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A Financial Feasibility Study of The Train Loading System 3 (TLS 3) Capacity Upgrade Project at PT XYZ

Chico Citra Tiara[1], Subiakto Soekarno[2]
[1,2]Institut Teknologi Bandung, Indonesia
E-mail: chicocitratiara.cct@gmail.com[1], subiakto@sbm-itb.ac.id[2]

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Abstract: *PT XYZ plans to increase the capacity of TLS 3 from 1.500 tons per hour to 2.500 tons per hour through conveyor motor replacement to support the company's long-term coal production targets. This study aims to evaluate the financial feasibility of the TLS 3 capacity upgrade project, analyze the sensitivity of key variables affecting project feasibility, and formulate risk mitigation strategies by applies capital budgeting, incremental cash flow analysis, and ARIMA method for coal price forecasting. The financial feasibility analysis results indicate that the project generates a positive NPV, an IRR exceeding the WACC, a BCR greater than one, and a payback period that remains within an acceptable financial threshold. Sensitivity analysis was conducted to evaluate the impact of coal prices, fixed operating costs, variable operating costs, inflation, and CAPEX on the project's NPV. The results visualized using spider charts and tornado diagrams indicate that coal price is the most sensitive variable affecting the project's NPV, followed by fixed operating costs and variable operating costs. Risk mitigation strategies are recommended through operational cost control, operational efficiency improvement, preventive maintenance implementation, and periodic monitoring of coal prices and project financial assumptions. Considering the overall analysis results, the TLS 3 capacity upgrade project is considered financially feasible for implementation.*

INTRODUCTION

PT XYZ has a structured mechanism for formulating strategic plans and policies to ensure business continuity aligned with the company's objectives and shareholder directives. The formulation process begins with developing a five-year Long-Term Business Plan (LTBP), which serves as the principal strategic document guiding PT XYZ in conducting its business and achieving its long-term vision.

In the formulation of the LTBP, the Board of Directors plays a critical role as the primary architect, responsible for translating shareholder directives into a comprehensive and measurable strategy that considers market dynamics, industry trends, and existing opportunities and challenges.

The LTBP is subject to annual realignment and revision in coordination with shareholders. PT XYZ targets a Compound Annual Growth Rate (CAGR) of +11,72% in company revenue over the period from 2025 to 2029, supported by a coal production growth target of up to 75 million tons by 2029. To realize these targets, PT XYZ maps out several strategic initiatives. One such initiative is unlocking logistics, where PT XYZ aims to annually increase the coal transportation capacity from the mine mouth to the port. The following table illustrates the coal transportation targets set for the period 2025–2029.

Table 1. Coal Transport Capacity Target 2025 – 2029

Years	2025	2026	2027	2028	2029
Annual Transports (million tonnes)	43,8	56,5	58,1	65,1	68,1

The coal transportation targets outlined in the table above represent PT XYZ's total overall target under the lower-case scenario. Operationally, PT XYZ manages five Train Loading Systems (TLS), each serving as the final loading terminal for coal before it is transported by railcars. PT XYZ has identified capacity constraints at TLS 3. As a critical component of the supply chain, TLS 3 is targeted to contribute 7,8 million tons annually toward the total transportation target for the 2025–2029 period. However, with operational capacity currently limited to 1.500 tons per hour, serious concerns arise regarding the ability to meet this transportation target. Historical data show coal transport volumes through TLS 3 were 5,4 million tons in 2022, 6,5 million tons in 2023, and 7,5 million tons in 2024, indicating a narrowing gap opposed to annual target.

To address this potential capacity deficit, PT XYZ has conducted a comprehensive technical study. The study recommends upgrading TLS 3's capacity to 2.500 tons per hour as an essential solution to ensure the achievement of the annual transport volume target of 7,8 million tons. Before implementing the TLS 3 capacity upgrade project, PT XYZ must conduct a financial feasibility evaluation. This analysis will include cash flow projections, sensitivity assessments under various economic scenarios, and calculations of key financial indicators such as Net Present Value (NPV), Internal Rate of Return (IRR), Benefit-Cost Ratio (BCR), and Payback Period. The analysis must incorporate macroeconomic assumptions, including inflation rates and coal price projections, to clearly depict expected project returns within the targeted timeframe. Furthermore, thorough review of historical transportation performance and cost data is necessary to ensure accuracy in estimations. The results of this financial feasibility evaluation play a crucial role for PT XYZ stakeholders in investment decision-making regarding the viability of the TLS 3 capacity upgrade project. Therefore, this study functions not only as a financial measurement tool but also as a strategic instrument to assist PT XYZ in managing risks and ensuring that investments optimally contribute to the targeted revenue growth.

LITERATURE REVIEW

Coal Price Forecasting

Coal price forecasting is an important component in financial feasibility analysis because coal prices directly influence projected revenue, cash flow generation, and overall project profitability. Since coal prices are highly influenced by market volatility, demand fluctuations, and global energy conditions, forecasting methods are required to estimate future coal price movements more systematically and objectively.

