

RISK MANAGEMENT IN PROJECT FINANCING OF FERRONICKEL PROJECT: A CASE STUDY OF PT NIKEL MAJU BERSAMA

MANAJEMEN RISIKO DALAM PEMBIAYAAN PROYEK FERONIKEL: STUDI KASUS PADA PT NIKEL MAJU BERSAMA

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ABSTRACT

This study aims to identify key financial risks in the financing strategy of the Venus Project by PT Nickel Maju Bersama (PT NMB), and to develop effective mitigation plans to ensure the project's continuity and success. The Venus Project is part of Indonesia's nickel down streaming agenda supporting the electric vehicle (EV) battery ecosystem. A qualitative approach was applied through in-depth interviews and Focus Group Discussions (FGDs) with internal and external stakeholders. Data analysis employed coding methods, SWOT, PESTEL, and stakeholder mapping. The findings reveal that financial risks such as funding delays, capital cost overruns, and market uncertainty significantly threaten project viability. Moreover, the lack of formal documentation on mitigation strategies was noted. Based on these findings, the study proposes a comprehensive risk management framework, including mitigation strategies such as optimized capital structure, financial hedging, and robust covenant design. This study contributes practical insights into financial risk management for large-scale mining projects, especially those utilizing project finance structures.

Keywords: Risk Management, Project Financing, Ferronickel, Nickel Down streaming, PT Nickel Maju Bersama

ABSTRAK

Penelitian ini bertujuan untuk mengidentifikasi risiko utama dalam strategi pembiayaan Proyek Venus oleh PT Nickel Maju Bersama (PT NMB), serta menyusun rencana mitigasi yang efektif untuk mendukung kelangsungan dan keberhasilan proyek. Proyek ini merupakan bagian dari hilirisasi nikel nasional untuk mendukung ekosistem baterai kendaraan listrik. Studi ini menggunakan pendekatan kualitatif dengan wawancara mendalam dan Focus Group Discussion (FGD) terhadap berbagai pemangku kepentingan internal dan eksternal. Analisis dilakukan melalui pengkodean data, SWOT, PESTEL, dan pemetaan pemangku kepentingan. Hasil penelitian menunjukkan bahwa risiko pembiayaan seperti keterlambatan pendanaan, pembengkakan biaya, dan ketidakpastian pasar sangat memengaruhi keberlanjutan proyek. Selain itu, ditemukan kurangnya dokumentasi formal atas strategi mitigasi yang telah disusun. Berdasarkan temuan ini, peneliti menyusun kerangka manajemen risiko yang komprehensif dengan strategi mitigasi seperti struktur modal yang optimal, lindung nilai keuangan, dan desain kovenan utang yang kuat. Studi ini memberikan kontribusi praktis terhadap pengelolaan risiko proyek skala besar di sektor pertambangan, khususnya proyek yang menggunakan pendekatan project finance.

Kata Kunci: Manajemen Risiko, Pembiayaan Proyek, Ferronikel, Hilirisasi Nikel, PT Nickel Maju Bersama

INTRODUCTION

Nickel is one of the critical minerals which is used in the manufacturing industry and is important for the broad economy for alloys and stainless steel, with growing demand driven by infrastructure, construction, and renewable energy projects. Nickel is most widely used for making EV batteries, but is also used in low emissions power generation, such as in wind and geothermal energy. From 2020 to 2023, demand from the clean energy sector became the main factor of 30% demand increased in overall nickel (IEA, 2024). Herewith the projection of global nickel demand starts from 2015 until 2050 along with growth of EV batteries and clean energy technologies development:

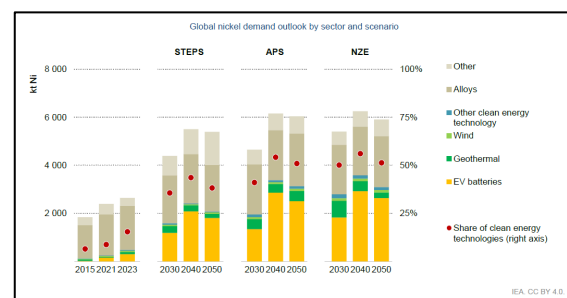


Figure 1. Global nickel demand period 2030-2050.

Source: (International Energy Agency (IEA), 2024)

From figure 1 we can determine that global nickel demand remained steady between 2018 and

2020 around 2.4 Mt, but then began to increase rapidly, reaching around 3.1 Mt in 2023. In the Net Zero Emission Scenario, demand increases more rapidly to 5.6 Mt in 2030 as more EVs and low-emissions power generation are deployed until 2040 then slightly decrease in 2050 due to lower demand for uses in stainless steel as secondary supplies (IEA, 2024).

Indonesia, one of the world's largest nickel producers with production amounted to an estimated 1.6 million metric tons per annum and reserve about 21 million metric tons in 2022 (Grace & Cindy, 2023). Indonesia government have push for downstream processing and industrialization under policies like the mineral export ban since 2014 triggered the several domestic and foreign investments coming up to build ferronickel and NPI smelters (mostly coming from China). Until July 2023, Indonesia has operating 43 nickel smelters in Sulawesi and the Maluku islands while several smelters are under construction (Grace & Cindy, 2023). China has been instrumental in building Indonesia's downstream nickel industries produces Ferronickel and Nickel Pig Iron (NPI) as raw materials for stainless steel production then export those stainless steel to their own country. Along with the potential of reserves and production of nickel, Indonesia will play a big role in the future supply for stainless steels as well as EV battery industries.

PT Nikel Maju Bersama (NMB), a reputable mining company in Indonesia has embarked on an industrial project to build ferronickel plant in East Halmahera, North Maluku ("Venus Project") aimed at maximizing the value of its mined resources to support the establishment of Electric Vehicle (EV) Battery ecosystem in Indonesia. This reflects the company's commitment to sustainability and long-term economic growth, particularly in East Halmahera. By investing in recent technology smelters, PT NMB intends to increase its efficiency in processing raw materials, thereby generating higher-quality outputs. In terms of developing Venus Project, the company requires additional financial support from strategic investors due to significant financial investment needed and is accompanied by various risks, including market volatility, regulatory challenges, and environmental concerns. Currently, PT NMB through its subsidiary has established Joint Venture (JV) with prominent partners of Chinese company, Lingbo Nickel Ltd ("Lingbo"), to develop Venus Project.

