



Existence Value of Post-Mining Conservation Area: A Contingent Valuation Study of Lati Petangis Grand Forest Park, East Kalimantan

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Keywords

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Abstract

Quantifying the existence value of post-mining conservation areas is essential for justifying their legal protection and securing conservation finance, yet such assessments remain scarce in Indonesian tropical settings. This study estimates the existence value of Lati Petangis Grand Forest Park (Tahura Lati Petangis/TLP), a conservation area established from former coal mining land in Paser Regency, East Kalimantan. The Contingent Valuation Method (CVM) with a Willingness to Pay (WTP) approach was applied to 96 visitor respondents. Results show a weighted mean WTP of IDR 178,486 per individual with an 87.5% participation rate. The existence value was estimated at IDR 21,284,188,625 for the visitor population and IDR 752,608,083 for surrounding local communities, yielding a combined total existence value of IDR 22,036,796,708 per year, equivalent to 2.29% of the total economic value under the moderate scenario. The high existence value reflects strong public support for preserving this post-mining landscape and provides empirical grounding for conservation policy and Payment for Ecosystem Services mechanisms at comparable restoration sites across Indonesia.

INTRODUCTION

The concept of existence value was first formally articulated by Krutilla (1967), who argued that certain valuable natural environments hold intrinsic worth that cannot be captured through conventional market mechanisms or direct use valuation. This passive use value, later termed existence value by economists, represents individuals' willingness to pay simply to ensure that a natural resource or ecosystem continues to exist, even without any intention of personal use either now or in the future (D. Pearce, 1992; D. A. Pearce & Moran, 1994; Pisani et al., 2021). As a fundamental component of the Total Economic Value (TEV) framework, existence value is particularly critical for conservation areas that face threats from competing land uses, as it provides economic justification for preservation decisions that transcend market-based calculations.

Post-mining reclamation areas

represent a unique category of conservation sites that embody both ecological restoration ambitions and complex social narratives. Unlike pristine natural reserves, these areas carry the legacy of industrial extraction and the promise of ecological regeneration, creating a distinctive context in which existence value estimation must grapple with layered public perceptions of risk, ecological restoration potential, and intergenerational responsibility. The Lati Petangis Grand Forest Park (locally known as Tahura Lati Petangis) in Paser Regency, East Kalimantan, Indonesia, exemplifies this challenge. Spanning 3,445.37 hectares, the area was established from the former concession of PT BHP Kendilo Coal Indonesia, which conducted open-pit coal mining from 1993 to 2002 in the Petangis block, covering an area approximately 613 hectares.

Following the cessation of mining

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activities, a gradual process of ecological and administrative transformation began. The site was formally designated as a Grand Forest Park through the Decree of the Minister of Forestry of the Republic of Indonesia Number SK.141/Menhut-II/2013 and subsequently delineated definitively through SK.4335/MenLHK-PKTL/KUH/2015. Today, the area hosts a remarkable ecological recovery, with approximately 64.07% forest cover dominated by secondary dryland forest and plantation timber. Eight artificial and natural lakes formed from former coal pits serve as ecological landmarks, the largest of which, Gentung Dayo, covers 124,458.64 square meters. The park is inhabited by diverse wildlife including 20 mammal species and 92 bird species, many of which are listed under CITES appendices and IUCN Red List categories.

Despite its ecological significance and growing ecotourism activity, with visitor numbers reaching 4,111 by July 2025, the non-use economic values of Tahura Lati Petangis remain poorly understood. Most valuation studies of Indonesian conservation areas have focused on direct use values such as timber, non-timber forest products, and tourism revenues (Adrianto et al., 2018; Munasinghe & Swart, 2020). Studies specifically addressing existence value in post-mining conservation contexts are exceptionally scarce, particularly in Southeast Asian tropical settings. This knowledge gap constrains evidence-based policy advocacy for conservation funding, legal protection reinforcement, and sustainable management planning.

