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## UNVEILING THE ECOSYSTEM BENEFITS OF ECO FOREST PARKS: A CONCEPTUAL VIEW

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### Abstract:

Eco forest parks are essential for sustaining biodiversity, mitigating climate impacts, and promoting environmental awareness. However, the ecosystem benefits they offer are often undervalued or fragmented in current conservation strategies. This paper addresses the gap by conceptualizing a framework to systematically understand the ecosystem benefits of eco forest parks. The objective is to identify and classify these benefits under four main ecosystem service categories—provisioning, regulating, cultural, and supporting—while aligning them with conservation and sustainable development goals. This conceptual research employs qualitative content analysis of secondary literature from multidisciplinary sources. The findings highlight that eco forest parks provide more than ecological value; they contribute significantly to socio-economic development, education, and public health. However, the lack of integrated planning and recognition limits their potential. It is recommended that ecosystem benefits be incorporated into national green policies and community-based conservation programs to strengthen ecological resilience and public engagement

### Keywords:

Eco-Forest Park, Conservation, Sustainable, Ecosystem Services, Ulu Bendul, Biodiversity

## Introduction

Eco-forest parks play a critical role in safeguarding biodiversity, providing recreational opportunities, and offering essential ecosystem services such as carbon sequestration, water purification, and climate regulation (MEA, 2005; TEEB, 2010). In Malaysia, these parks also serve as cultural and educational spaces that strengthen the public's connection with nature (Mohd Shahwahid, 2016). Amid growing concerns over environmental degradation and climate change, eco forest parks are increasingly recognised as nature-based solutions that align with both conservation and sustainable development goals (Suding et al., 2015).

One of Malaysia's most well-known recreational forest areas under sustainable forest management is Ulu Bendul Eco Forest Park in Negeri Sembilan (Forest Department of Negeri Sembilan, 2020). Rich in biodiversity, including endemic plants and animals, the area is located in the southern foothills of the Titiwangsa Range. Because of its beautiful waterfalls, jungle trails, and family-friendly features, the park welcomes thousands of visitors each year (Tourism Malaysia, 2023). Despite its ecological significance and widespread appeal, Ulu Bendul's entire range of ecosystem benefits is still little understood, especially when it comes to long-term conservation and socioeconomic integration.

Although the park's biodiversity and recreational qualities have been emphasised in previous research (Latifah & Abidin, 2018), conceptual studies that methodically map the ecosystem services it offers are lacking. Furthermore, little focus has been placed on comprehending how various stakeholders such as local communities, park officials, and tourists perceive and value these services (Ismail et al., 2021). To guarantee that park management techniques are both socially inclusive and ecologically successful, a deeper comprehension is required. Conservation areas are extremely important on a global scale because they possess incredible natural landscapes, hold historical significance, embody cultural value, and attract ecotourism (Dusim et al., 2023).

Despite its ecological and recreational significance, Ulu Bendul Eco-Forest Park is currently facing several pressing challenges. Increasing visitor numbers, particularly during weekends and public holidays, have led to issues of overcrowding, which can diminish the quality of the visitor experience and place additional strain on park facilities. Waste disposal remains a persistent problem, with inadequate collection systems and visitor negligence contributing to littering along trails and water bodies. Furthermore, popular hiking routes are experiencing trail erosion, leading to soil degradation and disturbance of sensitive habitats. There is also limited public understanding of the park's ecosystem service values, particularly among tourists and some local stakeholders, which undermines efforts to promote sustainable use. Lastly, the integration of The Economics of Ecosystems and Biodiversity (TEEB) valuation into park management practices remains minimal, reducing opportunities to align conservation priorities with economic and policy decision-making.

The purpose of this proposed study is to aid in the creation of an all-encompassing conceptual framework that encompasses Ulu Bendul Eco Forest Park's ecological advantages. The research will provide insights into the park's role in advancing conservation and sustainable development by categorising and evaluating these benefits using the framework of ecosystem service categories: providing, regulating, cultural, and supporting.