In terms of developing Venus Project, effective risk management is crucial for ensuring Venus Project is feasible to develop and generate economic return to the company as well as Venus Project supported by sufficient funding so that project development can be carried out without doubt that it will stop before the Venus Project is completed due to funding problems. Despite PT NMB engaged in partnership with Lingbo and

potentially secure the financing of project, the financing for ferronickel plant projects has complexities encompassing several factors such as the large capital requirements, long payback periods, and market uncertainties. Venus Project also has unique risks, including volatility of nickel prices, regulatory shifts in mining and environmental policies as well as high cost for environmental and social compliance aspects due to the ecological sensitivity of the region.

Project Risk Management is one of parts in Project Management Body of Knowledge (PMBOK) 6th edition which describes the process of planning, identification, analysis, response planning, and monitoring and controlling the risks which can occur on Venus Project. The objective of Project Risk Management is to increase likelihood and impact of positive events as well as decreasing the probability and impact of negative events in Venus Project therefore increasing probability of Venus Project can be successful. In terms of project financing strategies, negotiating risk-sharing arrangements that are appropriate for Venus Project being developed is an important thing to be considered by the company when preparing project finance for their individual projects (Khan & Parra, 2003). The risk-sharing arrangement is one example of how the company manages the risks which can occur while seeking funding as well as formulating a structure or strategy to finance Venus Project. Thus, the company needs to consider the importance of risk management in project financing since it can impact on successful project development.

In accordance with the government's priority program, PT NMB has incorporated Venus Project into its Corporate Long-Term Planning (RJPP) for 2020-2024, focusing on business diversification via nickel down streaming. In this project, PT NMB will concentrate on mining operations and smelter development, alongside processes for refining nickel to meet the demand from the electric vehicle battery industry. The down streaming initiative is anticipated to enhance the company's financial performance and generate additional value for shareholders. This initiative is also anticipated to assist the government in developing the national electric vehicle ecosystem.

Managing risk in financing and executing large-scale projects, such as a ferronickel plant in Indonesia, entails a complex interplay of strategic, operational, financial, and regulatory challenges. Such projects generally require substantial capital investment, engage multiple stakeholders, and face geopolitical, environmental, and market risks. The establishment of a ferronickel plant in Indonesia presents distinct challenges related to the nation's regulatory framework, socio-political context, and natural resource considerations. The authors were prompted to investigate in greater detail how PT NMB manages risks related to its financing strategy.

Managing financial risks, rather than operational, legal, and reputational risks, is essential for determining successful development of Venus Project.

The purpose of this study is to identify the key risks specifically related to the financing strategy of the Venus Project at PT Nikel Maju Bersama, as well as to assist the project owners in analyzing the causes and impacts of each potential risk. This research also aims to provide guidance in formulating a risk mitigation plan, implementing the plan, and monitoring its execution to ensure effective risk management in the project's financing strategy. Therefore, this study is expected to support better decision-making and enhance the overall success of the project.

LITERATURE REVIEW

In their research, (Kolodiziev et al., 2017) studied that risk management in project finance is important, particularly in Public-Private Partnership (PPP) project in Ukraine and emphasizes a balanced risk-sharing framework between public and private partners. Both parties collaborate to optimize shared benefits while distributing risks proportionally to their ability to manage them. According to (Anozie et al., 2023), through applying the strategies organizations can manage financial risks more effectively in large-scale project financing, ensuring improved performance and sustainability. According to (Nguyen, 2024), risk management effectiveness will decrease if the firms pursue **financial flexibility** since firms might prioritize short-term liquidity and accept higher costs. In the context of the Vietnamese stock market, where there might be a desire for quick returns and liquidity, firms could be sacrificing risk management quality. (Kovalenko et al., 2020) undertake research of **structured framework for understanding and mitigating risks in project financing**. Project finance is associated with the risk of its implementation, since there is a need to attract significant amounts of financial resources that project participants receive both by obtaining bank loans and by issuing various types of securities. To minimize the risks of project finance it is possible to use such strategies as: risk management strategy, supply chain strategy and search strategy.

RESEARCH METHODS

Research Design

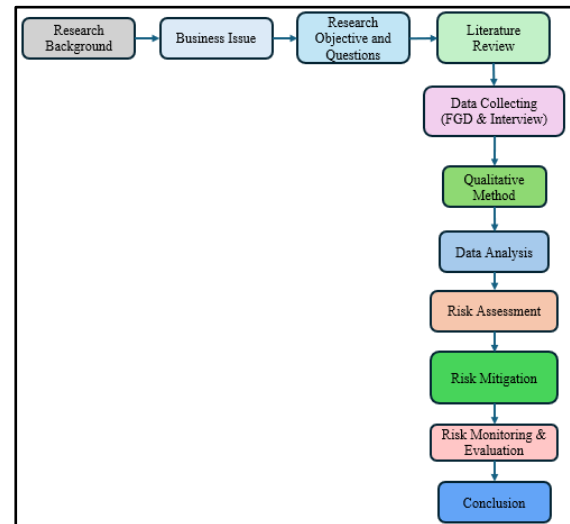


Figure 2. Research Design

Research design pertains to the several inquiry kinds within qualitative, quantitative, and mixed methodologies approaches that provide precise procedural guidance for a research study (Creswell & Creswell, 2017). A research design is a framework for gathering, measurement, and analysis of data, formulated to address research questions (Sekaran & Bougie, 2009).

The research design of "Risk Management in Project Financing for Ferronickel Projects: A Case Study of PT NMB" is organized according to a procedural flow that commences with the identification of problems and difficulties. The primary concern pertains to the significant risks associated with formulating the financing plan for Venus Project, while also considering the development undertaken by the joint venture and how PT NMB manages these risks, encompassing risk assessment, mitigation, as well as monitoring and evaluation. The study procedure employed a methodical approach to data collection and utilizing a qualitative methodology.