The Contingent Valuation Method (CVM) has emerged as the most widely accepted technique for estimating non-use values, including existence value, precisely because it employs hypothetical market scenarios to elicit individuals' willingness to pay (WTP) for intangible environmental goods (Bamwesigye et al., 2020; Go et al., 2025). The method has been extensively validated across conservation contexts ranging from biodiversity hotspots in India (Payal et al., 2024)

to wetland ecosystems in South East Asia (Siew et al., 2015; Truong, 2021). However, its application in Indonesian post-mining restoration areas is still developing, underscoring the originality and policy relevance of the present study.

This research therefore aims: (1) to estimate the existence value of Tahura Lati Petangis using the Contingent Valuation Method; (2) to examine the socioeconomic and attitudinal determinants of visitors' willingness to pay for the continued existence of this post-mining conservation area; and (3) to provide empirical evidence to inform conservation management and policy advocacy for similar post-mining restoration sites in Indonesia. The findings contribute to a broader understanding of how societies value ecological recovery in degraded landscapes, and offer a methodological framework applicable to other Taman Hutan Raya establishments across the Indonesian archipelago.

RESEARCH METHOD

This study employed a quantitative descriptive research design, utilizing the Contingent Valuation Method (CVM) as the primary analytical framework to estimate existence value of Tahura Lati Petangis. CVM is a stated preference technique widely used in environmental economics to elicit individuals willingness to pay (WTP) for non-market goods, including conservation areas with significant passive use values (Bizuneh, 2021; Tao et al., 2012). The research approach followed the guidelines established by National Oceanic and Atmospheric Administration (NOAA) Blue Ribbon Panel (Bateman & Turner, 1992), which prescribes best practices for CVM design ensure validity and reliability of the estimates. Data were collected through structured interviews using a pre-tested questionnaire incorporating a payment card elicitation format. This design enabled systematic measurement of respondents stated WTP values and their determinants within a controlled but naturalistic survey setting.

Study Area

The study was conducted at Tahura Lati Petangis, in Batu Engau Sub-district, Paser Regency, East Kalimantan Province, Indonesia. This location was selected purposively based on several criteria: (1) it represents one of the few legally designated conservation areas in Indonesia established on former coal mining land, offering a rare case study for post-mining ecological valuation; (2) it has an established ecotourism visitor base, ensuring availability of respondents capable of evaluating the site's conservation scenario; (3) it is managed by a formal government agency with accessible secondary data records; and (4) the site faces ongoing pressure from land conversion activities, making existence value estimation particularly relevant for conservation policy advocacy. The area covers 3,445.37 ha distributed across three villages: Saing Prupuk (63.59%), Petangis (31.45%), and Tebru Paser Damai (4.96%). The park is accessible via a national paved road linking East Kalimantan and South Kalimantan provinces, approximately 34 km from the Paser Regency capital, requiring 30 to 45 minutes of travel time. The study site is managed by the Environmental Management Agency (Dinas Lingkungan Hidup) of Paser Regency and receives visitors primarily for ecotourism activities centered on the former mining pit lakes.

Data Collection

Primary data were collected through structured interviews with 96 visitors during the ecotourism season of 2024–2025. Respondents were selected using purposive sampling, with the criteria each visitor (1) was at least 17 years of age, consistent with the legal threshold for adults capable providing informed consent and engaging meaningfully with economic valuation scenario and (2) had completed at least one full visit to the park's main attraction. The questionnaire was designed following standard CVM protocols (Arrow et al., 1993) and included three main components: (1) socioeconomic and demographic information;

(2) behavioral and attitudinal variables regarding conservation and environment; and (3) elicitation of WTP for the continued existence of Tahura Lati Petangis through a payment card format presenting a range of monetary values from IDR 0 to IDR 1,000,000 per year.

The payment vehicle used was a hypothetical annual voluntary contribution to a Tahura Lati Petangis Conservation Fund, which respondents were asked to consider paying to ensure the area's continued existence and ecological maintenance. The scenario clearly stated that the payment was independent of any intention to visit or derive direct benefit from the site. Secondary data were obtained from the 2020 Biodiversity Inventory Document, visitor statistics from the Tahura management office, and population data from the three surrounding villages (July 2025).

