



## Integrating Local Wisdom into Natural Resource Management: A Case Study of Sabah-Borneo, Malaysia

*(Integrasi Kearifan Lokal ke dalam Pengelolaan Sumber Daya Alam: Studi Kasus Sabah-Borneo, Malaysia)*

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### ABSTRACT

Natural resource management is increasingly recognized as a critical component of sustainable development, particularly when informed by local wisdom. This paper explores the integration of indigenous knowledge systems in Sabah, Malaysia, focusing on how traditional practices contribute to effective environmental stewardship. Drawing from field observations and documented practices, including the Tagal system of the Kadazan-Dusun community, community-based mangrove tourism, and ethnobotanical knowledge, this study highlights the significance of local wisdom in fostering ecological balance and sustainability. Local wisdom encompasses a range of practices and beliefs passed down through generations, emphasizing harmony with nature and communal resource management. The findings suggest that incorporating these traditional approaches into formal Sustainable Forest Management (SFM) frameworks can enhance biodiversity conservation, promote community resilience, and ensure equitable benefits. This study advocates for policies that formally recognize and empower local communities, ensuring their knowledge and voices are integral to decision-making processes for natural resource management in Sabah, Malaysia and similar regional contexts.

### ABSTRAK

Pengelolaan sumber daya alam semakin diakui sebagai komponen kritis dalam pembangunan berkelanjutan, terutama ketika didasarkan pada kearifan lokal. Makalah ini mengeksplorasi integrasi sistem pengetahuan masyarakat adat di Sabah, Malaysia, dengan fokus pada bagaimana praktik tradisional berkontribusi terhadap pelestarian lingkungan yang efektif. Berdasarkan pengamatan lapangan dan praktik yang terdokumentasi termasuk sistem 'Tagal' pada masyarakat Kadazan-Dusun, pariwisata bakau berbasis komunitas, serta pengetahuan etnobotani kajian ini menyoroti pentingnya kearifan lokal dalam memupuk keseimbangan dan kelestarian ekologi. Kearifan lokal mencakup berbagai praktik dan kepercayaan yang diwariskan secara turun-temurun, dengan menekankan keharmonisan dengan alam serta pengelolaan sumber daya komunal. Temuan studi menunjukkan bahwa menggabungkan pendekatan tradisional ini ke dalam kerangka kerja Pengelolaan Hutan Lestari (*Sustainable Forest Management* atau SFM) yang formal dapat meningkatkan konservasi biodiversitas, mempromosikan ketahanan masyarakat, serta menjamin manfaat yang adil. Kajian ini mendukung kebijakan yang secara resmi mengakui dan memberdayakan komunitas lokal, guna memastikan bahwa pengetahuan dan aspirasi mereka menjadi bagian penting dalam proses pengambilan keputusan terkait pengelolaan sumber daya alam di Sabah, Malaysia, maupun konteks regional serupa lainnya.

## 1. Introduction

The global challenge of balancing ecological preservation with human

development necessitates innovative and inclusive management strategies. In this context, local wisdom, the cumulative body of

traditional knowledge, practices, and beliefs developed by communities over generations offer invaluable insights for sustainable Natural Resource Management (NRM) (Borneo Post, 2021).

The Anthropocene epoch is characterized by unprecedented environmental degradation, biodiversity loss, and climate disruption, driven largely by unsustainable resource extraction and management models (Steffen et al. 2015). In response, global sustainability agendas, such as the UN Sustainable Development Goals (SDGs) and the Post-2020 Global Biodiversity Framework, increasingly emphasize the inclusion of Indigenous and Local Knowledge (ILK) systems (IPBES, 2019). ILK, also termed Traditional Ecological Knowledge (TEK), refers to the cumulative, place-based body of knowledge, practices, and beliefs evolved through adaptive processes and handed down through generations by cultural transmission (Berkes, 2018).

In Southeast Asia, a biodiversity hotspot facing intense development pressures, the integration of ILK with state-led scientific management presents a vital yet under-institutionalized opportunity. Sabah, a Malaysian state on the island of Borneo, is endowed with rich biodiversity and multicultural indigenous communities whose livelihoods are intimately linked to forest and river ecosystems. The island of Borneo serves as a critical miniature. Its rich tropical forests, covering 65% of the land area. Sabah are home to diverse Indigenous communities, including the Kadazan-Dusun, Murut, and Bajau, whose identities and livelihoods are inextricably linked to these ecosystems. While Sabah has established a formal Sustainable Forest Management (SFM) framework, historical over-exploitation and persistent challenges like illegal logging and land-use reveal their limitations (Bryan et al. 2013).