### The History of Ulu Bendul Eco-Forest Park

One of Malaysia's oldest forest recreation areas, Ulu Bendul Eco Forest Park (also known as Taman Eko Rimba Ulu Bendul) is situated in Negeri Sembilan's Angsi Forest Reserve. The Park, which was created by the Negeri Sembilan State Forestry Department in the early 1970s, has grown to be a popular ecotourism destination in Peninsular Malaysia's southern region (Forest Department of Negeri Sembilan, 2020). The local stream, Sungai Batang Terachi, and the traditional Malay word "ulu," which means upstream, are the sources of its name. Ulu Bendul has evolved over the years from a peaceful picnic area to a popular forest park that welcomes hikers, students, nature lovers, and conservationists (Tourism Malaysia, 2023). Picture 1 depicts Ulu Bendul Eco-Forest Park.



**Picture 1: Ulu Bendul Eco-Forest Park**

(Source: Laman Web Rasmi Majlis Keselamatan Negara)

Over 80 hectares of ecologically rich land make up the park, which is located inside a lowland dipterocarp forest. Many tree species, birds, insects, and small mammals that are indigenous to the central forest spine of Peninsular Malaysia are among its biodiversity (Latifah & Abidin, 2018). The Sungai Batang Terachi waterfall, a nature interpretation trail, camping areas, and a hiking trail that leads to Gunung Angsi, one of Malaysia's most accessible and visited mountains are among the well-liked attractions. The Park is an essential green learning area for nearby communities and educational institutions since it is also utilised for environmental awareness campaigns and nature education programs.

Ulu Bendul is under growing environmental pressure due to excessive visitor numbers, poor waste management, and unsustainable recreational practices, despite its significance for ecology, recreation, and education (Ismail et al., 2021). These new issues highlight the necessity of long-term conservation planning and integrated ecosystem-based management techniques. A major ecological landscape that sustains biodiversity, provides ecosystem services, and presents chances for sustainable development especially through community-based ecotourism and forest stewardship of Ulu Bendul is more than just a recreational destination.

### **Role Of Eco-Forest Park for Overall Ecosystem**

Ecosystem benefits, or ecosystem services, are vital to human survival and environmental stability, especially amid growing challenges such as climate change, biodiversity loss, and urbanization. Natural ecosystems regulate climate by absorbing greenhouse gases, stabilizing local weather patterns, and reducing the impact of extreme weather events (IPBES, 2019). Forests, wetlands, and green spaces play a significant role in carbon sequestration and climate adaptation by functioning as natural buffers against floods and heatwaves (MEA, 2005). Additionally, ecosystems support biodiversity by offering food, shelter, and breeding grounds for a wide range of species. Biodiversity enhances ecosystem resilience and ensures the continued provision of critical services like pollination, water purification, and disease regulation (Díaz et al., 2019). In rapidly urbanizing areas, the disappearance of natural habitats leads to a decline in environmental quality and public health. Green infrastructure, including eco forest parks, becomes essential in mitigating urban heat, improving air quality, and enhancing psychological well-being (Tzoulas et al., 2007). Eco forest parks, in particular, serve as multifunctional landscapes that integrate ecological preservation with recreational, educational, and cultural values. They conserve native flora and fauna, protect watersheds, and act as carbon sinks, while also providing spaces for environmental education and community engagement (Haaland & van den Bosch, 2015). These parks represent an essential element of sustainable development, offering economic opportunities through eco-tourism and fostering a deeper public appreciation for nature. Therefore, recognizing and enhancing the ecosystem benefits provided by eco forest parks is critical for building climate-resilient and biodiversity-rich communities.

