



Investment Feasibility Analysis of the Palembang–Indralaya Toll Road

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Abstract

The Palembang–Simpang Indralaya Toll Road, spanning 21.93 km, is a strategic component of the Trans-Sumatra Toll Road network, intended to improve regional connectivity and reduce logistics costs in South Sumatra. However, average daily traffic between 2017 and 2024 reached only 26%–45% of projected levels, raising concerns about the project's financial viability. This study evaluates the financial feasibility of the existing financing structure and compares alternative schemes, including the tariff-based Base Case, Availability Payment (AP), 30% Viability Gap Funding (VGF), and asset divestment at 49%, 51%, and 100%. Using a capital budgeting approach, financial performance was assessed through Net Present Value (NPV), Internal Rate of Return (IRR), and Payback Period (PP). Under the tariff scheme, the project generates an IRR of 10.98%, an NPV of IDR 1.37 trillion, and a payback period of 16 years. The 30% VGF scheme provides the strongest financial results, increasing the IRR to 12.41% and NPV to IDR 2.01 trillion while reducing the payback period to 14 years. Conversely, the AP scheme records an IRR of 4.17% and a negative NPV of IDR 635.43 billion, indicating financial infeasibility. Asset divestment also weakens financial performance as the divested share increases. These findings identify 30% VGF as the preferred financing alternative for improving investment feasibility and addressing risks arising from lower-than-expected traffic volumes. The results highlight the importance of targeted public financial support in sustaining infrastructure investment under persistent demand uncertainty. This assessment offers practical guidance for policymakers and investors selecting financing arrangements for comparable toll road developments.

Introduction

Indonesia, as an archipelagic country comprising more than 17,000 islands, requires an extensive and reliable road network to connect economic centers, business districts, and markets (Alfian, 2013; Pulungan, 2024; Midiyani & Yumitro, 2026). Land transportation infrastructure has therefore become one of the government's top priorities in accelerating economic growth and reducing national logistics costs (Farhansyah, 2021). Sumatra Island, which contributes 22.21% to Indonesia's Gross Domestic Product (GDP), is the country's second-largest economic contributor after Java (Nina, 2024; Supriadi et al., 2022; Andriansyah et al., 2026). Consequently, accelerating regional connectivity through the Trans-Sumatra Toll Road (JTTS) has become a strategic national policy, as mandated by Presidential Regulation No. 131 of 2022, amending Presidential Regulation No. 100 of 2014 concerning the Acceleration of Toll Road Development in Sumatra (Presidential Regulation No. 131 of 2022).

One of the most critical sections of the Phase I JTTS network is the Palembang–Simpang Indralaya (Palindra) Toll Road, which extends 21.93 km. This toll road plays a vital role in connecting the city of Palembang with Sriwijaya University, while facilitating the distribution of logistics and mining products throughout South Sumatra Province. Despite generating substantial macroeconomic benefits, the operation of the Palindra Toll Road faces significant challenges in terms of financial feasibility (Bina, 2021; Ebrahimi & Sharma, 2024; Pardeshi & Kale, 2026).

The primary challenge lies in the realization of Average Daily Traffic (ADT), which has consistently fallen far below the projections established in the initial business plan (Ali et al., 2023; Ma et al., 2026; Talaghat et al., 2026). Data indicate that during the operational period from 2017 to 2024, actual traffic volumes reached only 26%–45% of the projected target. The most significant decline occurred during the COVID-19 pandemic in 2020, when traffic realization dropped to only 25% of the planned target. This persistent underperformance in traffic demand poses substantial risks to the cash flow stability and long-term investment sustainability of the Toll Road Business Entity (BUJT) (Darmawan, 2025; Septiawan & Jin, 2026; Nhat & Hoang, 2025).

To mitigate these financial risks, it is necessary to evaluate the conventional financing model, which currently relies entirely on toll revenue (Ying et al., 2025; Yanney, 2025; Rawat et al., 2026). In line with the flexibility provided under Indonesian government regulations, several alternative investment recovery mechanisms can be considered, including Availability Payment (AP), Viability Gap Funding (VGF) for construction support, and Asset Divestment (Ery & Isrochmani, 2022). Accordingly, this study aims to analyze the financial feasibility of the existing financing structure and evaluate these alternative financing schemes to identify the most optimal and sustainable investment model for ensuring the long-term viability of toll road infrastructure.