Data Analysis

Data analysis was conducted based on the three research objectives. To address the first objective (estimating the existence value of Tahura Lati Petangis) a weighted mean WTP was calculated based on responses obtained from the payment card method and subsequently extrapolated to the visitor and surrounding community populations. To address the second objective (characterizing the socio-economic and attitudinal determinants of WTP) descriptive statistics and logistic regression analysis were applied to identify significant predictors of willingness to pay. To address the third objective (providing empirical evidence for conservation management and policy advocacy) the estimated existence value was positioned within the Total Economic framework and benchmarked against comparable post-mining restoration assessments in the literature. All analyses were performed using Data Analysis for Excel and Microsoft Excel.

Willingness to Pay (WTP) Estimation

Willingness to Pay was estimated using the mean WTP method with frequency weighting, following the formula

proposed by Pearce and Turner (1990) (Fadillah & Juwana, 2023):

$$\text{Mean WTP (Weighted)} = (\sum W_i \times P_{fi}) / n \quad (1)$$

Where W_i is each WTP bid value offered by respondents, P_{fi} is the relative frequency of each bid value as a proportion of total responses, and n is the total number of respondents. The weighted mean WTP was computed to account for the non-uniform distribution of bid values across the payment card scale, providing a more representative central tendency estimate than a simple arithmetic mean.

Total Willingness to Pay and Existence Value

Following the estimation of mean WTP, the Total WTP (TWTP) was calculated by multiplying the proportion of respondents willing to pay by the estimated mean WTP: $TWTP = \text{Proportion WTP} \times \text{Mean WTP} \times \text{Population}$ (2)

The existence value was then extrapolated to two reference populations: (1) the total visitor population as recorded for 2024–2025 (4,111 individuals), and (2) the total resident population of the three villages surrounding Tahura Lati Petangis (4,819 individuals as of July 2025). This dual-population approach allows for a comprehensive assessment of societal valuation from both user (visitor) and local community perspectives, recognizing that existence value may manifest differently across these groups.

Validity and Reliability Testing

To ensure the robustness of the CVM estimates, the study applied scope tests, comparing WTP responses across sub-groups with different levels of ecological awareness. The consistency of WTP bids was assessed through a split-sample analysis, and protest zeros (respondents who refused to pay due to principled objections rather than zero valuation) were identified through follow-up questions and excluded from the main WTP calculation but reported separately. A consistency ratio test was conducted to validate the internal coherence of the WTP distribution, and results were compared between the initial dataset and a consistency-tested subsample to ensure

stability of estimates.

Ethical Considerations

Informed consent was obtained from all respondents prior to interviews. Participation was entirely voluntary and respondents were assured of data confidentiality. The study complied with the ethical guidelines for environmental economic research.

RESULTS AND DISCUSSION

Respondent Socioeconomic Profile

The socioeconomic profile of the 96 respondents reveals a visitor base dominated by educated adults with moderate to good purchasing power. Female visitors constituted 61% of the sample compared to 39% male, suggesting that Tahura Lati Petangis attracts a demographically gender-balanced, albeit female-leaning, visitation profile. This finding aligns with recent trends observed in ecotourism contexts globally, where women demonstrate higher stated preferences for nature-based recreation and environmental preservation (Payal et al., 2024; Zegeye et al., 2023).

In terms of age distribution, the productive age cohort of 26–35 years was the largest segment (31%), followed by the 36–45 age group (29%) and the 17–25 cohort (22%). Together, the 17–45 age group accounted for 82% of respondents, representing a predominantly active and environmentally conscious demographic. Educational attainment was markedly high, with 63% holding undergraduate or postgraduate qualifications (S1/S2) and 27% being senior secondary school graduates. This educational profile suggests a visitor population with above-average capacity to comprehend and evaluate complex conservation scenarios as presented in the CVM exercise (Zegeye et al., 2023).

