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Integration of SROI, Community Satisfaction Index (CSI), and SEM-PLS Analysis in the Evaluation of CSR Programs for Indigenous Forest Community Empowerment

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ABSTRACT

This study integrates Social Return on Investment (SROI), the Community Satisfaction Index (CSI), and Structural Equation Modeling–Partial Least Squares (SEM-PLS) to evaluate the effectiveness of the Corporate Social Responsibility (CSR) program implemented by PT PLN (Persero) UIP Kalimantan Bagian Barat in the Rungan Indigenous Forest area, Central Kalimantan. This approach aims to quantitatively and qualitatively assess the social, economic, and environmental impacts of a community empowerment program grounded in conservation principles and local wisdom. The research employs a descriptive–explanatory design with 76 indigenous respondents selected through purposive sampling. The results show an SROI ratio of 3.43, indicating that every Rp1.00 invested generates Rp3.43 in socio-economic benefits. The CSI score reached 3.565, equivalent to a converted value of 89.128 in category A (very good), reflecting a high level of satisfaction with the quality of program implementation. The SEM-PLS analysis reveals that institutional support and social capital significantly influence community empowerment, with access and capability acting as key mediators. The integration of these three methods provides a comprehensive, measurable, and evidence-based CSR evaluation framework, which is relevant for replication in other indigenous forest areas and supports the achievement of the social and environmental pillars of the Sustainable Development Goals (SDGs).

Introduction

Pressure on indigenous forest areas in Indonesia has continued to intensify due to development expansion and land-use change, resulting in ecosystem degradation and increasing social vulnerability among customary law communities. Within the framework of sustainable development, indigenous communities play a crucial role in advancing the United Nations' Sustainable Development Goals (SDGs), particularly Goal 13 (Climate Action), Goal 15 (Life on Land), and Goal 16 (Peace, Justice, and Strong Institutions). Recent studies indicate that deforestation dynamics in Indonesia are strongly driven by commodity expansion and shifts in land governance (Gaveau et al., 2022), while sustainable forest management grounded in ecosystem-based approaches and participatory governance is essential to maintaining hydrological functions, biodiversity, and carbon stability (FAO, 2019; IPCC, 2019).

Corporate Social Responsibility (CSR) represents a policy instrument with the potential to bridge development and conservation interests through community empowerment approaches. However, CSR evaluation studies in Indonesia remain largely confined to measuring economic outputs and program activities, with limited integration of social value, beneficiary satisfaction, and empowerment mechanisms (Suharto, 2022). This limitation creates a methodological gap in assessing CSR effectiveness as a sustainable development instrument rooted in indigenous community contexts.

From a scientific perspective, integrating Social Return on Investment (SROI), the Community Satisfaction Index (CSI), and Structural Equation Modeling–Partial Least Squares (SEM-PLS) is necessary to address this gap. SROI measures social, economic, and environmental value through impact monetization (Corvo et al., 2022); CSI captures beneficiaries' perceptions and levels of satisfaction (Sururi, 2019); while SEM-PLS enables the analysis of causal relationships among latent variables within complex social contexts (Hair et al., 2021). The integration of these three approaches provides a comprehensive evaluation framework that addresses not only "the magnitude of program value creation," but also "how and why the program effectively empowers indigenous communities."

Based on this framework, this study evaluates the effectiveness of the CSR Conservation and Indigenous Forest Community Empowerment Program in Rungan, implemented by PT PLN (Persero) UIP Kalimantan Bagian Barat. The study formulates three research questions: (1) to what extent does the CSR conservation and empowerment program generate measurable social and economic value; (2) how do indigenous communities perceive and evaluate their level of satisfaction with program implementation; and (3) which factors significantly influence the empowerment process within a data-driven causal framework, thereby informing the formulation of more effective and sustainable CSR policies.

Literature Review

The Relationship between Corporate Social Responsibility (CSR) and Indigenous Community Empowerment

Corporate Social Responsibility (CSR) is understood as a corporation's responsibility toward all stakeholders, not solely its shareholders. This perspective aligns with Stakeholder Theory proposed by R. Edward Freeman (1984), which emphasizes the creation of shared value for affected communities, including indigenous peoples. In practice, contemporary CSR is oriented toward community development and empowerment (Suharto, 2022). Within community-based forest management, program success is largely determined by participatory processes and the strength of local institutions (Iriyani et al., 2024).