Inflation Assumption

Inflation refers to the general increase in the prices of goods and services over time, resulting in a decline in purchasing power. In financial and economic analysis, inflation is an important factor because it directly affects operational costs, production expenses, transportation costs, and overall project cash flow projections. Therefore, inflation assumptions are commonly incorporated into feasibility studies to reflect future economic conditions and provide more realistic financial projections.

Time Value of Money (TVM)

The concept of Time Value of Money (TVM) is a fundamental principle in finance which states that a sum of money received today holds greater value than the same amount in the future. This is due to the potential of the money to earn interest or generate income if invested. TVM is crucial in capital budgeting since investment projects involve cash flows occurring at different times.

Capital Structure Theory

In project feasibility analysis, understanding the company's cost of capital and capital structure is important because investment projects must generate returns exceeding the company's financing cost in order to create economic value. The Weighted Average Cost of Capital (WACC) represents the average cost incurred by a company to finance its operations through a combination of equity and debt financing (Ross, Westerfield, & Jaffe, 2009). Therefore, WACC is commonly used as the discount rate in project valuation and capital budgeting analysis.

RESEARCH METHODOLOGY

This research primarily employs a quantitative research design. This approach is driven by the numerical nature of the research objectives, which focus on evaluating the financial feasibility of the TLS 3 capacity upgrade project. The study calculates several financial feasibility indicators, including Net Present Value (NPV), Internal Rate of Return (IRR), Benefit-Cost Ratio (BCR), and Payback Period (PBP), to objectively assess the project's investment viability. Furthermore, sensitivity analysis is conducted to evaluate the impact of changes in key variables, such as coal price, operational costs, capital expenditure, and discount rate assumptions, on project feasibility. The findings from the sensitivity analysis are subsequently used as the basis for qualitative risk mitigation discussion aimed at identifying potential operational and financial risks associated with the project implementation. Therefore, the study combines quantitative financial evaluation with qualitative managerial interpretation to support investment decision-making. The data collection in this research combining secondary data analysis and primary data collection via interviews, ensuring comprehensive coverage of all necessary financial and operational inputs for the feasibility analysis.

1. Primary data is gathered through data collection and discussion with key personnel within PT XYZ, including project team, maintenance team, operational team, finance team, and accounting team. Discussion is essential for validating assumptions derived from secondary sources, obtaining details not captured in formal reports (e.g., specific CAPEX breakdowns and existing asset book value), clarifying internal decision-making criteria, and gaining qualitative insights into strategic considerations that inform the financial projections.
2. Secondary data forms the foundational layer, sourced from PT XYZ's internal documents such as annual reports, project technical feasibility, and operational performance records, which provide specific historical and projected figures crucial for the financial model.

Complementary external secondary data, including market reports from reputable research firms, economic forecasts from financial institutions, and industry benchmarks, are utilized to establish realistic macroeconomic assumptions (e.g., coal price projections, inflation, interest rates, cost of debt, and cost of equity) and validate internal projections.

RESULT AND DISCUSSION

Feasibility Analysis

In this study, the terminal value of the new motor is estimated using a conservative assumption of 10% of the initial capital expenditure (CAPEX), representing the residual economic value of the asset at the end of the project analysis period. The terminal value assumption has also incorporated inflation adjustment to reflect the estimated future economic value of the asset at the end of the projection period. Although the project is expected to generate incremental revenue through increased operational capacity, the project does not materially alter the company's operating cycle, receivable policy, inventory requirements, or short-term operational liquidity structure. Therefore, additional working capital requirements are considered immaterial and are not separately incorporated into the financial model.

Based on the cash flow projection, the project feasibility indicators consisting of Net Present Value (NPV), Internal Rate of Return (IRR), Benefit-Cost Ratio (BCR), Payback Period, and Discounted Payback Period were obtained as presented in the following table. These indicators collectively provide an assessment of the project's financial feasibility from a firm-level perspective using incremental project cash flows discounted by the Weighted Average Cost of Capital (WACC), where NPV > 0, IRR > WACC, BCR > 1, and a reasonably short payback period generally indicate that the investment is financially viable.

Table 2. Financial Feasibility Analysis Result

Description	Unit	Results
NPV	Rp	20.421.248.529
IRR	%	29,11%
BCR	X	1,45
Payback Period	Year	3
Discounted Payback Period	Year	4
IRR - WACC	%	17,32%

The calculation results indicate that the project generates a positive NPV of Rp20.421.248.529, an IRR of 29,11%, and a BCR of 1,45. Furthermore, the resulting project IRR exceeds the project WACC by 17,32%, confirming that the projected return generated by the project is expected to generate returns above the company's required rate of return. The project also demonstrates a payback period of 3 years and a discounted payback period of 4 years, indicating that the initial investment that incurred since Year 0 can be recovered within the project economic life. Based on these indicators, the TLS 3 capacity upgrade project can be considered financially feasible from a firm-level cash flow perspective.

Sensitivity Analysis

The results indicate that a positive change in coal price generates a substantial increase in project NPV, while a negative coal price shock causes the project NPV to decline significantly into a negative position. This condition demonstrates that the project's financial feasibility is highly dependent on coal market conditions and commodity price stability. Since project revenue is

directly influenced by coal selling prices, fluctuations in coal prices produce a magnified effect on projected project cash inflows and overall project profitability.