Data Collection Methods

The data gathering for the research "Risk Management in Project Financing for Ferronickel Projects: A Case Study of PT NMB" is a crucial stage that underpins the research conclusions. The study aims to get a comprehensive and deep understanding of the risk management associated with the funding plan for Venus Project through two basic ways: primary and secondary data sources. The author will obtain primary data using a questionnaire survey and comprehensive interviews. Secondary data is acquired through a literature review, company records, reports, and pertinent publications

Qualitative (In-depth Interviews)

The primary emphasis of the qualitative data collection is on comprehensive interviews with

pivotal participants in Venus Project, alongside senior management of PT NMB, including board members, executives (division heads), managers, and employees.

Table 1. List of informants for interview

No	Name	Position	Level
1	Respondent 1	Risk Management Division Head	Executive
2	Respondent 2	Risk Management Lead Specialist	Manager
3	Respondent 3	Investment Manager	Manager

The objective of selecting informants is to ensure that the insights obtained represent various perspectives within the organization, spanning from the strategic to the operational level.

Qualitative (Focus Group Discussion)

Focus Group Discussion (FGD) conducted aiming to cross-check themes from individual interviews (e.g., key risk factors, mitigation effectiveness) in a peer-interaction setting as well as generate collective solution through brainstorming and refining mitigation strategies such as capital-structure tweaks, hedging tactics, and contingency plans.

Table 2. List of informants for interview

No	Name	Position	Level
1	Respondent 1	Business Development Division Head	Executive
2	Respondent 2	Risk Management Lead Specialist	Manager

3	Respondent 3	Business Development Manager	Manager
4	Respondent 4	Investment Manager	Manager
5	Respondent 5	Business Development Staff	Staff

Data Analysis Methods

To assess the implementation of risk management in financing strategies to fund Venus Project, qualitative method analyses were performed with a focus on primary data obtained through interviews and FGD to validate the effectiveness of the risk management framework's implementation, particularly in terms of financing strategy.

Interviews will be conducted to acquire a more in-depth and qualitative knowledge of the experiences and perspectives of those directly involved in Venus Project. The qualitative data will be examined using the coding method established by (Creswell & Creswell, 2017). Coding is the process of organizing data by bracketing chunks (or text or image segments) and inserting a category-specific word in the margins (Rallis & Rossman, 2012). It entails gathering text data or images obtained during data collection, segmenting sentences (or paragraphs) or photos into categories, and labelling those categories with a word, frequently based on the participant's native language (called an *in vivo* term). Using this strategy, the researchers will be able to extract useful insights from the interviews, highlighting the nuances of stakeholder perspectives and the complexities of risk management framework implementation. This study uses inductive qualitative analysis to add context and depth to the qualitative findings, enabling a thorough knowledge of risk management implementation in Venus Project, as well as the implications for how PT NMB develops financing solutions for Venus Project.

RESULTS AND DISCUSSIONS

Table 3. PESTEL Analysis

Factors	Issues	Possible Cause
Political	Regulatory environment	Frequent updates to mining laws and regulations can create uncertainty and could impact long-term incentives.
	Stability and regional politics	While Indonesia politics is stable, regional autonomy especially in regions hosting Venus Project, as local governments may have additional requirements.
	Shifting geopolitics	Recent fluctuations in US tariff policies have hastened deeper structural changes in the global economy.
Economics	Cost of capital	High interest rates in emerging markets can increase the financing cost

Factors	Issues	Possible Cause
	Global nickel demand	The global surplus which causes declining prices can reduce the revenue and profitability while the Venus Project is finished and operated.
	Access to financing	Availability of investment or loans might depend on perceptions of sectoral and country risk, which can deter or attract financiers.
Social	Local community impact	Resistance from social communities may arise due to environmental degradation or insufficient benefits of Venus Project to the community.
	Relocation	Mining projects require land acquisition which has a wide range of implications including social disturbance, loss of access to resources, and even long-term health effects.
Technological	Energy efficiencies	Adopting advanced ferronickel processing technologies can enhance efficiency, reduce costs, and attract investors which have concerns with environment sustainability.
	Digitalization	Use of digital tools for project management, risk monitoring, and financial modeling can improve efficiency.
Environmental	Sustainability concerns	The process of ferronickel production is energy-intensive and produces greenhouse gases cause the investor required Venus Project owner to invest in green technologies.
	Climate change	Extreme weather events, such as heavy rain, flooding, landslides, tropical storms and high winds may disrupt operations and supply chains and increase financial risk.
Legal	Taxation policies	Fluctuating corporate tax rates and special royalties for nickel can impact profitability projections.
	Contractual risks	Arrangement of financing such as loan agreements which are not clearly structured can potentially raise legal issues.

The PESTEL analysis results indicate that financing the ferronickel project is not solely influenced by PT NMB's internal conditions but is also heavily shaped by external, systemic factors beyond the company's full control. Among the six factors analyzed: Political and legal factors reveal challenges in regulatory uncertainty—both from central and regional governments—as well as potential changes in tax and royalty policies. This highlights the need for strong regulatory and legal risk management, particularly in designing financing agreements and contracts.

Economic factors show that funding risks are affected by high interest rates and perceptions of country risk by investors and financial institutions. Therefore, the financing strategy must be aligned with macroeconomic conditions and consider access to multinational funding sources.

Social and environmental factors suggest the project may face community resistance and sustainability challenges, directly impacting operational continuity and the project's reputation. This indicates that social and environmental risk management should be an integral part of the financing strategy.

Technological factors offer risk mitigation opportunities by improving efficiency and aligning with sustainable practices. Environmentally friendly technologies may attract global investors who prioritize ESG (Environmental, Social, and Governance) criteria.

Overall, the PESTEL findings underscore the importance of a holistic and adaptive approach in designing a financing strategy that is responsive to external dynamics.