This paper examines NRM in Sabah through the lens of local wisdom, arguing that integrating indigenous knowledge systems with contemporary scientific approaches is crucial for long-term sustainability. The research aims

to: (1) document and analyze key ILK systems related to NRM in Sabah; (2) evaluate their ecological, socio-economic outcomes into integrated formal SFM policy and practice. By doing so, it contributes to the growing literature on biocultural diversity and environmental governance in the tropics

## 2. Materials and Methods

### 2.1. Study Area

#### 1. Biophysical and Administrative Profile

Sabah (74,500 km<sup>2</sup>) occupies the northern portion of Borneo. Its topography ranges from coastal mangroves and lowland dipterocarp forests to montane forests atop Mount Kinabalu (4,095m). The climate is equatorial, but localized impacts of global climate change are observed. Administratively, forest resources are governed by the Sabah Forestry Department (SFD) under enactments of Forest Policy Enactment (1968). Figure 1 shows the map of forest lands that are classified into totally protected forest reserve and other protected forest lands in Sabah with a total of 2.012 million ha (Sabah Forestry Department, 2023).

#### 2. Socio-Cultural Landscape

Sabah, has a multi-ethnic population of over 3.1 million, comprising over 30 ethnic groups including significant Kadazan-Dusun, Murut, and Bajau communities. Indigenous communities maintain strong cultural ties to specific territories (*wilayah adat*). Their customary laws (*adat*) and spiritual beliefs (often animistic) form the foundation of ILK systems, governing resource access, use, and intergenerational transfer.

#### 3. Modern Challenges and Management Responses

Sabah's forests face pressures from deforestation, shifting cultivation, forest fires, and climate change, leading to increased temperatures and ecological disruption. In response, the Sabah Forestry Department has implemented Sustainable Forest Management (SFM) strategies. Key components include:

- 1) Reduced Impact Logging (RIL): Utilizing directional felling and advanced technology (e.g., drones) to minimize forest floor damage.
- 2) Forest Protection: Guarding against encroachment and disasters.
- 3) Community Involvement: Engaging local communities in decision-making through community forestry initiatives.
- 4) Agroforestry: Promoting integrated systems to restore degraded lands and support livelihoods.

These strategies aim to maintain ecosystem services namely provisioning, regulating, cultural, and supporting as defined by the Millennium Ecosystem Assessment (2005).

## 2.2. Procedures of Research

This study adopts a qualitative, interpretive case study design (Yin, 2018), suitable for exploring complex socio-ecological phenomena in their real-world context. Data collection (2019-2024) involved:

- 1) Document Analysis: Policy documents, SFD reports, academic literature, and media archives were reviewed to establish the formal management context.
- 2) Participant Observation: The author, embedded in the region for 25 years, conducted longitudinal field observations of ILK practices, including *Tagal* site management, *tamu* (market) interactions, and agroforestry systems.
- 3) Community Engagement: Informal dialogues and structured exchanges were held with village elders (*ketua kampung*), *Tagal* committee members, beekeepers, and herbalists. This ensured an insider perspective, guided by principles of Free, Prior and Informed Consent (FPIC).

Data was analyzed thematically to identify core principles, practices, and institutions within Sabah's ILK systems and to put together them with formal SFM mechanisms

## 3. Results and Discussion

The local wisdom in Sabah's and their synergies with SFM (Sustainable Forest

Management) provides a complementary, ground-level approach to natural resource management (NRM). The following case studies exemplify this integration:

### 3.1. The *Tagal* System: Institutionalized Communal Governance

The *Tagal* system, practiced by the Kadazan-Dusun people, is a traditional resource governance model based on the principle of *Gompi-Guno* (use and protect). The *Tagal* system is a sophisticated, rule-based common-pool resource management regime (Ostrom, 1990). It divided into two system:

- 1) *Tagal Sungai* (River): Specific River sections are declared off-limits (*tagal*) to fishing to allow fish stocks, like the *Pelian* (Malaysian Mahseer), to regenerate. Managed by the community, successful *Tagal* sites (e.g., *Tagal Luant*, *Ranau*) have evolved into ecotourism attractions, generating income and fostering stewardship. Elders determine closure periods based on biological indicators (e.g., fish spawning behavior), allowing stock recovery.
- 2) *Tagal Hutan* (Forest): Community forests are designated where resource extraction is controlled to protect watersheds and biodiversity. Access is permitted only for monitoring or with communal consent, governed by customary laws (*adat*) that ensure community involvement and stewardship. It protects upstream catchments, regulating the collection of non-timber forest products (NTFPs). This directly supports SFM goals of watershed protection and biodiversity conservation.