Methods

Research Design

This study employed a quantitative approach using financial investment feasibility analysis to evaluate the Palembang–Simpang Indralaya Toll Road project. The analysis focused on assessing the financial performance of the existing tariff-based financing scheme and comparing it with alternative financing arrangements. A capital budgeting approach was applied to evaluate investment returns, capital recovery, and financial viability under different financing scenarios.

Data Collection

The study used primary and secondary data. Primary data were obtained through direct observations of toll road operations and maintenance activities. Secondary data were collected from the Toll Road Business Entity (BUJT), including average daily traffic (ADT) records from 2017 to 2024, toll revenue, tariff adjustments, investment costs, financing structures, and operational expenditures. The total initial investment was IDR 3.394 trillion, consisting of 74% equity and 26% bank loans, with an annual loan interest rate of 9.5%. Relevant government regulations and project financial documents were also reviewed to support the analysis.

Financial Assumptions and Cash Flow Analysis

Financial projections were developed based on the project's revised business plan and a 50-year concession period. The analysis considered toll revenue, traffic growth, tariff adjustments, operating and maintenance costs, and financing expenses. Toll tariffs were assumed to increase by 8.48% every two years, while operating and maintenance costs were

adjusted for annual inflation of 6%. These assumptions were used to estimate project cash flows and evaluate the financial performance of each financing scheme.

Investment Feasibility Analysis

Investment feasibility was assessed using three financial indicators: Net Present Value (NPV), Internal Rate of Return (IRR), and Payback Period (PP). NPV was used to determine whether discounted project cash inflows exceeded investment costs. IRR measured the expected investment return and was compared with the Minimum Attractive Rate of Return (MARR) of 9.5%. Meanwhile, PP measured the time required to recover the initial investment through accumulated cash inflows. A financing scheme was considered financially feasible when it generated a positive NPV and an IRR exceeding the MARR.

Evaluation of Alternative Financing Schemes

Four financing schemes were evaluated. The first was the existing tariff-based scheme (Base Case), in which investment recovery relied on toll revenue. The second was the Availability Payment (AP) scheme, assuming government payments over a 15-year period. The third was the 30% Viability Gap Funding (VGF) scheme, involving government financial support covering 30% of construction costs. The fourth was asset divestment, examined under three equity divestment scenarios of 49%, 51%, and 100%.

Each scenario was evaluated using the same financial indicators to identify differences in investment returns, capital recovery, and overall financial feasibility. The results were compared to determine which financing arrangement provided the most favorable financial performance for the project.

Comparative Financial Analysis

A comparative analysis was conducted to assess the financial implications of each financing scheme relative to the Base Case. Differences in NPV, IRR, and PP were examined to identify the effects of government financial support, payment arrangements, and asset divestment on project profitability. Particular attention was given to the financial implications of lower-than-expected traffic volumes, as actual ADT between 2017 and 2024 reached only 26%–45% of the initial business plan projections.

Results and Discussion

Analysis of Research Findings

The analysis focuses on comparing the financial performance of the alternative investment schemes evaluated for the Palembang–Simpang Indralaya Toll Road to identify the most financially viable financing model. The evaluation is based on three capital budgeting indicators: Internal Rate of Return (IRR), Net Present Value (NPV), and Payback Period (PP).

Financial Feasibility of the Existing Scheme (Tariff Scheme/Base Case). The existing financing structure, referred to as the Base Case, was analyzed to assess the project's financial performance based on current toll revenue realization and projected future Average Daily Traffic (ADT). The analysis indicates that the conventional tariff-based concession model remains financially feasible according to the capital budgeting criteria.