In the forestry context, issues of deforestation and carbon emissions (Gaveau et al., 2022) underscore the importance of integrating environmental dimensions into CSR initiatives. The economic valuation of carbon and ecosystem services refers to national regulatory frameworks established by the Pemerintah Republik Indonesia (2021) and Kementerian Lingkungan Hidup dan Kehutanan (2022), as well as international guidelines issued by the Intergovernmental Panel on Climate Change (IPCC, 2019), (FAO, 2019), and the World Bank (2021). Conceptually, CSR in this study is positioned as an exogenous variable influencing indigenous community empowerment through institutional support, social capital formation, economic access, and environmental sustainability. Empowerment functions as the mediating mechanism linking CSR interventions to the program's broader socio-economic impacts.

Social Return on Investment (SROI) as a Measure of Socio-Economic Impact

Social Return on Investment (SROI) is an evaluation approach that converts social, economic, and environmental impacts into monetary values in order to assess program effectiveness comprehensively. In the context of forest management and indigenous communities, the measurement of social value encompasses not only income enhancement but also ecological benefits such as carbon sequestration and ecosystem services (Kementerian Lingkungan Hidup dan Kehutanan, 2022).

The valuation of environmental services is further supported by methodologies developed by the Food and Agriculture Organization (FAO, 2019) and the World Bank (2021), as well as national carbon pricing data such as IDX Carbon (2024). In the Indonesian context, the importance of community-based forest management in reducing deforestation and carbon emissions has been highlighted by Gaveau et al. (2022) and Iriyani et al. (2024). Accordingly, in this study, SROI is positioned as an impact indicator representing the ultimate outcomes of indigenous community empowerment through conservation-oriented CSR interventions. Through this approach, the social, economic, and environmental value generated by the program can be measured in an integrated and systematic manner.

Community Satisfaction Index (CSI) as an Evaluation of Beneficiary Perceptions

The Community Satisfaction Index (CSI) is a public service evaluation instrument regulated under Regulation of the Minister of Administrative and Bureaucratic Reform (Peraturan Menteri PAN-RB) No. 14 of 2017, issued by the Kementerian Pendayagunaan Aparatur Negara dan Reformasi Birokrasi Republik Indonesia (2017). It is employed to measure beneficiaries' perceptions regarding service quality, procedural clarity, program benefits, and implementer responsiveness. In the context of CSR programs targeting indigenous communities, CSI functions as a tool to assess the extent to which corporate interventions are accepted and perceived as beneficial by the community.

Conceptually, community satisfaction reflects the social legitimacy of a program and constitutes a key indicator of the sustainability of community-based interventions (Sururi, 2019; Suharto, 2022). Accordingly, within the research model of this study, CSI is positioned as a perceptual outcome variable that complements the objective impact measurement provided by Social Return on Investment (SROI). Thus, CSR effectiveness is evaluated not only through the monetized socio-economic value generated, but also through the level of community acceptance and satisfaction as program beneficiaries.

Structural Equation Modeling-Partial Least Squares (SEM-PLS) as a Causal Analysis Approach

Structural Equation Modeling–Partial Least Squares (SEM-PLS) is a variance-based statistical method used to analyze causal relationships among latent variables. According to Hair et al. (2019), SEM-PLS is particularly suitable for complex models, relatively small sample sizes, and data that do not follow a normal distribution. This method enables the simultaneous assessment of both the measurement model and the structural model, thereby allowing researchers to evaluate construct validity and hypothesized relationships within a unified analytical framework.

Cheung et al. (2024) emphasize the importance of assessing discriminant validity and construct reliability to ensure the robustness and accuracy of causal inferences. Meanwhile, Ramayah et al. (2018) demonstrate that SEM-PLS is effective in testing both direct and indirect relationships among variables, particularly in community empowerment research contexts.

In this study, SEM-PLS is employed to examine the relationships among CSR support, indigenous community empowerment, socio-economic impact as measured by Social Return on Investment (SROI), and community satisfaction as measured by the Community Satisfaction Index (CSI). The model evaluates both direct and indirect effects, thereby providing a more comprehensive understanding of the causal mechanisms underlying the effectiveness of CSR programs.

Conceptual Framework

This study integrates Social Return on Investment (SROI), the Community Satisfaction Index (CSI), and Structural Equation Modeling–Partial Least Squares

(SEM-PLS) to evaluate a CSR program aimed at empowering indigenous forest communities. SROI measures socio-economic impacts through the monetization of social, economic, and environmental outcomes. CSI assesses beneficiaries' perceptions and levels of satisfaction regarding program implementation, while SEM-PLS analyzes causal relationships among latent variables within the proposed research model. Through this integrative approach, a comprehensive and measurable evaluation model is established, enabling the assessment of both objective impacts and perceptual outcomes, as well as the underlying causal mechanisms linking CSR interventions to empowerment and program effectiveness. The conceptual framework of this study is presented in Figure 1.