Table 4. SWOT Analysis

Strengths	Weaknesses
<ul style="list-style-type: none"> Proven experience in nickel down streaming more than five decades. (S1) 	<ul style="list-style-type: none"> High investment costs for ferronickel plant construction as well as

<ul style="list-style-type: none"> Supporting from government to encourage downstream investment and processing. (S2) 	<ul style="list-style-type: none"> implementing the recent technology. (W1) Dependency on external financing will be exposed to currency and interest rate risks. (W2)
Opportunities	Threats
<ul style="list-style-type: none"> Growth in EV battery demand is which potentially increases nickel consumption. (O1) Potential for conducting partnership with technology providers to reduce environmental impact and improve efficiency. (O2) Conducting a joint venture (JV) to share financial risks. (O3) 	<ul style="list-style-type: none"> Volatility in nickel prices can affect the deviation between revenue realization and projection. (T1) Changes in regulation and geopolitical risks. (T2) Environmental degradation is caused by the operation of the ferronickel plant. (T3)

Based on the SWOT analysis above author will build TOWS matrix to formulate strategies by matching internal and external factors in SWOT analysis to achieve goals and mitigate risks. The directions to formulate strategies in TOWS matrix as below:

1. Strength-Opportunity (SO): Use internal strengths to capitalize on external opportunities.

2. Weakness-Opportunity (WO): Address internal weaknesses to exploit opportunities.
3. Strength-Threat (ST): Use strengths to counter external threats.
4. Weakness-Threat (WT): Minimize weaknesses and avoid threats

Herewith the strategy in TOWS matrix as described in table below:

Table 5. TOWS Matrix

TOWS Analysis	Strength	Weakness
Opportunity	<ul style="list-style-type: none"> Leverage capabilities to build down streaming facilities to fulfill growth in EV battery demand. (S1-S2-O1) Build a ferronickel plant through JV with a strategic partner and collaborate with technology providers. (S1-O2-O3) 	Establish JV in developing the down streaming plant and engage technology provider for sharing investment cost as well as risk sharing. (W1-W2-O1-O2-O3)
Threat	<ul style="list-style-type: none"> Reduce the operation cost of ferronickel plant to mitigate volatility in nickel prices (S1-T1). Ensure to get support from the government to build down streaming plant. (S2-T2) 	<ul style="list-style-type: none"> Minimize investment cost to reduce impact of volatility nickel prices. (W1-T1) Leverage equity financing capabilities to mitigate regulation and geopolitical risk (W2-T2)






Stakeholder Analysis

A stakeholder analysis approach was developed to assist organizations in planning a stakeholder map by categorizing key people or parties to be managed and closely followed up (Widianingrum, 2018). Stakeholder identification is then followed up with an analysis on the

stakeholders that may affect or be affected by the financing completion of the Venus Project. The author has identified both internal and external stakeholders along with the level of their power, interest and the importance of the research for them respectively:

1. Internal Stakeholders

Table 6. Internal Stakeholders Identification

No	Internal Stakeholders	Level of Power	Level of Interest	The importance of the research
1	BOD 	High	High	BOD as project sponsor holds ultimate accountability for the success of Venus Project. The research will provide insights into how PT NMB manages the risk particularly to financing Venus Project as well as can assist the board in making decisions on financing structures and conduct partnerships.
2	Project Manager 	Medium	High	The Project Manager is the person who oversees the daily execution of Venus Projects and is responsible for the completion of Venus Project. The risk management is needed to ensure that Venus Project is executed on budget.
3	Risk Management Division 	Medium	High	They guide the company to identify, mitigate risks, and ensure risk management effective to reduce the likelihood of project failure. The research will support risk management role through identifying, assessing and prioritizing the key risk of strategy to financing Venus Project.
4	Corporate Finance Division 	High	High	This division has a critical role to secure the funding, negotiation terms and ensure financial sustainability for the Venus Project. The research will help to design several financing strategies and enable effective planning of funding arrangements.
5	Researcher 	Low	High	Researcher is an actor which expects to contribute providing innovative solutions for managing risks regarding the complexity to financing Venus Project.

From the internal stakeholder identification table, five key actors within PT NMB are identified as having crucial roles in ensuring successful financing of the Venus Project.

- The Board of Directors (BOD) and Corporate Finance Division possess the highest power and interest levels. They are the primary decision-makers and must be actively involved in formulating and monitoring the financing strategy.
- The Risk Management Division and Project Manager hold medium influence but play essential roles in implementation



and oversight of daily financial risks arising throughout the project lifecycle.





- The Researcher, while having low authority, provides valuable analytical and innovative input that contributes to improving risk mitigation plans and continuous evaluation.

The analysis shows that PT NMB has adequate internal human capital to support financial risk management. However, cross-functional coordination and clear assignment of risk ownership must be reinforced to ensure effective mitigation.

2. External Stakeholders

Table 7. External Stakeholders Identification

No	External Stakeholders	Level of Power	Level of Interest	The importance of the research
1	Shareholders 	High	High	Shareholders are highly concerned about the financial performance of Venus Project. The research will help to ensure that the Venus Project is financially viable, and risks are mitigated as well as increasing trust to management.
2	Government 	High	Medium	The government expects that Venus Project giving benefits for national economic

No	External Stakeholders	Level of Power	Level of Interest	The importance of the research
				growth, job creation and the downstream process of nickel. The research provides insights into regulatory compliance and ensures value added in the mining industry.
3	Creditors 	High	High	Creditors can influence terms and conditions in loan agreements. The research will help to ensure that Venus Project is viable to finance as well as the risks are mitigated effectively.
4	Investors 	Medium	High	Investors can influence strategic decisions and seek financial returns from Venus Project. This research will increase investor's confidence through a good approach to financing and managing the risk of Venus Project.
5	Customers 	Low	High	Customers rely on Venus Project through quality of ferronickel supply to meet their needs. The research will help to ensure the risks are mitigated and ensure high-quality product supply.
6	Local Community 	Medium	High	The community can influence Venus Project through protests or lobbying for government intervention. The research helps to ensure that the concerns are addressed through local employment and infrastructure development.

The external stakeholder identification table reveals that the success of project financing depends heavily on how well PT NMB manages relationships with strategic external parties.

- Shareholders, creditors, and the government hold significant power in financing decisions and project continuity. They expect transparency, legal compliance, and long-term economic viability.
- Investors and local communities have high interest, though moderate power. They can exert pressure through market signals or public opinion, especially if the project is perceived to neglect sustainability and social justice.

- Customers, despite having lower power, are still relevant as end users of the ferronickel output. A consistent supply is crucial to maintaining their trust in PT NMB's product.

From this analysis, it is concluded that stakeholder expectation management and communication must be part of the financing risk mitigation strategy. Strong relationships with external stakeholders can facilitate financial closure and enhance the project's bankability.