Table 1. Summary of Investment Feasibility

No.	Description	Revised Business Plan (2023)
I	Technical Aspects	
1	Toll Road Length (km)	21.9
2	Construction Period	2015–2018
II	Operational Aspects	
1	Average Daily Traffic (vehicles/day) – 2023	30,095
2	Toll Revenue (IDR billion) – 2023	295

3	Class I Toll Tariff (2023)	IDR 1,232
4	Toll Tariff Adjustment	8.48% every 2 years
5	O&M Cost Inflation	6% per year
III	Financial Aspects	
1	Investment Cost (IDR billion)	
	a. Project Cost	
	• Planning Cost	10
	• Construction Cost	2,870
	• Toll Equipment Cost	67
	• Supervision Cost	25
	• Feasibility Study Cost	5
	• VAT (11%)	300
	• Overhead Cost	61
	• OTF & OF Cost	0
	Total Project Cost	3,360
	b. Interest During Construction (IDC)	33
	c. Financial Cost	1
	Total Investment Cost	3,394
2	Project Financing	
	• Equity	2,514
	• Debt	880
3	Annual Loan Interest Rate	9.50%
4	Investment Feasibility	
	Concession Period	50 years
	Internal Rate of Return (IRR)	10.99%
	Net Present Value (NPV) (IDR billion)	2,401
	Payback Period (PP)	14 years

The financial analysis demonstrates that the project generates an IRR of 10.98%, which exceeds the project's Minimum Attractive Rate of Return (MARR), represented by the annual loan interest rate of 9.5%. This result indicates that the investment is capable of generating a return higher than its financing cost and is therefore considered financially feasible. Furthermore, the project produces a positive NPV of IDR 1.37 trillion, indicating that the present value of future cash inflows exceeds the total initial investment of IDR 3.39 trillion. A positive NPV signifies that the project is expected to create economic value for investors over the concession period. The estimated Payback Period is 16 years, suggesting that the initial investment can be recovered within approximately one-third of the 50-year concession period. Although traffic realization has remained below the original business plan projections, the existing tariff-based financing scheme still satisfies the minimum investment feasibility requirements. Nevertheless, the relatively modest financial returns indicate that the project remains vulnerable to traffic demand uncertainty, highlighting the need to evaluate alternative financing mechanisms that can improve financial performance and reduce investment risk.

Analysis of the Viability Gap Funding (30% VGF) Scheme

The 30% Viability Gap Funding (VGF) scheme was evaluated as a form of government fiscal support aimed at reducing the capital expenditure (CAPEX) borne by the Toll Road Business Entity (BUJT). By partially financing the project's construction cost, the VGF mechanism significantly improves the project's financial performance and investment attractiveness.

Table 2. Comparison of Financial Feasibility: Tariff Scheme vs. 30% VGF Scheme

Evaluation Method	Tariff Scheme (Base Case)	30% VGF Scheme
Internal Rate of Return (IRR)	10.98%	12.41%
Net Present Value (NPV)	IDR 1,372,796 million	IDR 2,012,937 million
Payback Period (PP)	16 years	14 years

Under the 30% VGF scheme, the government provides a construction grant of approximately IDR 878.45 billion, thereby reducing the amount of capital that must be financed by the

concessionaire. This reduction in the initial investment requirement substantially enhances the project's financial viability. As presented in Table 2, the implementation of the VGF scheme increases the Internal Rate of Return (IRR) from 10.98% under the base case to 12.41%, indicating a higher rate of return on investment. Likewise, the Net Present Value (NPV) rises significantly from IDR 1.37 trillion to IDR 2.01 trillion, reflecting a greater level of value creation for investors. In addition, the Payback Period is shortened from 16 years to 14 years, demonstrating that the initial investment can be recovered more quickly. A shorter payback period improves project liquidity and reduces investors' exposure to long-term financial and traffic demand risks. Overall, the 30% VGF scheme delivers the strongest financial performance among the financing alternatives evaluated. By lowering the upfront capital burden while maintaining future revenue streams, this financing mechanism significantly enhances project profitability and investment feasibility. Consequently, the 30% VGF scheme is identified as the most effective standalone financing alternative for improving the financial sustainability of the Palembang–Simpang Indralaya Toll Road project.

Analysis of the Availability Payment (AP) and Asset Divestment Schemes

The study also evaluates the Availability Payment (AP) scheme and the Asset Divestment (Asset Recycling) strategy to assess their effectiveness as alternative financing mechanisms for the Palembang–Simpang Indralaya Toll Road. Compared with the existing tariff scheme and the 30% Viability Gap Funding (VGF) scheme, these alternatives demonstrate relatively weaker financial performance.