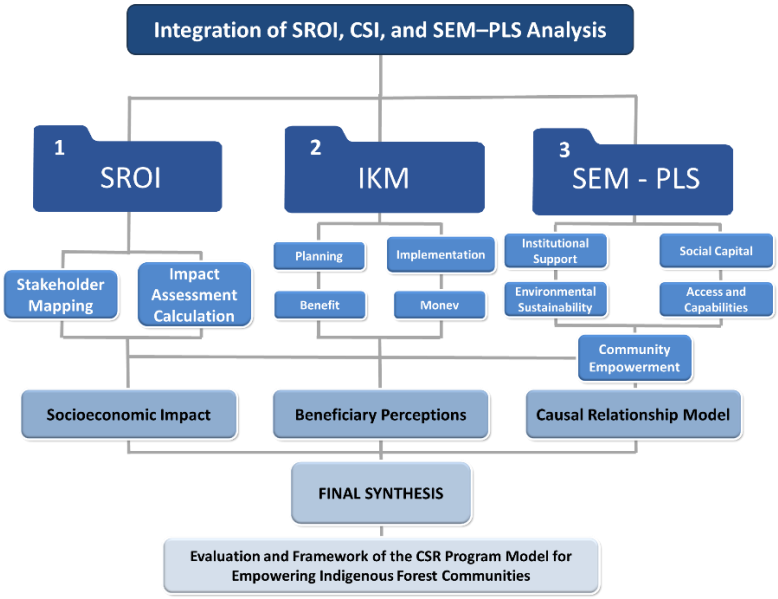

Figure 1. Conceptual Framework

Souce: Data Analysis, 2025

Research Methods

Research Design

This study employs a descriptive and explanatory quantitative research design to obtain empirical evidence regarding the effectiveness of the CSR program implemented by PT PLN (Persero) UIP Kalimantan Bagian Barat in the Rungan Indigenous Forest area, Central Kalimantan. The descriptive approach is utilized to systematically depict the characteristics of the program, the forms of intervention, and their impacts on indigenous communities and the environment. Meanwhile, the explanatory approach aims to examine causal relationships between CSR implementation, community empowerment, and socio-economic and environmental outcomes through data-driven hypothesis testing (Gimeno-Arias et al., 2021).

The combination of these two approaches is intended to ensure that the study not only presents a comprehensive overview of program conditions, but also

explains the interrelationships among variables that empirically determine CSR effectiveness.

Population and Sample

The study population consists of 310 members of the Rungan Indigenous Forest Community in Gunung Mas Regency, Central Kalimantan, who are beneficiaries of the CSR program implemented by PT PLN (Persero) UIP Kalimantan Bagian Barat.

A purposive sampling technique was employed based on the following criteria:

1. Registered as a beneficiary of the CSR program;
2. Actively involved in program activities;
3. Willing to participate as a research respondent.

The sample size was determined using the Slovin formula with a 10% margin of error, resulting in 76 respondents.

Furthermore, the sample size satisfies the minimum requirement for Structural Equation Modeling–Partial Least Squares (SEM-PLS), which recommends a minimum of ten times the largest number of indicators used to measure a single construct (Hair et al., 2019). With four indicators per construct, the minimum required sample size is 40 respondents; therefore, a total sample of 76 respondents is considered adequate for SEM-PLS analysis.

Data Collection Techniques

Data were collected through the following methods:

1. A questionnaire survey administered to 76 respondents using a five-point Likert scale (1–5);
2. Semi-structured interviews conducted to strengthen and contextualize the interpretation of quantitative findings;
3. Document analysis of program accountability reports, monitoring and evaluation reports, and CSR-related documentation.

Data triangulation was applied to enhance the validity and credibility of the research findings.

Research Variables

This study employs three primary analytical components: Social Return on Investment (SROI), the Community Satisfaction Index (CSI), and Structural Equation Modeling–Partial Least Squares (SEM-PLS).

The SEM-PLS analysis is utilized to examine the causal relationship between the CSR variable, positioned as the exogenous construct, and the community empowerment variable, positioned as the endogenous construct, based on indicators derived from the questionnaire data. Through this approach, the structural relationships among constructs are empirically tested to determine the

extent to which CSR interventions influence indigenous community empowerment outcomes.