This system has been recognized by the Sabah Fisheries Department and Sabah Forestry, that many *Tagal* sites have evolved into Community-Based Ecotourism (CBET) enterprises. For example, *Tagal Luant* *Ranau*, generates revenue from guided fishing and lodging, which is reinvested into community funds and conservation patrols, creating a virtuous cycle of value and protection. Similarly, the *Tagal Hutan* in Kg. *Bolotikon*

Papar has been initiated by the community to protect the watershed and biodiversity.

### 3.2. Community-Based Mangrove Conservation (Kampung Rampayan Laut)

Facing mangrove degradation, the community of Kampung Rampayan Laut initiated a self-organized conservation program. This coastal community demonstrates high awareness of mangrove ecology. The development of the Kawa-Kawa River Cruise, focusing on habitat protection of proboscis monkeys (*Nasalis larvatus*) and fireflies (*Pteroptyx* spp.), created a market-based incentive for conservation. This model exemplifies how ILK-driven ecotourism can diversify incomes while fulfilling the "cultural services" pillar of the SFM's ecosystem services framework.

### 3.3. Cultural-Spiritual Foundations of Stewardship.

Indigenous communities often view nature as a living entity. Cultural events like the *Pesta Kaamatan* (Harvest Festival) involve rituals thanking spirits (gayo/amit) for bounty, reinforcing a reciprocal relationship with the land. Whereas the venues like the Mari Mari Cultural Village reinforce respect for nature. Customary laws (*adat*) prescribe sanctions for over-harvesting, enforced by village elders. This internalized governance complements (and sometimes surpasses) the limitation effect of state laws. Elders enforce customary laws that guide sustainable resource use, embedding conservation within cultural identity.

### 3.4. Apiculture (Stingless Bee Keeping): Integrating Production and Pollination

Beekeeping, particularly of stingless bees (*Madu kelulut*), is a widespread sustainable practice. It provides significant supplementary income (RM5,000–RM30,000 monthly for some farmers) from honey, propolis, and pollen. While supporting forest pollination and health, aligning economic benefits with ecological function. Crucially, kelulut bees are effective pollinators for forest and farm species,

enhancing crop yields and forest regeneration a direct contribution to SFM's "provisioning" and "supporting" services that is rarely quantified in management plans.

### 3.5. Ethnobotanical Knowledge: A Living Pharmacy

The use of *Tongkat Ali* (*Eurycoma longifolia*) for medicine is a deep-seated tradition. Knowledge of its properties and preparation is transmitted intergenerationally. Its sale in local *tamu* (markets) sustains traditional economies and serves as a hub for sharing herbal knowledge. This aligns with the Access and Benefit-Sharing (ABS) objectives of the Convention on Biological Diversity (CBD), which Malaysia has ratified.

### 3.6. Lessons Learned and Discussion

The integration of local wisdom with formal NRM in Sabah yields critical insights:

- 1) Enhanced Sustainability and Resilience: Traditional systems like *Tagal* are inherently adaptive and focused on long-term resource security, directly supporting SFM goals.
- 2) Imperative of Community Involvement: Effective conservation requires genuine community participation in governance, as seen in *Tagal* and mangrove management, which fosters ownership and compliance.
- 3) Biodiversity Conservation: Traditional agricultural and land-use practices often create and maintain heterogeneous landscapes that support high biodiversity.

Learning from History: Past development focused on extraction has led to environmental degradation. Incorporating local wisdom helps avoid repeating these mistakes by prioritizing balance and community welfare.

## 4. Conclusion

This paper highlights that local wisdom manifested in the *Tagal* system, community-based ecotourism, cultural practices, apiculture, and ethnobotany is not merely historical but a dynamic, viable component of contemporary

NRM in Sabah. These practices offer models for sustainable use, community-led governance, and biodiversity conservation. A holistic approach that fosters close cooperation between communities, government agencies, and NGOs is essential. By formally valuing and incorporating local knowledge and perspectives, policymakers can develop more inclusive, effective, and resilient strategies for managing natural resources. This ensures the preservation of ecological integrity and cultural heritage, allowing future generations to inherit both healthy ecosystems and the wisdom to care for them

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