### **Theoretical Background**

Ecosystem services refer to the broad range of benefits that humans obtain from nature, which are essential for survival, well-being, and economic development. According to the Millennium Ecosystem Assessment (2005) and the TEEB (The Economics of Ecosystems and Biodiversity) initiative (TEEB, 2010), ecosystem services are commonly classified into four main categories: provisioning, regulating, cultural, and supporting services. These services not only sustain the natural environment but also provide vital resources and functions that underpin human life and societal progress. Provisioning services are the tangible products derived directly from ecosystems, such as food, freshwater, fuel, and medicinal resources. Forest ecosystems, for instance, are known to provide a variety of medicinal plants, clean water from protected watersheds, and edible products such as fruits and mushrooms (MEA, 2005). These resources are especially crucial for rural and Indigenous communities that rely on forest ecosystems for their daily needs and livelihoods. Regulating services involve the benefits obtained from the regulation of ecosystem processes. Forests, including Eco Forest Parks, contribute significantly to climate regulation through carbon sequestration, where they absorb and store carbon dioxide, helping to mitigate climate change (IPCC, 2022). Additionally, trees and vegetation purify the air by filtering pollutants, and they regulate water flows and quality, reducing the risk of floods and landslides (TEEB, 2010). Cultural services refer to the non-material benefits ecosystems provide, such as recreational opportunities, aesthetic enjoyment, spiritual enrichment, and educational value. Eco Forest Parks serve as important spaces for outdoor recreation, ecotourism, nature-based education, and community engagement, fostering a stronger connection between people and the natural world (Haaland & van den Bosch, 2015). In many cultures, forests are also considered sacred and play a role in cultural identity and heritage.



Lastly, supporting services are fundamental processes that maintain the conditions for life on Earth, including nutrient cycling, soil formation, and primary production. These services are not always directly visible but are essential for the functioning of all other ecosystem services. For example, forest ecosystems enhance soil fertility through organic matter decomposition and nutrient cycling, which support plant growth and biodiversity (MEA, 2005). In summary, understanding and valuing these multiple dimensions of ecosystem services is critical for developing integrated conservation and management strategies in Eco Forest Parks. Such a framework promotes not only environmental sustainability but also socio-economic well-being.

### ***Past Studies on Forest Parks and Ecosystem Valuation***

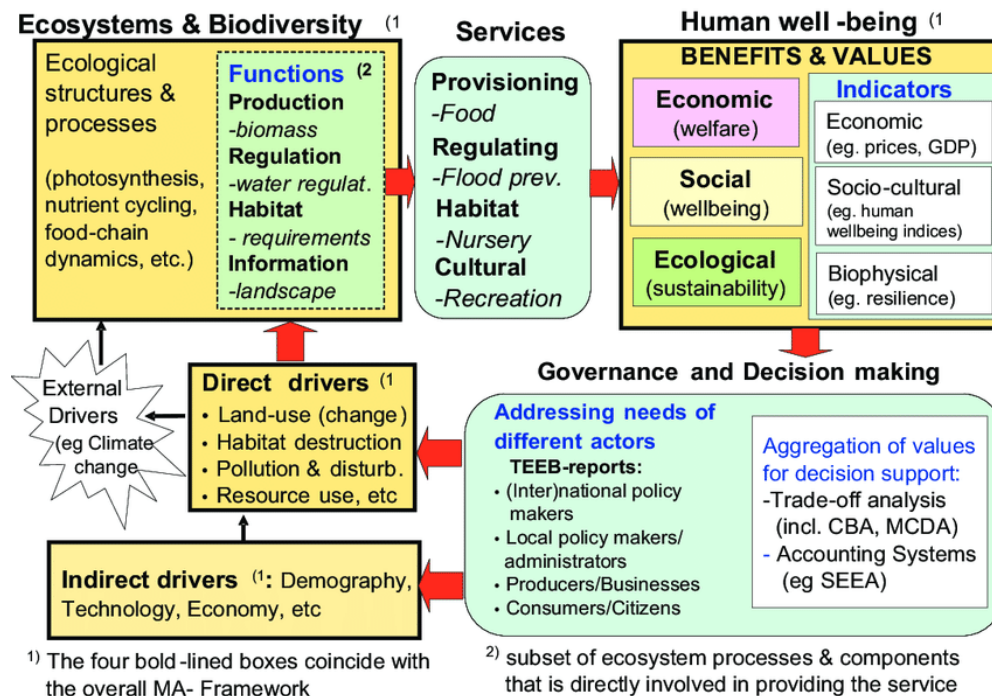
Over the years, forest parks have been widely studied for their ecological, recreational, and socio-economic importance. The crucial role that a quality environment plays in the lives of both humans and animals cannot be overstated (Amin et al., 2024). Numerous studies have assessed their biodiversity value, eco-tourism potential, and contribution to community livelihoods (Rahman et al., 2020; Ghazali et al., 2019). However, there has been a growing shift toward quantifying the economic value of ecosystem services they provide, such as carbon storage, water regulation, and air purification. For example, Costanza et al. (2014) estimated the global value of ecosystem services at approximately USD 125 trillion annually, emphasizing the vast contributions of forests. In the Malaysian context, Norhasyim et al. (2019) used contingent valuation methods to estimate the willingness to pay for forest conservation, highlighting the public's growing awareness and appreciation of forest ecosystem services. Despite these advancements, most valuation studies still focus on individual services (like tourism or carbon), with limited integration of the multi-functional ecosystem service framework in forest park planning and management.