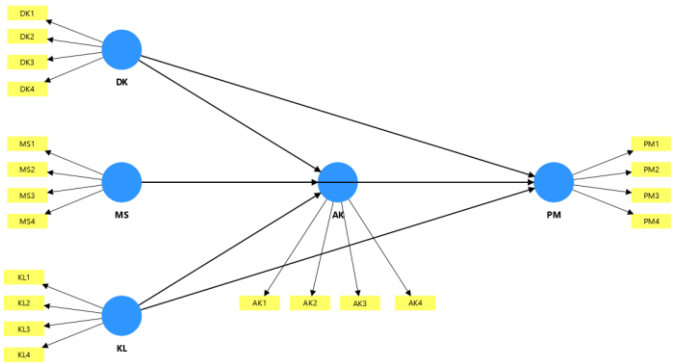

Figure 2. Research Variable Relationship Model

Source: Data Analysis, 2025

Table 1. SEM-PLS Analysis Variables

Variabel	Indicator	Definition
Exogenous	Institutional Support (DK) DK1-DK4	Indicators include participation of customary institutions, collaboration with external stakeholders, clarity of roles and responsibilities, and program facilitation or mentoring.
	Social Capital (MS) MS1-MS4	Indicators comprise community trust, collective cooperation, supportive social norms, and the strength of social networks.
	Environmental Sustainability Practices (KL) KL1-KL4	Indicators include participation in conservation activities, environmentally friendly practices, and protection of natural resources
Mediator	Access and Capability (AK) AK1-AK4	Indicators measure ease of access to program resources, improvement in knowledge and skills, resource management capacity, and enhanced socio-economic opportunities.
Endogenous	Community Empowerment (PM) PM1-PM4	Indicators include participation in planning processes, control over resources, and self-efficacy

Source: Data Analysis, 2025

Table 2. Variables in the SROI and CSI Analysis

Analysis	Indicator	Definition
SROI	Stakeholders	Parties involved in or affected by the CSR program, including indigenous community members, program implementers, and relevant institutions.
	Monetization of Socio-Economic Impact	The process of assigning financial proxies to social, economic, and environmental outcomes generated by the program.
	Present Value of Program Benefits	The total monetized benefits adjusted for the time value of money (discounted value).

Analysis	Indicator	Definition
	Value of Input (CSR Investment)	The total financial and non-financial resources invested in program implementation.
	SROI Ratio	The ratio of total present benefits to total investment, showing social value per unit invested.
CSI	Planning	Clarity of program requirements, procedures, and systems prior to implementation.
	Implementation	Timeliness, cost appropriateness, service conformity, and implementer competence and conduct.
	Perceived Benefits	The extent to which program outputs correspond to community needs and the quality of facilities and infrastructure provided.
	Monitoring and Evaluation	The availability and effectiveness of complaint-handling mechanisms and community feedback systems.

Source: Data Analysis, 2025

Data Analysis Techniques

This study integrates three analytical methods sequentially to ensure a comprehensive evaluation framework:

1. SROI: Calculating the social and economic value generated by the program through the ratio of total monetized benefits to total investment. This analysis quantifies the net social value created by the CSR intervention.
2. CSI: Measuring beneficiaries' perceptions and levels of satisfaction regarding the quality of program implementation, including planning, execution, perceived benefits, and monitoring mechanisms.
3. SEM-PLS: Examining causal relationships among institutional support, social capital, environmental sustainability practices, access and capability, and community empowerment. This method enables the testing of both direct and indirect effects within the proposed structural model.

The integration of these three approaches enables a multidimensional evaluation of CSR effectiveness, encompassing: (1) quantified social value creation (SROI), (2) beneficiary perceptions and legitimacy (CSI), and (3) the causal mechanisms underlying program outcomes (SEM-PLS).

Calculation of Social Return on Investment (SROI)

The Social Return on Investment (SROI) analysis is employed to measure the social and economic value generated by the CSR program. The calculation is conducted by comparing the present value of benefits with the total value of inputs (investment).

$$\text{SROI Ratio} = (\text{Present of Value})/(\text{Value of Input})$$

The principal stages of the SROI analysis include: identification of key stakeholders → monetization of impacts → calculation of total benefits → computation of the SROI ratio (Corvo et al., 2022).

Community Satisfaction Index (CSI)

The measurement of the *Community Satisfaction Index* (CSI) is conducted to assess beneficiaries' perceptions regarding the quality of CSR program implementation. The CSI score is calculated using the following formula:

CSI = (Total Perception Scores per Indicator)/(Total Completed Indicators) x Weighting value

In this study, the resulting CSI score is categorized based on the interpretation standards stipulated where higher score ranges indicate better perceived service quality and stronger program acceptance among beneficiaries (KepmenPANRB, 2017).

Structural Equation Modeling–Partial Least Squares (SEM-PLS) Analysis

Data analysis in this study employs Partial Least Squares (PLS) as a variance-based Structural Equation Modeling (SEM) method. SEM-PLS is flexible, does not require multivariate normality assumptions, and is suitable for moderate sample sizes (Hair et al., 2019). The PLS approach can accommodate both reflective and formative indicators and allows for the simultaneous analysis of complex causal relationships among latent constructs.