Table 3. Comparison of Financial Feasibility: Tariff Scheme vs. Availability Payment (AP) Scheme

Evaluation Method	Tariff Scheme (Base Case)	Availability Payment (AP) Scheme
Internal Rate of Return (IRR)	10.98%	4.17%
Net Present Value (NPV)	IDR 1,372,796 million	(IDR 635,529 million)
Payback Period (PP)	16 years	Not Achieved

The Availability Payment (AP) scheme, which assumes a 15-year government payment period, generates a negative Net Present Value (NPV) of IDR 635.53 billion, indicating that the periodic government payments are insufficient to recover the project's investment costs and long-term operation and maintenance (O&M) expenses. Furthermore, the scheme produces an Internal Rate of Return (IRR) of only 4.17%, substantially below the project's Minimum Attractive Rate of Return (MARR) of 9.5%. Consequently, the AP scheme is considered financially infeasible, as it fails to generate an adequate return on investment and does not achieve full capital recovery within the concession period. The Asset Divestment (Asset Recycling) scenarios likewise exhibit declining financial performance as the proportion of equity sold increases. The analysis indicates a nearly linear deterioration in investment feasibility, with larger divestment proportions resulting in lower profitability. Under the 100% asset divestment scenario, the project records the lowest IRR of 3.21% and the largest negative NPV of IDR 991.02 billion, making it the least attractive financing alternative among those evaluated. These findings suggest that although asset divestment may provide immediate liquidity through upfront cash proceeds, it significantly reduces the project's long-term financial returns. Therefore, asset divestment should be regarded primarily as a corporate liquidity management strategy rather than as an approach to maximizing the standalone profitability of the toll road investment. Overall, the comparative analysis demonstrates that neither the Availability Payment (AP) scheme nor the Asset Divestment strategy offers financial performance comparable to the 30% Viability Gap Funding (VGF) scheme. Among all alternatives evaluated, the 30% VGF scheme remains the most effective financing mechanism for improving project feasibility, increasing investor returns, and enhancing the long-term financial sustainability of the Palembang–Simpang Indralaya Toll Road.

Based on the analysis, the 30% Viability Gap Funding (VGF) scheme is identified as the most effective financing instrument for improving the project's standalone financial performance (Thomas et al., 2024; Ogor & Banda, 2025; Bade et al., 2025). The government construction grant of IDR 878.45 billion substantially reduces the capital expenditure (CAPEX) that must be financed by the Toll Road Business Entity (BUJT). This fiscal intervention directly enhances the project's financial indicators, increasing the Net Present Value (NPV) to IDR 2.01 trillion and the Internal Rate of Return (IRR) to 12.41%, which is significantly higher than the project's Minimum Attractive Rate of Return (MARR), represented by the loan interest rate of 9.5%.

From a theoretical perspective, Viability Gap Funding (VGF) is intended to bridge the financial viability gap of strategically important infrastructure projects that generate substantial social and economic benefits but exhibit marginal commercial feasibility (Wibowo, 2017; Uddin & Rabbi, 2025; Rahman et al., 2025). In the case of the Palembang–Simpang Indralaya Toll Road, the VGF mechanism effectively mitigates the financial consequences of lower-than-expected Average Daily Traffic (ADT), which reached only 26%–45% of the business plan target during the 2017–2024 period (Muchsin, 2025a). By reducing the initial investment requirement, the VGF scheme lowers the project's break-even threshold, enabling financial sustainability to be achieved at a lower traffic volume than under the conventional tariff-based financing model (Fatanah et al., 2025; Wicaksono & Rachmawati, 2026; Mpaka & Krishnamurthy, 2025).

Although the Availability Payment (AP) scheme is designed to reduce demand risk by transferring traffic volume risk from the concessionaire to the government, the analysis indicates that the 15-year payment period is insufficient to ensure financial feasibility. The scheme generates a negative NPV of IDR 635.43 billion and an IRR of only 4.17%, indicating that the government payments over the contract period are inadequate to recover the project's IDR 3.39 trillion investment cost together with its operation and maintenance expenditures. These findings are consistent with the long-term nature of toll road investments, which typically involve concession periods of up to 50 years. To become financially attractive for investors, the AP scheme would require a longer contractual payment period extending beyond 15 years, allowing capital costs and investment amortization to be distributed more proportionally throughout the concession period (Muchsin, 2025; Zhang et al., 2026; Zelbi et al., 2026).