Based on power and interests of each stakeholder, herewith the picture of stakeholder mapping:

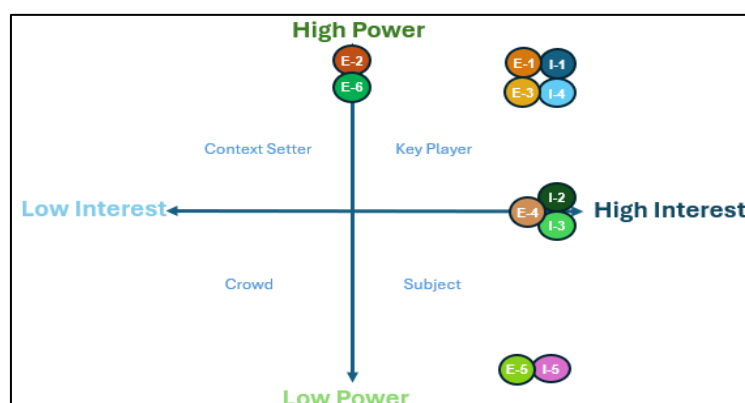


Figure 3. Stakeholder Mapping

Data Analysis – Qualitative

Table 8. Themes Category

Themes	Descriptions	Counter
Financial Risk Identification	Types of financial risks identified for the project consists of funding uncertainty, cost overrun, market/offtake, interest and currency, as well as stakeholder governance risk.	30
Financing Strategies	How the project's financing is structured and pursued consists of equity contribution from shareholders (40%), debt financing (plan to rise 60% debt financing), Lingbo led financing process, external funding actions, as well as contingency funding measures.	24
Mitigation strategies for Financial Risks	How identified risks are addressed or minimized consists of risk governance process, continuous risk monitoring, mitigation planning, risk action by risk owner, expert support and validation, as well as stakeholder oversight.	20
Stakeholder's roles and coordination	How various stakeholders collaborate or need to do to ensure financing success consists of JV partners roles, internal division coordination, external stakeholder engagement, as well as governance and oversight.	16

Based on the coding and themes as described above, the author can determine some findings regarding how PT NMB manages the risks while formulating the strategy to financing the Venus Project as below:

1. PT NMB has identified several key financial risks such as funding uncertainties source from equity and debt financing, market/offtake product, interest and currency risk, as well as stakeholders' governance.
2. PT NMB and its JV have not yet prepared a comprehensive plan and strategy to manage the risks in financing the Venus Project as well as its strategy not yet documented appropriately.
3. PT NMB has several financing strategies to ensure the financial closure of the Venus Project. However, those strategies have not yet aligned comprehensively with the key risks which have identified based on information from FGD and in-depth interviews. Therefore, the strategies which have been taken may not effectively minimize the likelihood and impact of all risk related to strategy to financing the Venus Project.

4. PT NMB and Lingbo have not yet prepared a comprehensive plan and strategy to manage the risks related to stakeholder roles and action in order the boundaries across organization can be managed as well as ensuring transparency and accountability for financial closure.
5. PT NMB need to implement comprehensive risk management of financing strategy for the Venus Project.

All the information refines from FGD and in-depth interviews through coding and themes grouping process will be integrated with the PESTEL, SWOT and Stakeholders Analysis and become a main reference to conduct risk assessments, risk mitigation, risk monitoring and evaluation related to financing strategies to funding the Venus Project as comprehensive risk management strategy.

Business Solution Risk Management in PT NMB

Table 9. Risk Prioritization

Key Risk	Impact Level	Likelihood	Risk Level	Risk Prioritization
Financing Delay or Shortfall	5	5	25	1
Capital Cost Overrun	5	5	25	2
Unintegrated Stakeholder Governance	5	5	25	3
Repayment or mismatch to fulfill cashflow as required	5	5	24	4
Product Off-Taker Uncertainty	5	5	23	5
Interest Rate and Currency Fluctuation Risk	5	5	23	6
Uncertainty in BEP and ROI	5	5	23	7

Based on risk prioritization, herewith the risk heatmap to visually communicate the relative severity and priority of risks by plotting them based on their likelihood and impact, as well as highlight

which risks require immediate attention and guiding to determine appropriate risk treatment

Risk Heat Map Financing Strategy of Venus Project

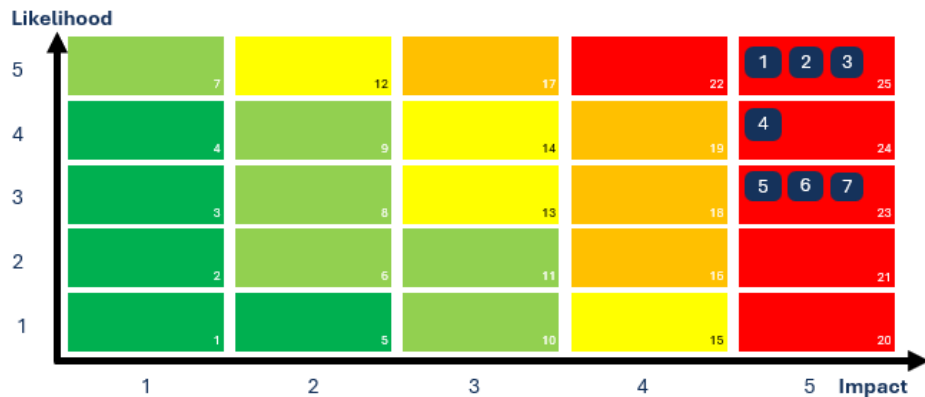


Figure 4. Risk Heat Map

Due to the level of all risks related to financing strategy to funding Venus Project are in red quadrant of risk heat map, the author strongly emphasizes that PT NMB conducting appropriate risk treatment to minimize the impact and likelihood of each risk at the accepted level.