The stages of analysis include: (1) specification of the structural model (inner model), (2) evaluation of the measurement model (outer model), (3) evaluation of the structural model (inner model assessment), and (4) hypothesis testing through bootstrapping procedures.

A detailed explanation of the SEM-PLS testing procedures is presented as follows.

Table 3. SEM-PLS Evaluation Criteria

Evaluation	Type of Test	Testing Indicator	Definition
Outer Model	Convergent Validity	*Outer Loading*	Measures the strength of the relationship between each indicator and its corresponding latent construct. Higher loading values indicate stronger indicator validity.
	Discriminant Validity	*Cross Loading*	Ensures that each indicator has the highest correlation with its intended construct compared to other constructs.
	Reliability	*Composite Reliability*	Measures the internal consistency of indicators within a construct.
		Cronbach's Alpha	Assesses the internal consistency reliability of indicators within a construct.

Evaluation	Type of Test	Testing Indicator	Definition
Inner Model	Coefficient of Determination	R^2	Measures the extent to which exogenous variables explain the variance of endogenous variables.
	Effect Size	f^2	Assesses the magnitude of the effect of each exogenous variable on the endogenous variable.
	Hypothesis Testing	Patch Coefficient	Tests the significance and strength of causal relationships among constructs.

Source: Data Analysis, 2025

Results and Discussion

Calculation of Social Return on Investment (SROI)

Identification of Key Stakeholder

The identification of key stakeholders constitutes the initial stage in the SROI analysis, aimed at determining the parties directly or indirectly involved in, or affected by, the implementation of the CSR Conservation and Indigenous Forest Community Empowerment Program in Rungan. The primary stakeholders involved in the program implemented by PT PLN (Persero) UIP Kalimantan Bagian Barat can be described as follows:

Table 4. Mapping of *Key Stakeholder*.

Stakeholder	Role in the Program	Impact Generated
PT PLN (Persero) UIP Kalimantan Bagian Barat	Program initiator and primary funder; responsible for coordination and supervision of implementation.	Enhancement of ESG reputation and the creation of synergies between development and conservation objectives.
Rungan Indigenous Community	Main implementer of conservation activities and area management.	Increased capacity, income generation, and strengthened local economic sustainability.
Borneo Nature Foundation (BNF)	Technical partner (biodiversity surveys, training, mentoring).	Strengthened science-based conservation governance and improved technical capacity.
Regional Government of Gunung Mas Regency	Regulator and policy facilitator for area management.	Integration of conservation policy with regional development planning.
Service Providers and Suppliers	Provision of facilities, goods, and operational support.	Stimulation of local economic circulation through the program's supply chain.

Source: Data Analysis, 2025

Impact Event Calculation

Following stakeholder mapping, an impact analysis and monetization of social value were conducted as the basis for calculating the *Social Return on Investment*

(SROI). This stage aims to quantitatively measure the social, economic, and environmental benefits generated by the program so that its effectiveness and sustainability can be assessed objectively (Corvo et al., 2022).

Table 5. Impact Event Calculation

Stakeholder	Impact	Value (Rp)	Source
Masyarakat Hutan Adat (MHA) Rungan)	Increased community capacity and skills: forest patrol activities	3.600.000	Program Financial Report Document
	Increased community capacity and skills: nursery development and tree planting	48.000.000	
	Increased community income from biodiversity survey activities	31.500.000	
	Economic benefit value from local fruit seedling nurseries	72.000.000	
	Community ownership of productive assets (hut, dock, klotok boat)	165.000.000	
	Increased income from customary forest patrol	16.800.000	
	Institutional strengthening: formulation of written customary law	15.000.000	Interview
	Benefits of patrol activities in preventing illegal logging, wildlife poaching, and illegal timber harvesting that may damage the potential of the Customary Forest	60.000.000	Interview
	Benefits of the Kaleka hut in optimizing harvest yields	30.000.000	Interview
	Benefits of the klotok boat as a community transportation facility to Kaleka	61.440.000	Interview
	Income of local labor (carpenters, boat builders, field workers) from the construction of huts, docks, and nurseries	64.000.000	Interview
	Value of Kaleka management workshop activities	16.000.000	Financial Report Document
	Value of the Pendeng Keramat customary ritual event (traditional equipment, consumption, and documentation costs)	45.000.000	
	Value of program ceremonial events (launching, visits, symbolic handover)	8.000.000	
Borneo Nature Foundation (YBNF)	Benefit value received by YBNF from conservation and community empowerment facilitation services	90.000.000	PLN–YBNF Cooperation Agreement Document
	YBNF staff income	105.000.000	Interview
Local Service Providers	Income of timber and building material suppliers for the construction of huts, docks, and klotok boats	15.000.000	Financial Report Document