The analysis of the Asset Divestment (Asset Recycling) scenarios reveals a clear negative linear relationship between the proportion of equity divested and the project's financial performance (Marozva & Gherghina, 2025; Sharma & Singla, 2026; Nikou, 2026). As the percentage of ownership transferred increases, the financial feasibility indicators decline correspondingly. The 100% divestment scenario produces the weakest performance, resulting in a negative NPV of IDR 991.02 billion. Nevertheless, from a broader corporate finance perspective, asset divestment serves a different strategic purpose than VGF. While it reduces the standalone profitability of the project, divestment generates immediate upfront cash proceeds that can be reinvested in other strategic infrastructure projects and improve the company's solvency and financial flexibility. Consequently, asset divestment should be implemented only on a minority basis (up to 49%), thereby maintaining an appropriate balance between corporate liquidity and long-term asset profitability (Muchsidin et al., 2025; Liwaul et al., 2023; Ndruru, 2025).

The risk assessment further demonstrates that each financing mechanism presents a distinct risk profile for the Toll Road Business Entity (BUJT) (Suryana & Muttaqien, 2026; Bakulina et al., 2025; Novianingsih et al., 2026). Among the alternatives evaluated, the 30% VGF scheme offers the most balanced allocation of financial risk. Although the BUJT continues to bear traffic demand risk, the reduction in initial capital expenditure substantially decreases

financing obligations and interest expenses, thereby strengthening the project's financial resilience. The conventional tariff-based financing scheme exposes the BUJT to the highest level of traffic demand risk, making project performance highly sensitive to fluctuations in traffic volume. This vulnerability became particularly evident during extraordinary events such as the COVID-19 pandemic, when traffic volumes declined sharply and significantly affected toll revenue and project cash flows. These findings suggest that targeted government support through VGF not only enhances investment feasibility but also contributes to a more balanced distribution of financial risk between the public and private sectors, thereby improving the long-term sustainability of strategic toll road infrastructure projects.

Conclusion

Based on the investment feasibility analysis and the evaluation of alternative financing schemes for the Palembang–Simpang Indralaya (Palindra) Toll Road, several key conclusions can be drawn. Three principal financing mechanisms can be considered to mitigate the financial risks arising from the project's lower-than-expected Average Daily Traffic (ADT), which has reached only 26%–45% of the original business plan target. These alternatives include the Availability Payment (AP) Scheme, the 30% Viability Gap Funding (VGF) Scheme, and the Asset Divestment (Asset Recycling) Scheme with divestment levels of 49%, 51%, and 100%.

Among the financing alternatives evaluated, the 30% VGF scheme proves to be the most effective standalone financing mechanism for enhancing the project's financial feasibility. The scheme delivers the strongest financial performance, achieving an Internal Rate of Return (IRR) of 12.41%, which exceeds the project's financing cost of 9.5%, generating a positive Net Present Value (NPV) of IDR 2,012,937 million, and reducing the Payback Period to 14 years.

The analysis also indicates that the Availability Payment (AP) scheme, assuming a 15-year government payment period, is not financially feasible because it produces a negative NPV of IDR 635.43 billion. This outcome suggests that the payment period is too short to recover the project's capital investment and long-term operation and maintenance costs. Meanwhile, the Asset Divestment scenarios exhibit progressively weaker financial performance as the proportion of equity sold increases. In particular, the 100% divestment scenario records the poorest results, with an IRR of only 3.21% and a negative NPV of IDR 991.02 billion.

Based on these findings, this study recommends that the Indonesian government implement the 30% Viability Gap Funding (VGF) scheme to enhance the financial sustainability and long-term investment viability of the Palembang–Simpang Indralaya Toll Road. In contrast, minority asset divestment (up to 49%) should be considered only as a secondary financing option to address short-term corporate liquidity needs rather than as the primary mechanism for maximizing project profitability.

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