Risk Mitigation

In line with ISO 31000's risk treatment process, PT NMB will implement focused mitigation strategies for each key risk. The goal of these business solutions is to reduce the likelihood of adverse financial events and/or lessen their impact to acceptable levels, in alignment with the company's risk appetite and project goals. Key mitigation strategies include optimized capital structure, financial hedging, robust covenant design, use of contingency measures, and rigorous financial analysis. Below are the main strategies corresponding to the risks identified:

1. Optimized Capital Structure

The company will maintain a prudent mix of debt and equity to ensure financial stability. As noted, an approximately 70:30 debt-to-equity ratio is common in project finance, providing enough equity buffer that lenders are comfortable with project risk. PT NMB's strategy is to avoid over-leveraging; a moderate leverage ensures the debt service burden remains sustainable. By limiting debt to a level where projected DSCR stays above the required minimum (~1.25x) even in downside cases, the project reduces the risk of default. An optimized capital structure also means structuring debt in line with project cash flows: for example, employing a sculpted repayment schedule (where debt repayments are smaller in early years and increase

as production ramps up) to maintain stable DSCR. The financing plan may include subordinated debt or mezzanine capital if needed to fill funding gaps without overloading senior debt. Ensuring equity is injected upfront or pari-passu with debt drawdown is another mitigation to prevent situations where lenders disburse funds while equity commitments fall. The right size of the debt and equity and structuring repayment to project realities, PT NMB mitigates funding structure risk and enhances bankability.

2. Capital Sourcing and Contingency Funding

This mitigation aimed to address Financing Delay or Shortfall risk. PT NMB needs to diversify and solidify its funding sources. This involves securing firm commitments from project sponsors for the required equity and obtaining underwritten loan commitments from banks or investors before major expenditures. By financial close, all necessary funds should be committed or in place, eliminating uncertainty about capital sources. As a contingency, PT NMB plans to arrange a standby facility or credit line that can be drawn if project costs exceed budget (a common practice to manage unforeseen funding needs). Such contingency funding (e.g. an overrun facility or sponsor support agreement) ensures that even if a cost overrun occurs, the project can access additional capital quickly, thereby preventing work stoppages. Additionally, maintaining a cash reserve from the initial funding (or requiring sponsors to set aside a reserve) can cushion against minor shortfalls. This proactive sourcing and backup funding strategy greatly lowers the likelihood and impact of capital shortfall. It aligns with the company's cautious risk appetite by not assuming that additional funds will

be easily raised lastminute; instead, preparations are made in advance.

3. Cost Overrun Controls

PT NMB needs to impose strict cost control measures, primarily through contractual arrangements and budgeting practices. A cornerstone strategy is to use a fixed-price and turnkey EPC contract with a reputable contractor for plant construction. By looking at a fixed contract price, the risk of cost escalations is largely transferred to the contractor. The EPC contract will include provisions for liquidated damages (LDs) if the contractor fails to meet schedule or performance milestones, which indirectly protects against cost overruns by compensating delays (e.g., LDs for late completion can offset additional interest or other costs incurred due to delays). Moreover, the company will allocate a contingency allowance in the project budget (typically 10–15% of total capital cost) dedicated to covering unforeseen expenses. This contingency fund is included in the financing plan from the start, so that known financing covers likely overruns. PT NMB could also seek performance bonds or guarantees from the contractor and/or completion guarantees from sponsors (where the sponsors commit to fund any cost overruns necessary to complete the project). These measures give lenders confidence that cost overruns will be managed without threatening debt repayment. Internally, a robust project control system will be instituted: strict procurement procedures, ongoing cost monitoring (monthly budget vs. actual tracking), and change-order controls (to prevent scope creep) will help prevent overruns. In essence, through fixed-price contracting, budget contingencies, and active cost management, the project significantly reduces the probability of a cost overrun and limits its financial impact if one occurs.

4. Hedging Financial Risks

The financing strategy employs hedging instruments to mitigate interest rate and currency fluctuations. Interest rate risk is addressed by locking in rates for the project's debt. If the loans are floating-rate (e.g. tied to LIBOR/SIBOR or other benchmarks), PT NMB will enter into interest rate swap agreements or similar derivatives to fix the borrowing rate on a substantial portion of the debt (often 70–100% of the notional amount, as often required by lenders). By hedging the interest rates, the project protects itself from rising interest costs that could otherwise seriously erode debt service capacity. Indeed, studies have noted that projects which hedged before recent rate hikes were much better positioned, whereas those unhedged faced covenant strains as rates spiked. In addition to swaps, the financing could consider interest rate caps (options) if full fixing is not feasible, to at least put

an upper limit on interest costs. For currency risk (if applicable), matching the loan currency with revenue is the first preference (natural hedge). For example, if ferronickel sales yield USD, taking USD-denominated loans can hedge currency by alignment. If a mismatch is unavoidable (e.g. some IDR costs funded by USD debt), PT NMB will use FX forward contracts or swaps to hedge exchange rate exposure or possibly obtain political risk insurance/ guarantees for extreme scenarios of currency inconvertibility. These hedges will be put in place at financial close or when exposures commence. Hedging does introduce costs (premiums or swap spreads), but it significantly stabilizes cash flows, ensuring that debt serviceability risk due to market variables is reduced. The extent of hedging is aligned with the company's risk appetite – given a likely moderate risk tolerance, PT NMB opts to hedge critical exposures (interest, FX) rather than speculate on favorable market movements.

5. Robust Covenant and Reserve Structure

The project's financing agreements will be structured with covenants and reserves that help manage risk proactively. One key tool is the establishment of a Debt Service Reserve Account (DSRA). The DSRA is a reserve fund (typically funded upfront or built up during early operations) that holds enough cash to cover several months of debt service (often 3–6 months of loan payments). This acts as a buffer against temporary cash shortfalls. By having a DSRA in place, lenders and the company gain time to resolve issues if project cash flows underperform, thus mitigating short-term debt service risk. Additionally, financial covenants written into loan agreements will enforce discipline. For instance, maintaining a minimum DSCR (e.g. 1.25) each quarter will be a covenant; if the DSCR falls below the threshold, excess cash will be trapped (not allowed to be paid out as dividends) and instead used to prepay debt or kept as reserve – this is known as a cash sweep or cash trap mechanism. Such covenants ensure that when the project's financial performance weakens, remedial actions (like conserving cash) kick in automatically, preserving the ability to pay debt. Another covenant might restrict further borrowing or cap additional capex without lender approval, preventing risk of over-extension. Negative covenants will likely include limits on dividend distributions (e.g. only allowed if DSCR > 1.3x) and requirements for the sponsors to inject equity if certain financial ratios deteriorate (equity cure provisions). The loan agreements will also stipulate regular reporting to lenders, early warning triggers (such as if costs exceed X% of budget or delays past a date), and step-in rights for lenders if major problems arise. Collectively, these covenants align all parties with risk management objectives and provide mechanisms to mitigate

emerging financial risks before they become crises. The presence of strong covenants and reserves is justified by their widespread use in project finance to enhance credit quality – effectively acting as contractual mitigation measures that both protect lenders and keep the project on a prudent financial path.