Stakeholder	Impact	Value (Rp)	Source
	Income of seedling suppliers	27.000.000	Interview
	Increased rental income from housing used by the BNF team during program implementation	18.000.000	Interview
Regional Government of Gunung Mas Regency	Environmental benefit: carbon sequestration from 9,000 productive trees	33.750.000	IDX Carbon, 2024)
	Benefit of conservation area integrity covering 472 hectares (ecosystem and biodiversity value)	944.000.000	(KLHK, 2022)
	Hydrological benefits and flood/erosion prevention from forest cover	188.800.000	(KLHK, 2022)

Source: Data Analysis, 2025

SROI Valuation

The Social Return on Investment (SROI) calculation was conducted to identify the social, economic, and environmental benefits generated from the CSR/TJSL investment in the conservation and empowerment program of the Rungan Customary Forest community. Based on the calculation:

$$\frac{\text{Present Value}}{\text{Value of Input}} = \frac{\text{IDR } 1{,}959{,}895{,}238}{\text{IDR } 571{,}428{,}571} = 3.43$$

An SROI value of 3.43 indicates that every IDR 1.00 invested generates social, economic, and environmental benefits equivalent to IDR 3.43 for the community and other stakeholders. This value demonstrates that the program has been implemented effectively, delivers high economic value, and produces significant social and environmental impacts for Indigenous communities, conservation partners, local governments, and local service providers.

Conceptually, this finding reinforces the position of SROI as an integrated socio-economic impact measurement tool that captures not only income improvements but also ecosystem services and environmental value. The environmental valuation approach adopted in this study aligns with methodologies developed by the Food and Agriculture Organization (2019) and the World Bank (2021), as well as the use of Indonesia's national carbon pricing reference from IDX Carbon (2024).

Furthermore, these results are consistent with the findings of David Gaveau et al. (2022) and Iriyani et al. (2024), which indicate that community-based forest management contributes to reducing deforestation and carbon emissions. Therefore, the SROI value obtained in this study represents the ultimate outcome of Indigenous community empowerment through conservation-based CSR intervention, where local economic benefits and ecological value are measured in an integrated and quantifiable manner.

Community Satisfaction Index (CSI) Analysis

The Community Satisfaction Index (CSI) data were obtained through questionnaires and interviews with 76 beneficiaries of the CSR conservation and empowerment program for the Rungan Indigenous Forest Community (MHA Rungan). The CSI assessment covers four main aspects: (1) planning and community participation, (2) program implementation, (3) social, economic, and environmental benefits, and (4) monitoring and sustainability based on Indigenous community governance.

Table 6. Results of the Community Satisfaction Index (CSI) Measurement

No	Variable	Value
1	Planning	0,907
2	Implementation	0,872
3	Benefits Received	0,916
4	Monitoring and Evaluation	0,869
	CSI Score	3,565
	Converted Interval Score	89,128

Source: Data Analysis, 2025

The measurement results indicate a CSI score of 3.565 with a converted value of 89.128 (Category A – Very Good). The highest score was recorded in the benefits dimension (0.916) and planning (0.907), followed by implementation (0.872) and monitoring–evaluation (0.869). These findings suggest that the program is perceived as delivering tangible impacts and actively involving the community, although further strengthening of participatory evaluation mechanisms remains necessary.

Within the framework of Regulation of the Minister of Administrative and Bureaucratic Reform No. 14 of 2017, the Community Satisfaction Index (CSI) measures beneficiaries' perceptions of service quality and program usefulness. Conceptually, a high level of satisfaction reflects social legitimacy and community acceptance of CSR interventions (Sururi, 2019; Suharto, 2022). Therefore, in this study, the CSI functions as a perceptual outcome indicator that complements the objective measurement provided by SROI, ensuring that program success is assessed not only in terms of economic value but also in terms of the level of acceptance and satisfaction among Indigenous communities.

SEM-PLS Analysis

Outer Model Analysis

Outer model evaluation was conducted to ensure that the reflective indicators are valid and reliable in representing their respective latent constructs. The

assessment includes convergent validity, construct reliability, and discriminant validity testing prior to conducting the structural model analysis.