In addition, operating cost components also demonstrate significant influence on project feasibility. Fixed operating costs (COGS Fixed Cost) exhibit particularly high sensitivity because these recurring expenses continue to be incurred regardless of production fluctuations, thereby increasing the project's operating leverage. Similarly, increases in variable operating costs directly reduce operating margins and incremental project cash flows generated by the upgrading project. These findings indicate that operational efficiency and cost control represent critical managerial factors in maintaining project profitability throughout the project operational period.

Meanwhile, variables such as production volume, CAPEX, and WACC demonstrate moderate sensitivity toward project NPV. Higher production volume contributes positively to project feasibility due to increased incremental revenue generation, whereas higher CAPEX and discount rate assumptions reduce project economic attractiveness through increased investment burden and discounting effect.

On the other hand, inflation rate, royalty cost, and selling & marketing costs demonstrate relatively limited sensitivity toward project feasibility within the assumed sensitivity range. This result suggests that the project's economic performance is influenced more significantly by operational profitability and commodity market performance rather than by moderate macroeconomic assumption changes.

Risk Mitigation

Based on the sensitivity analysis results presented in the previous section, several variables were identified as having significant influence on the financial feasibility of the TLS 3 capacity upgrade project. The sensitivity analysis demonstrates that fluctuations in coal price, operational costs, production performance, capital expenditure, and macroeconomic assumptions may materially affect the project's Net Present Value (NPV) and overall investment attractiveness.

Accordingly, a risk mitigation analysis was subsequently conducted to identify the potential risks associated with the project implementation and to formulate appropriate mitigation strategies aimed at reducing the likelihood and impact of unfavorable conditions. The risk mitigation analysis focuses primarily on variables identified as highly sensitive through the sensitivity analysis, particularly those related to operational performance, commodity market conditions, investment realization, and financial assumptions.

Business Solution

Based on the overall financial feasibility analysis, the TLS 3 capacity upgrade project demonstrates positive economic prospects and is considered financially feasible for implementation. The feasibility indicators show that the project is capable of generating a positive Net Present Value (NPV), an Internal Rate of Return (IRR) exceeding the Weighted Average Cost of Capital (WACC), a Benefit-Cost Ratio (BCR) greater than one, and an acceptable payback period. These results indicate that the project is capable of generating incremental economic benefits and enhancing operational value for PT XYZ through increased loading capacity at TLS 3. The analysis further indicates that the upgrading project contributes positively toward operational performance by increasing production throughput and improving loading efficiency. Since the project is relatively limited in scale compared to PT XYZ's overall operational capacity and financial position, the investment can be financed internally without requiring additional

external debt financing. Consequently, the project may be implemented without materially increasing the company's financial leverage or financing burden.

Nevertheless, the sensitivity analysis demonstrates that the project's financial feasibility remains highly sensitive to fluctuations in coal prices, fixed operating costs, and variable operating costs. Coal price represents the dominant external risk factor because the project's projected revenue depends directly on coal market conditions. Meanwhile, operational cost efficiency becomes a critical internal factor affecting long-term project profitability due to the relatively high proportion of recurring production costs associated with the upgrading operation. The risk mitigation analysis therefore emphasizes the importance of maintaining operational efficiency, strengthening preventive maintenance programs, optimizing fuel and operational resource utilization, and implementing disciplined cost control mechanisms throughout the project operational period. In addition, PT XYZ should continuously monitor coal market developments and periodically evaluate operational assumptions in order to maintain project sustainability under changing business conditions. Based on the overall feasibility, sensitivity, and risk mitigation analyses, the recommended business solution for PT XYZ is to proceed with the implementation of the TLS 3 capacity upgrade project while simultaneously prioritizing operational cost efficiency and adaptive operational planning as key managerial strategies. The project is considered capable of supporting production capacity improvement and generating positive economic value for the company, provided that operational performance and cost management are consistently maintained throughout the project life cycle.

CONCLUSION

This study was conducted to evaluate the financial feasibility of the TLS 3 capacity upgrade project at PT XYZ using the incremental cash flow approach and the Weighted Average Cost of Capital (WACC) as the discount rate. Based on the feasibility analysis results, the project is considered financially feasible for implementation, as indicated by a positive Net Present Value (NPV), an Internal Rate of Return (IRR) exceeding the WACC, a Benefit-Cost Ratio (BCR) greater than one, and an acceptable payback period. These results indicate that the project is capable of generating positive incremental economic benefits and supporting the company's operational capacity improvement objectives.

The sensitivity analysis results indicate that the project's financial feasibility is primarily influenced by coal price, fixed operating costs (COGS Fixed Cost), and variable operating costs (COGS Variable Cost). Among these variables, coal price demonstrates the highest sensitivity toward project Net Present Value (NPV), indicating that the project's economic performance is highly dependent on coal market conditions. In addition, operational cost efficiency plays an important role in maintaining project profitability throughout the operational period.

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