6. Sensitivity Analysis and Stress Testing

An important proactive strategy is the use of financial sensitivity analysis and scenario planning as part of risk mitigation. PT NMB will continually refine its financial model to test “what-if” scenarios: for example, what if construction costs increase by 15%? What if nickel prices drop 20% below forecast for two years? What if interest rates are 200 basis points higher than assumed? By analyzing these scenarios, management can identify which variables most significantly threaten the project’s financial health and plan appropriate responses. Sensitivity analysis thus helps reduce uncertainty and inform decision making, as it highlights the tolerance of the project to various shocks and which risk factors warrant close attention. The results of sensitivity tests directly feed into mitigation plans: for instance, if a stress test shows that a 10% cost overrun would push DSCR below acceptable levels, this justifies increasing the contingency budget or securing extra equity commitments in advance. If a certain adverse scenario would trigger covenant breaches, the company can negotiate covenant headroom or prepare an action plan (such as refinancing or cost cuts) for that scenario. In essence, sensitivity and risk analysis are used to validate the robustness of the financing strategy and to drive adjustments to the mitigation measures. This dynamic approach ensures that the risk mitigation plan remains aligned with reality and the company’s risk appetite. It also communicates to stakeholders (investors, lenders, management) that the company has thoroughly examined potential outcomes and is prepared to manage them. By treating the financial model not just as a static tool but as a living risk management instrument, PT NMB embodies ISO 31000’s iterative approach – regularly analyzing and treating risks as new information emerges.

All the above mitigation strategies provide a holistic financial risk management solution. They address risk at its sources: ensuring funding is in place, controlling costs, structuring debt prudently, safeguarding against market volatility, and planning for worst-case scenarios. Each strategy was chosen for its effectiveness and feasibility in the context of PT NMB’s project and aligns with the company’s objective of completing the Venus Project within budget and without financial distress. By implementing these risk treatments, the company increases the likelihood of project success (on-time,

on-budget completion and profitable operation) while staying within an acceptable risk threshold.

Risk Monitoring and Evaluation

PT NMB will establish a rigorous framework to continuously monitor key financial risk indicators and to evaluate the effectiveness of mitigation strategies throughout the project lifecycle.

a. Key Risk Indicators (KRIs)

A set of quantifiable metrics will be defined for the major risks, serving as early-warning signals for changing risk conditions. These KRIs will be monitored at defined intervals. Herewith the KRI of each key risk:

- **Capital Funding KRI:** Funding status vs. schedule – e.g. percentage of total equity injected, and debt disbursed against the project timeline. During the financing stage, delays in achieving financial close or in disbursements would flag a capital availability issue. Another indicator might be credit market conditions (such as interest rate spreads or bank lending sentiment) if additional fundraising is needed, to gauge if the environment is tightening.
- **Cost Overrun KRI:** Cost variance, is the ratio of actual project cost incurred vs. budgeted cost for the work achieved. A variance exceeding a threshold (for instance, actual costs >110% of budget for a given progress milestone) would indicate potential overruns. Related indicators are contingency utilization which shows how much of the contingency fund is already consumed and schedule performance index (since delays often translate to cost overruns). Frequent use of contingency early in the project or actual timeline behind the schedule would trigger management action such as re-forecasting costs and claims management with contractors.
- **Debt Serviceability KRI:** Debt Service Coverage Ratio (DSCR) which measured quarterly once the project is operational, using updated cash flow figures. If the DSCR approaches the minimum covenant level (say 1.25x) or trends downward significantly, it signals rising financial stress. Another KRI is Loan Life Coverage Ratio (LLCR) which considers the present value of projected cash flows vs. outstanding debt; a declining LLCR could indicate long-term serviceability issues. In addition, Interest Coverage Ratio (EBITDA/Interest) can be tracked during operation as a simpler gauge of ability to pay interest from earnings. Any material deterioration in these ratios would prompt investigation into causes (such as lower production or prices) and activate contingency plans (like cost reductions or drawing on the DSRA).

- Interest and currency fluctuation Risk KRI: Interest rate benchmark for any unhedged portion of debt, for instance, if only 80% of debt is hedged, the remaining 20% is exposed. A rise in benchmark rate above a certain level could increase debt cost beyond budget. Similarly, the exchange rate for any currency mismatch is monitored. If the local currency is depreciated beyond a set threshold, it may signal future difficulty in servicing foreign currency debt. These interest and currency KRIs inform whether additional hedging or other adjustments are needed in a timely manner.

Each KRI has a predefined threshold or trigger level. When a KRI approaches or breaches its threshold, an escalation process is initiated: the issue is reported to senior management and the risk management team for review, and appropriate response actions are decided. For instance, if the cost variance trigger is hit, the team may freeze non-essential spending or negotiate scope adjustments; if DSCR covenant is at risk, they may restrict dividends or engage lenders early. This approach ensures emerging risks are caught.

b. Monitoring Activities and Governance

PT NMB will form a Risk Monitoring Committee or integrate responsibilities into an existing Project Management Office and Finance Committee. This cross-functional team including the Project Director, CFO, Risk Manager, and key finance and project control staff will convene to review risk reports monthly during construction and quarterly if the Venus Project is operational. The risk reports will compile the latest KRI metrics, any incidents or changes, and the status of mitigation actions. Through conducting such periodic reviews, the committee evaluates whether risk responses are effective or need adjustment. For instance, if the cost overrun risk remains low (cost variance within limits), they affirm that current controls (EPC contract, etc.) are effective. If risk likelihood increases, such as commodity prices fall or there is pressure in DSCR, the committee may recommend enhancing mitigations such as increasing hedge or seeking cost cuts aimed to continually improve risk treatment. The monitoring process is documented through an updated risk register specific to financing risks. This register is a living document listing all identified financing risks, their KRIs, current flag status (e.g. “green”, “amber”, “red”), responsible owners, and notes on mitigation actions taken. It will be updated after each review cycle, providing a historical log and ensuring accountability.