Table 7. Analysis Outer Model Results

Indicator	Convergent Validity	Discriminant Validity	Reliability Test	
	Loading Factor	Cross Loading	Cronbach's Alpha	Composite Reliability
Institutional Support				
DK1	0,822	0,822	0,898	0,929
DK2	0,929	0,929		
DK3	0,863	0,863		
DK4	0,886	0,886		
Social Capital				
MS1	0,869	0,869	0,866	0,908
MS2	0,821	0,820		
MS3	0,871	0,871		
MS4	0,815	0,816		
Environmental Sustainability				
KL1	0,818	0,818	0,865	0,908
KL2	0,841	0,841		
KL3	0,848	0,848		
KL4	0,866	0,867		
Access and Capability				
AK1	0,810	0,812	0,865	0,908
AK2	0,833	0,834		
AK3	0,895	0,893		

Indicator	Convergent Validity	Discriminant Validity	Reliability Test	
	Loading Factor	Cross Loading	Cronbach's Alpha	Composite Reliability
AK4	0,835	0,834		
Community Empowerment				
PM1	0,882	0,879		
PM2	0,875	0,877	0,876	0,914
PM3	0,827	0,826		
PM4	0,824	0,828		

Source: Data Analysis, 2025

The results of the outer model evaluation indicate that all indicators have loading factors and cross-loadings greater than 0.70, thereby satisfying the criteria for convergent and discriminant validity. The Cronbach's Alpha values (0.865–0.898) and Composite Reliability values (0.908–0.929) also exceed the 0.70 threshold, indicating very good construct reliability (Haji-Othman & Yusuff, 2022).

Therefore, all constructs—Institutional Support (DK), Social Capital (MS), Environmental Sustainability (KL), Access and Capability (AK), and Community Empowerment (PM)—are declared valid and reliable and are thus appropriate for use in the structural model analysis (Cheung et al., 2024).

Inner Model Analysis and Hypothesis Testing

Inner model evaluation was conducted to assess the strength of relationships among latent variables and the model's ability to explain the endogenous construct. The assessment includes the coefficient of determination (R^2), effect size (f^2), and path significance testing to ensure that the relationships among variables are statistically significant and consistent with the proposed hypotheses (Hair et al., 2021).

This analysis examines both the direct and indirect effects of the exogenous variables—Institutional Support, Social Capital, Environmental Sustainability, and Access & Capability—on the endogenous variable, Community Empowerment. The results are used to verify the hypotheses and to identify the most influential variables in determining the effectiveness of the CSR-based Indigenous forest community empowerment program (Ramayah et al., 2018).

The following section presents the results of the inner model analysis and hypothesis testing.

Table 8. Inner Model Analysis Value

R-Square overview		*F-Square overview*	
Indicator	**Value**	**Indicator**	**Value**
AK	0,539	DK -> PM	0,208
		DK-> AK	0,526
		MS -> PM	0,211
		MS -> AK	0,056
PM	0,519	KL -> PM	0,001
		KL -> AK	0,751
		AK -> PM	0,110

Source: Data Analysis, 2025

The R^2 values indicate that Access and Capability (AK) has an R^2 of 0.539 and Community Empowerment (PM) has an R^2 of 0.519. This means that more than 50% of the variance in both endogenous variables can be explained by the constructs included in the model. Referring to Hair et al. (2021), these values fall within the moderate category, suggesting that the model possesses adequate predictive capability.

The f^2 results show a strong effect for the relationships between Environmental Sustainability (KL) → Access and Capability (AK) (0.751) and Institutional Support (DK) → Access and Capability (AK) (0.526). Meanwhile, the paths DK → PM (0.208) and Social Capital (MS) → PM (0.211) demonstrate moderate effect sizes. The relationship KL → PM (0.001) is very weak, indicating that the influence of environmental sustainability on community empowerment occurs primarily through an indirect pathway, particularly via improvements in community access and capability.

Table 9. Hypothesis Testing.

Indicator	***T Statistics (|O/STDEV|)***	***P Values***	**H**	**Significance**
Direct Effects				
DK -> PM	3,498	0,001	H1	There is a significant effect with a positive direction of relationship.
MS -> PM	3,810	0,001	H2	There is a significant effect with a positive direction of relationship.
KL -> PM	0,303	0,762	H3	There is no significant effect.
DK -> AK	6,522	0,001	H4	There is a significant effect with a positive direction of relationship.
MS -> AK	2,079	0,038	H5	There is a significant effect with a positive direction of relationship.
KL -> AK	8,615	0,001	H6	There is a significant effect with a positive direction of relationship.

Indicator	*T Statistics (|O/STDEV|)*	*P Values*	H	Significance
AK -> PM	2,562	0,010	H7	There is a significant effect with a positive direction of relationship.
Indirect Effects				
DK -> AK -> PM	2,454	0,014	H8	There is a significant effect with a positive direction of relationship.
MS -> AK -> PM	1,601	0,109	H9	There is no significant effect.
KL -> AK -> PM	2,407	0,016	H10	There is a significant effect with a positive direction of relationship.