In recent years, valuation methods have evolved to include both market and non-market techniques, such as travel cost method (TCM), choice modelling (CM), and benefit transfer approaches, to assess the recreational and cultural values of forest parks (Garrod & Willis, 1999; Yacob et al., 2017). These techniques have been useful in capturing the intangible benefits that are otherwise excluded from traditional economic accounting. For instance, studies conducted in recreational forests in Malaysia showed that visitors are willing to pay entrance fees or make donations to support conservation and maintenance, reflecting their perception of forest parks as valuable assets beyond mere tourism attractions (Yacob et al., 2017).

However, a major limitation in the current body of research is the fragmented nature of ecosystem valuation, where services are often evaluated in isolation rather than as interconnected systems. This approach underrepresents the synergistic functions of ecosystem services and may lead to under-informed policy decisions (de Groot et al., 2012). Furthermore, most studies emphasize short-term economic gains from tourism rather than the long-term ecological sustainability of forest parks. There is a need to shift from conventional conservation narratives to a systems-based understanding that integrates ecological, economic, and socio-cultural values into holistic forest park management strategies (Daily et al., 2009).

While the TEEB framework offers a comprehensive approach to valuing ecosystem services, its application in Ulu Bendul Eco-Forest Park has been limited (TEEB, 2010). Current park assessments lack a systematic valuation of all four TEEB categories: provisioning, regulating,

cultural, and supporting services which restricts the ability to fully capture the park's ecological and socio-economic contributions. Policy and management plans have not consistently incorporated TEEB results, leading to a gap between valuation studies and actionable conservation strategies. Notably, there are significant data gaps in the valuation of cultural and regulating services, such as recreation benefits, carbon sequestration, and climate regulation. These undervalued aspects often remain underreported in official documents, resulting in policies that fail to recognize their long-term benefits for both biodiversity conservation and local livelihoods. Diagram 1 shows TEEB's framework for ecosystem services.



