ecosystem as a recreational sphere throughout the journey and also enjoy the experience of going through several rapids. Among such river activities that are tourism products in Kuala Tahan is river exploration. The following assertion by the participant epitomised the significance of the river in the recreational and tourism aura:

“Increased tourism often boosts local pride as residents recognise the appeal and uniqueness of their community,

leading to a stronger sense of identity and community spirit. Tourism can incentivise the preservation of historical and cultural sites as they become key attractions, encouraging the local community to protect and maintain their heritage.”

(Informant 1)

Consequently, all these activities portend an economic fortune and goodness for the Batek people. The main basis of a tourist focus area is the river. For Kuala Tahan National Park, the river is the backbone of the ecological beauty of the area. Tourism can breathe new life into cultural practices and traditions, encouraging the local community to actively participate and celebrate their heritage, sometimes through festivals and events.

Promote the Transportation System

River transport is often more cost-effective than other modes, making it an efficient means of moving bulk goods, raw materials, and agricultural products within and between communities. Rivers connect various regions, promoting social and economic connectivity (Seyfang *et al.*, 2014). This connectivity enhances trade, cultural exchange, and overall cooperation between communities. The presence of the river ecosystem is also critical in promoting the sustainability of the transportation system.

People can be seen along the river banks using boats for various activities (Seyfang *et al.*, 2014; Martiskaine, 2017). The local people depend heavily on the river for transportation. Small traditional boats equipped with motors are used to cross the river or navigate along the riverbanks while larger boats transport commodities from production areas to city marketplaces. The rivers provide access to remote or landlocked areas, promoting development in regions that might be otherwise challenging to reach by road or other transportation means (Figure 6).

Conclusions and Recommendations

The preoccupation of this study is to reveal the profound impact of the Sungai Tembeling ecosystem on the socio-economic and environmental sustainability of the Batek indigenous community in Kuala Tahan. In doing so, the following conclusions were inferred from the study: The river serves as a vital resource, providing not only essential water for domestic use but also supporting livelihoods through fishing, agriculture, and ecotourism. Thus, the findings underscore the critical linear relationship between the health of the river ecosystem and the well-being of the Batek people, highlighting the need for sustainable management practices that honour their cultural heritage and traditional knowledge. Moreover, the current research suggests that well-preserved



Figure 6: Transportation and tourism activities

river ecosystems are fundamental in enhancing recreational opportunities and attracting eco-tourism, which in turn promotes sustainable economic development within the community.

Furthermore, the preservation of river ecosystems is essential not only for maintaining biodiversity and ecological balance but also for safeguarding cultural heritage and traditions, thereby supporting the overall sustainability of the community. Overall, it may be inferred from the findings of this study that the ecosystems provide invaluable educational resources and serve as platforms for ecological research, raising awareness of environmental issues, and encouraging sustainable practices. Nevertheless, the community faces challenges such as environmental degradation and the pressures of modern development, which threaten their way of life and the integrity of the ecosystem.

Based on the study findings, it was recommended that the involvement of the Batek community in decision-making processes regarding the management of the Sungai Tembeling ecosystem is very germane and consequential. This will ensure and pave the way for their traditional knowledge and practices to be integrated into conservation strategies and sustainable use of resources. Likewise, awareness campaigns highlighting the ecological and cultural significance of the Sungai Tembeling ecosystem need to be launched to educate both the local community and external stakeholders.

Also, veridical advocacy and policies must be fostered that will protect the river ecosystem and the rights of indigenous communities. This can include, for instance, legal recognition of the Batek people's land rights and their role as stewards of the environment. Additionally, there is a need to encourage the adoption of sustainable agricultural and fishing practices that will have minimal environmental impact, at the same time maximising resource efficiency. To actualise the aforementioned, training programs and workshops can be organised to educate the community on sustainable means, methods, and practices.

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Conflict of Interest Statement

The authors declare that they have no conflict of interest.

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