Source: Data Analysis, 2025

The results indicate that Environmental Sustainability (KL) does not have a direct effect on Community Empowerment (PM), but it is significant through Access and Capability (AK). This finding underscores that environmental resources alone do not automatically lead to empowerment without improvements in community capacity and access. This mediation mechanism aligns with the view that SEM-PLS is effective in identifying indirect relationships within empowerment models (Ramayah et al., 2018).

The significant relationship AK → PM demonstrates that enhanced access to training, information, and economic opportunities is a key prerequisite for achieving community empowerment. This is consistent with the capability approach in social development, which emphasizes the enhancement of individual and collective abilities as the core of empowerment (Suharto, 2022). Methodologically, the model's ability to explain this pathway is consistent with the characteristics of SEM-PLS in analyzing complex, predictive models (Hair et al., 2019; Hair et al., 2021).

Meanwhile, the direct effects of Institutional Support (DK) and Social Capital (MS) on PM reinforce participatory empowerment theory, highlighting the importance of institutional legitimacy and social networks in strengthening community capacity (Sururi, 2019). The strong construct validity in this model also aligns with recommended measurement evaluation procedures in PLS-SEM to ensure accurate causal inference (Cheung et al., 2024).

Integration of SROI, CSI, and SEM-PLS Analysis

The integration of SROI, CSI, and SEM-PLS provides a comprehensive evaluation of the CSR program. SROI demonstrates that the social, economic, and environmental benefits exceed the investment costs, CSI confirms a very high level of community satisfaction, and SEM-PLS shows that institutional support, social capital, and access and capability are the primary determinants of Indigenous community empowerment. These findings show that CSR success depends not only on investment size but also on strengthening local social and institutional capacities, with environmental sustainability contributing indirectly by enhancing community capabilities.

Table 10. Synthesis of Analysis Results

Analysis	Key Indicator	Result	Interpretation	Managerial Implications
SROI	Benefit ratio	3,43	Each Rp1 of investment generates Rp3.43 in social–economic–environmental benefits. Efficient and highly impactful.	Expand CSR models leveraging local institutional frameworks with ESG/green finance schemes.
CSI	Beneficiary perception	Category A (89.128)	Program quality is rated "Excellent"; the community is highly satisfied with both outcomes and processes.	Focus on strengthening monitoring and evaluation components.
SEM-PLS	R^2(AK)=0,539 ; R^2(PM)=0,519	Significant paths: DK→AK MS→AK KL→AK AK→PM DK→PM MS→PM, DK→AK→PM MS→AK→PM	Access and capability (AK) is the primary mediator for Indigenous community empowerment. Environmental sustainability (KL) does not directly affect PM but influences it through AK.	Strengthen institutional support and capacity-building programs to enhance AK among community members.
Synthesis	Value, Acceptance, Mechanism	Program is efficient (high SROI), well-received (high CSI), and operates through socio-institutional mechanisms (SEM-PLS).	This evaluation model can be replicated and used as a reference for developing collaborative policies and community-based natural resource management frameworks.	

Source: Data Analysis, 2025

Conclusion

This study shows that integrating SROI, CSI, and SEM–PLS provides an evaluation framework that not only quantifies CSR benefits but also explains the causal mechanisms of Indigenous community empowerment. The SROI result (3.43) confirms that benefits exceed costs, while the CSI in the "Excellent" category (A) indicates strong perceived effectiveness. SEM–PLS further identifies institutional support, social capital, and access and capability as key determinants of empowerment, with environmental sustainability exerting an indirect effect through enhanced community capacities.

The integration of these three approaches represents a more comprehensive impact-based CSR evaluation model compared to conventional methods, which

tend to focus solely on outputs. Conceptually, the combination of social value measurement (SROI), public satisfaction assessment (CSI), and causal analysis (SEM–PLS) can serve as a new evaluation framework for CSR studies in Indonesia, particularly in contexts of conservation and Indigenous community empowerment, where social complexity is high. This model extends evaluative approaches beyond financial accountability toward a structural understanding of social change processes.

The findings underscore that the sustainability of conservation-oriented CSR programs cannot rely solely on financial investment or environmental interventions; it must be accompanied by strengthening local institutions, ensuring social legitimacy, and enhancing community capabilities. Therefore, companies and local governments need to design interventions that balance ecological and socio-institutional aspects to ensure sustainable and replicable program impacts.

This study has limitations, including a cross-sectional design that does not capture long-term impact dynamics, a sample restricted to a single Indigenous community, and potential respondent perception biases. Future research is recommended to employ longitudinal designs, expand geographic and sectoral coverage, and integrate long-term social and environmental indicators to test the consistency and generalizability of this integrated evaluation model across various sustainable development contexts.

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