**Diagram 1: TEEB's framework for ecosystem services**

(Sources: Finlayson, 2018)

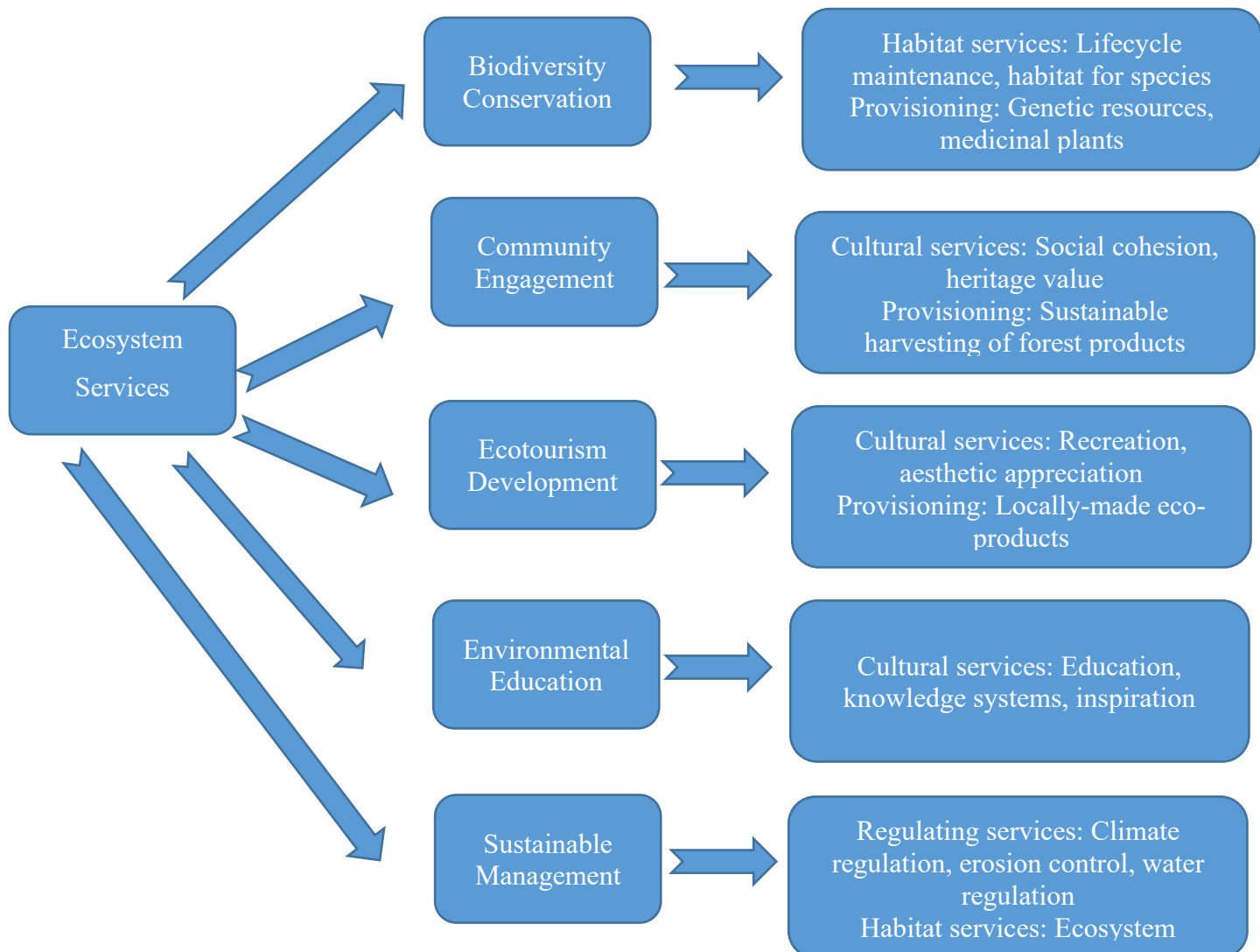
The present study is grounded in two complementary theoretical foundations: the The Economics of Ecosystems and Biodiversity (TEEB) framework and the Millennium Ecosystem Assessment (MEA). The MEA provides a global classification of ecosystem services provisioning, regulating, cultural, and supporting, while TEEB advances this by embedding these categories within an economic and policy-relevant valuation approach. TEEB is particularly relevant to this research as it translates ecological benefits into socio-economic terms that can influence decision-making at multiple governance levels. In the context of Ulu Bendul Eco-Forest Park, TEEB serves as the interpretive "lens" through which ecosystem service categories are identified, valued, and linked to sustainable management strategies. This dual-theoretical foundation ensures that both ecological and socio-economic dimensions are integrated into the conceptual model.