Income distribution showed that 39% of respondents earned between IDR 1,000,000 and IDR 3,000,000 per month, while 31% earned IDR 3,000,000–5,000,000 monthly, and 25% reported income exceeding IDR 5,000,000. Only 5% reported income below IDR 500,000. This

Table 1
Socioeconomic Profile of Respondents (n = 96)

Variable	Category	Frequency	Percentage (%)
Gender	Male	37	39
	Female	59	61
Age (years)	17-25	21	22
	26-35	30	31
	36-45	28	29
	46-55	15	16
	> 55	2	2
Education	Senior High School	26	27
	Diploma (D3)	8	8
	Bachelor/Master (S1/S2)	61	63
	Others	1	2
Monthly Income (IDR)	< 500,000	5	5
	1,000,000-3,000,000	37	39
	3,000,000-5,000,000	30	31
	> 5,000,000	24	25

Source: Processed Primary Data, 2025

income structure indicates a visitor population with sufficient discretionary income to participate meaningfully in contingent valuation exercises, reducing the risk of strategic underbidding due to budget constraints.

Willingness to Pay for Existence Value

The CVM elicitation process revealed a high overall willingness to pay for the continued existence of Tahura Lati Petangis, with 84 out of 96 respondents (87.5%) expressing a positive WTP amount. The 12 respondents (12.5%) who stated a zero WTP were further questioned to distinguish true zero valuers from protest respondents. Of these, eight cited principled objections, primarily the view that conservation funding is the government's responsibility—and were classified as protest zeros, while four reported genuine zero valuations due to financial constraints. In line with established CVM practice (Doli et al., 2021; Musa & Shahrudin, 2023), protest zeros were excluded from the WTP calculation and only genuine zeros were retained.

The distribution of positive WTP bids ranged from IDR 5,000 to IDR 500,000 per year, with the modal response clustering around IDR 50,000–100,000. The aggregate sum of willingness-to-pay amounts ($\sum W_i$) across the 96 respondents reached IDR 5,917,000, yielding a simple mean WTP of IDR 61,635.42 per individual. When adjusted using the frequency-weighting method to account for the relative distribution of bid values, reflecting the relative frequency ($P_{fi} = 2.896$) of the predominant bid category, the weighted mean WTP was estimated at IDR 178,486 per individual per year.

The total existence value for the visitor population of 4,111 individuals was thus estimated at IDR 21,284,188,625 (approximately USD 1.33 million at IDR 16,000/USD), while the existence value derived from the 4,819 local residents of the three surrounding villages amounted to IDR 752,608,083. The combined total existence value therefore reached IDR 22,036,796,708 (approximately USD 1.38 million) annually.

Tabel 2
Summary of Willingness to Pay Estimation for Existence Value

Parameter	Value
Total WTP Bids (ΣW_i)	IDR 5,917,000
Number of Respondents (n)	96
Simple Mean WTP ($\Sigma W_i/n$)	IDR 61,635.42
Relative Frequency (P _{fi})	2.896
Weighted Mean WTP	IDR 178,486
Respondents Willing to Pay (ni)	84 (87.5%)
Total WTP (TWTP)	IDR 5,177,375
Visitor Population (2025)	4,111
Existence Value - Visitors	IDR 21,284,188,625
Local Population (3 Villages)	4,819
Existence Value - Local Communities	IDR 752,608,083
Total Existence Value	IDR 22,036,796,708

Source: Processed Primary Data, 2025

These figures place Tahura Lati Petangis among the higher end of non-use valuations for conservation areas of comparable size in Indonesia (Efendi et al., 2024; Irawan Johari & Safaat Adiansyah, 2021; Karmini et al., 2021; Sari et al., 2022), a result attributable in part to the high educational and income profile of its visitor base.

Determinants of Willingness to Pay

The high participation rate (87.5%) and the elevated mean WTP observed in this study can be interpreted through several intersecting factors. First, the educational profile of the visitor population with 63% holding university degrees is consistent with the well established positive relationship between education and environmental WTP documented across multiple continental settings (Deely et al., 2022; Musa & Shahrudin, 2023; Odysseas Kopsidas & Leonidas Fragkos-Livanios, 2015; Payal et al., 2024). Highly educated individuals tend to possess greater awareness of ecosystem services and their economic implications, facilitating more informed responses in CVM scenarios.