As a result, forest parks may not receive adequate funding or protection, despite their proven contributions to climate regulation, health, and community resilience. Bridging this gap requires both scientific research and policy innovation to incorporate ecosystem service values into environmental planning, land use policies, and public education campaigns.

Overall, past studies demonstrate a growing recognition of the multiple values provided by forest parks. Yet, more integrated and interdisciplinary research is needed to fully articulate their ecosystem service functions and guide evidence-based conservation and management.

### Conceptual Framework

The conceptual framework illustrates the multidimensional role of Eco Forest Parks in delivering ecosystem services that support both environmental sustainability and human well-being. These parks act as integrated landscapes where biodiversity conservation, community participation, educational activities, and eco-tourism development converge under the umbrella of sustainable management. Each component is interlinked and contributes to the provision of various ecosystem services provisioning, regulating, cultural, and supporting services as outlined by the Millennium Ecosystem Assessment (MEA, 2005). Biodiversity Conservation serves as the foundation by preserving native flora and fauna, which is critical for ecosystem stability and resilience. Community Engagement fosters local stewardship, encourages sustainable livelihoods, and increases awareness of the value of forest ecosystems. Ecotourism generates economic benefits while promoting conservation-oriented recreational activities. Education builds environmental awareness through interpretive trails, school visits, and citizen science, enhancing the public's appreciation for nature. Sustainable Management ensures that all these elements are maintained in balance, using scientific monitoring and adaptive practices to protect ecosystem integrity. Together, these components function synergistically to maximize the social, economic, and environmental benefits of Eco Forest Parks. The study's conceptual framework demonstrates how Eco Forest Parks integrate biodiversity conservation, community involvement, ecotourism, environmental education, and sustainable management to function as multipurpose landscapes that offer a broad range of ecosystem services. For a variety of stakeholders, this framework provides insightful information. Diagram 2 summarise the ecosystem services framework in Ulu Bendul Eco-Forest Park.



**Diagram 2: Ecosystem Services Framework in Ulu Bendul Eco-Forest Park**

### Conclusion

This study underscores the critical importance of recognizing and integrating ecosystem services into the planning, management, and promotion of Eco Forest Parks. Forest parks are not merely recreational spaces they are dynamic ecological systems that provide vital services such as climate regulation, biodiversity conservation, clean water, education, and cultural enrichment. As pressures from urbanization, climate change, and development continue to mount, it is essential to adopt a holistic, ecosystem-based approach in forest park governance. For Ulu Bendul Eco-Forest Park to achieve ecological sustainability and community well-being, an integrated management approach guided by the TEEB framework is essential. First, systematic TEEB valuation should be conducted to inform decision-making, ensuring that all ecosystem services particularly regulating and cultural services are adequately recognized. Second, waste management infrastructure and visitor regulation measures should be strengthened to reduce pollution and habitat degradation. Third, community-based ecotourism initiatives should be expanded to enhance local livelihoods and encourage active stewardship. Fourth, a biodiversity monitoring system should be established to track species diversity,



ecosystem health, and service provision over time. Lastly, ecosystem service education should be incorporated into tourism programs to raise visitor awareness and foster a culture of conservation.

A clear call to Ecosystem benefit thinking must be mainstreamed into forest park policy, educational curricula, tourism strategies, and community outreach. By doing so, Eco Forest Parks can be better positioned to contribute meaningfully to environmental sustainability, human well-being, and the achievement of global goals such as the SDGs. An integrated approach ensures that these green spaces continue to thrive not just for recreation, but for the long-term resilience of nature and society.

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