Second, the unique origin of Tahura Lati Petangis as a post-mining

restoration site appears to have heightened respondents' perceived importance of active conservation support. When asked about their primary motivation for visiting, 85% cited leisure and ecotourism, while 63% identified the post-mining lakes (gentung) as the most compelling attraction. This attachment to a visually distinctive landscape that represents successful ecological recovery likely amplified respondents' willingness to pay for its continued existence, consistent with place attachment theory in environmental psychology (Aldred, 1994; Harini et al., 2021; Johari et al., 2023; Nor et al., 2022).

Third, the proximity of the study area to the resource extraction industry with active coal mines bordering the southern boundary of the park and oil palm plantations on the north, west, and east flanks, may have activated a threat-induced valuation effect. Previous CVM studies have demonstrated that perceived environmental threats significantly increase stated WTP for conservation (Hanif et al., 2025; Pagouni et al., 2024; Siahaan et al., 2025; Zeqiri et al., 2024), suggesting that respondents who were aware of the park's vulnerable boundary

context may have expressed higher WTP to reflect their desire for stronger conservation protection.

Existence Value in the Context of Total Economic Value

Within the broader Total Economic Value (TEV) framework calculated for Tahura Lati Petangis, the existence value component of IDR 22,036,796,708 represents 2.29% of the total estimated economic value under the moderate carbon valuation scenario of IDR 961,430,823,264. While this percentage appears modest relative to the Indirect Use Value dominated by carbon sequestration (92.97%), the absolute magnitude of the existence value is substantial and exceeds the entire Direct Use Value (DUV) of all forest products, fauna, non-timber forest products, and ecotourism combined (IDR 24,294,494,394), indicating that the conservation significance of the area extends well beyond what its current use-based economy captures.

This finding corroborates the theoretical premise advanced by (Balmford et al., 2002; Costanza, 2024) that non-use values constitute a substantial and frequently

underestimated component of the total social value of conservation areas. The relative magnitude of the existence value relative to bequest value (IDR 21,284,188,625) with the two values being nearly equal further confirms the methodological consistency of the CVM exercise, as existence and bequest values are conceptually related and empirically expected to be of comparable scale (Efendi et al., 2024; Sari et al., 2022).

Implications for Post-Mining Conservation Policy

The quantified existence value of IDR 22,036,796,708 per year provides a compelling empirical foundation for strengthening the policy case for Tahura Lati Petangis's legal protection and management funding. At a time when the 2024 Ministerial Decree has already authorized the conversion of 100 ha of park land for economic investment purposes, the existence value estimates offer a direct counterargument framed in the language of economic rationality: the societal value of the area's continued existence measured conservatively against visitor and local populations alone substantially exceeds the expected economic returns from small-scale land

Table 3
Existence Value in the Context of Total Economic Value (Moderate Scenario)

Value Category	Value (IDR)	Percentage (%)
Direct Use Value (DUV)	24,294,494,394	2.53
- Flora (Timber)	155,312,043	0.02
- Fauna	873,419,200	0.09
- NTFP (HHBK)	76,130,000	0.01
- Ecotourism (ITCM)	23,189,633,151	2.41
Indirect Use Value (IDUV)	893,815,343,537	92.97
- Carbon Sequestration	885,864,497,576	92.14
- Water Regulation	333,000,000	0.03
- Erosion Control	7,617,845,961	0.79
Bequest Value	21,284,188,625	2.21
Existence Value	22,036,796,708	2.29
TOTAL ECONOMIC VALUE	961,430,823,264	100.00

Source: Processed Primary Data, 2025

conversions.

Moreover, the relatively high WTP among local residents (mean IDR 178,486 per household per year) suggests that community engagement in conservation finance mechanisms such as Payment for Ecosystem Services (PES) schemes could be both feasible and politically viable in this context. International experience with community-financed conservation trusts in reclaimed landscapes (Bamwesigye et al., 2020; Payal et al., 2024; Sourokou et al., 2023) offers transferable models that could be adapted to mobilize the latent financial commitment expressed through WTP statements into actual conservation investment. The Indonesian government's growing engagement with the IDX Carbon exchange further opens pathways for linking the carbon sequestration value of the post-mining forest with the concept of existence value as a dual justification for conservation finance.

The lower existence value estimated for the local residential population (IDR 752,608,083) compared to the visitor population reflects both a smaller absolute population contributing to the calculation and a potentially different valuation frame among residents, many of whom are migrants from Java, South Kalimantan, and Sulawesi with shorter tenure of place attachment (Bizuneh, 2021; Budi Setyawan et al., 2020; Mauri et al., 2022). This disparity underscores the importance of investing in environmental awareness programs and community interpretation services that translate ecological knowledge into economic valuation literacy among local stakeholders, thereby expanding the social constituency for conservation over time.

Methodological Considerations and Limitations

Several methodological considerations warrant acknowledgment in interpreting these findings. The CVM, while the most widely accepted technique for existence value estimation, is subject to hypothetical bias, the tendency for stated WTP to

exceed actual payment behavior (Alarcón-Aguirre et al., 2025; Lan et al., 2024; Payal et al., 2024). Even under the most conservative calibration assumption, however, the resulting adjusted existence value would still substantially exceed IDR 7 billion annually, maintaining the policy relevance of the estimates.

Additionally, the sample of 96 visitors, while statistically adequate for a single-season study, may not fully capture seasonal variation in visitor demographics and WTP distributions. Future research should incorporate multi-season sampling and expand the respondent pool to include non-visitor segments of the regional population in order to derive a more comprehensive existence value estimate. The payment card elicitation format, while reducing non-response and protest bids, may introduce starting point bias; future studies could complement this with open-ended or dichotomous choice formats to improve robustness.

CONCLUSION

This study demonstrates that Tahura Lati Petangis possesses a substantial and measurable existence value, estimated at IDR 21,284,188,625 for the visitor population and IDR 752,608,083 for surrounding communities, yielding a combined existence value of IDR 22,036,796,708 per year. These values, derived through the Contingent Valuation Method with a weighted mean WTP of IDR 178,486 per individual, underscore the high level of societal commitment to the preservation of this post-mining conservation area even in the absence of direct utilization intent. Within the broader Total Economic Value framework, the existence value constitutes 2.29% of total estimated value, a modest proportion that nonetheless exceeds the total direct use value of all forest goods and ecotourism combined. The findings provide robust empirical support for reinforcing the legal protection of Tahura Lati Petangis against ongoing land conversion pressures and for establishing

conservation finance mechanisms including Payment for Ecosystem Services and carbon market linkages, that can translate passive societal valuation into active conservation investment. Future research should expand to multi-season sampling, non-visitor populations, and experimental WTP elicitation formats to deepen the precision and representativeness of existence value estimates for this and comparable post-mining conservation areas across Indonesia. Based on these findings, several recommendations are proposed. First, the Environmental Management Agency of Paser Regency should formally incorporate the estimated existence value into budget planning and performance reporting frameworks to strengthen the case for sustained public funding of Tahura Lati Petangis conservation programs. Second, the national and provincial governments should consider Tahura Lati Petangis as a pilot site for implementing a Payment for Ecosystem Services scheme, wherein the documented societal WTP can serve as the financial basis for rewarding local communities engaged in conservation stewardship activities. Third, mining companies operating in adjacent areas should be encouraged (through regulatory requirements or voluntary corporate sustainability commitments) to contribute to conservation financing mechanisms proportional to the measured existence value of the conservation area. Fourth, the methodological framework developed in this study, particularly the dual-population CVM approach combining visitor and community valuations, should be adopted as a standard tool for existence value assessment at other Taman Hutan Raya sites across Indonesia, particularly those established on post-extractive landscapes.

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