The Risk Manager or appointed risk officer is responsible for maintaining this register and coordinating the monitoring activities, while the CFO is chiefly concerned with financial KRIs and lender communications.

c. Effectiveness Evaluation

Monitoring evaluates whether the mitigation strategies are working as intended. For example, the committee will assess: Are the hedges performing? Is the DSRA funded and sufficient? Are the covenants being complied with, and do they need waivers or amendments? Each major mitigation measure has a performance indicator. If mitigation is deemed ineffective, for instance, if despite a fixed-price contract, there are cost overruns due to scope changes which indicate a gap in scope management, the committee will revisit the risk treatment plan and possibly implement additional measures or adjusting the strategy. This might involve going back to negotiating contract modifications, increasing reserves, or, in extreme cases, activating contingency plans like refinancing the debt or injection of additional equity by sponsors if things deviate significantly from plan. Adaptive Management: The risk management plan remains iterative. The monitoring framework ensures feedback loops which insights from risk data drive updates to risk assessment and treatment. For example, if a new risk emerges perhaps due to a change in government policy affecting financing terms or a sudden tightening in credit market conditions, it will be identified through environmental scanning and added to the risk register. The plan would then be adapted by formulating a mitigation for that risk such as lobbying for policy support, adjusting financing strategy, etc. Likewise, positive developments such as higher nickel prices which lead to stronger cash flows might allow the company to optimize its risk approach further through maybe reduce hedging if no longer needed, or refinance to cheaper debt. The risk monitoring results will be reported to top management and included in stakeholder communications, for example, lenders will receive compliance certificates and updates on DSCR, cost-to-complete, etc., as per loan agreement requirements. This transparency maintains trust and ensures everyone is aware of the project’s financial health.

Risk Monitoring and Evaluation is the “heartbeat” of the risk management process, keeping the financing strategy resilient and responsive. By continuously tracking KRIs, conducting regular risk reviews, and evaluating control effectiveness, PT NMB will ensure that the financial risk mitigations for the Venus Project remain effective and that any sign of trouble is addressed early. This dynamic oversight mechanism completes the business solution for financing risk management, closing the loop in the ISO 31000 framework by linking back into improved risk assessment and treatment over the project’s duration.

DISCUSSION

The results of this study indicate that the risks in the financing of the Venus Project by PT Nikel Maju Bersama (PT NMB) are not only technical in nature but also complex and multidimensional. These risks include financial, operational, and stakeholder governance-related risks. This discussion elaborates on the key findings based on qualitative analyses and the risk management methods applied, as well as their relevance to the literature and international risk management frameworks, particularly ISO 31000 and the PMBOK 6th Edition.

1. Complexity of Project Financing Risks

Based on in-depth interviews and focus group discussions (FGDs), PT NMB faces several key financial risks, including:

- Financing delays or shortfalls,
- Capital cost overruns,
- Unintegrated stakeholder governance,
- Uncertainties in cash flow projections and return on investment.

These risks suggest that financing a ferronickel project cannot rely solely on conventional financing approaches. Instead, it requires a structural and dynamic risk management strategy, including scenario planning, sensitivity analysis, and contingency strategies.

2. Inadequate Financing and Mitigation Strategy Readiness

One of the significant findings is that PT NMB's financing strategy—although it includes various schemes such as a joint venture with Lingbo Nickel Ltd and a debt-to-equity capital structure—has not yet been fully based on a thoroughly documented risk assessment. The identified risks have not been systematically mapped into concrete mitigation strategies, which should ideally be part of the project's Risk Register. This has created a gap between risk identification and the implementation of mitigation measures, which may affect the feasibility and sustainability of the project.

3. Stakeholder Roles: Fragmentation and Governance Challenges

Stakeholder analysis shows that both internal and external stakeholders play a crucial role in the success of the project. However, the fragmentation of roles and the absence of an adequate coordination structure pose significant governance risks. For instance, the roles of JV partners, local government, and lenders often come with differing interests, which can potentially lead to conflict if not managed through a strong governance and communication framework.

4. Effectiveness of Risk Mitigation: Evaluation Based on ISO 31000 and PMBOK

The designed mitigation strategies—such as optimizing the capital structure, hedging against

interest rate and currency risks, and designing debt covenants and reserves (e.g., DSRA)—are consistent with the principles of ISO 31000:2018, especially in the context of “risk treatment.” However, their effectiveness heavily depends on consistent implementation and integrated monitoring mechanisms. Within the PMBOK framework, the risk management cycle—which includes risk identification, assessment, planning, response, monitoring, and control—has not yet been fully and iteratively applied by PT NMB. This is evidenced by the absence of formal strategic documentation outlining measurable mitigation plans.

This study reinforces the previous findings of (Khan & Parra, 2003), which assert that the financing of large-scale projects—such as ferronickel plants—requires a risk management approach tailored to the specific characteristics of the project, rather than relying solely on conventional financing models. The case study of PT NMB emphasizes that risk management approaches must include cross-functional involvement (multi-stakeholder governance), risk simulation, and the strengthening of formal documentation.

A study by (Widianingrum, 2018) on stakeholder engagement in infrastructure projects indicates that failure to manage stakeholder expectations and contributions can lead to internal conflicts that affect financing certainty. This is reflected in the findings at PT NMB, where cross-divisional coordination and collaboration with JV partners remain suboptimal.

In theoretical terms, the findings of this study are consistent with the ISO 31000:2018 risk management framework. ISO 31000 requires organizations to integrate risk management into the entire strategic decision-making process—including in project financing. However, PT NMB has not fully applied these principles, as evidenced by the absence of systematic documentation for the assessment, mitigation, and evaluation of financing risks.

Meanwhile, the *Project Management Body of Knowledge (PMBOK) 6th Edition*, a global standard for project management, designates Project Risk Management as one of the 10 essential knowledge areas. PMBOK recommends processes such as Risk Identification, Qualitative Risk Analysis, Plan Risk Responses, and Monitor Risks—all of which have not been fully implemented by PT NMB. This highlights a gap between field practices and the ideal theoretical framework of project risk management.

Strategically, the absence of a comprehensive risk management approach at PT NMB has led to reduced effectiveness in securing financial close and ensuring project sustainability. The high-risk items located in the red quadrant of the

risk heatmap indicate the urgent need for executive-level actions, including:

- Preparing a financing risk register,
- Appointing designated risk owners,
- Providing risk mitigation training for the financial and project teams.

From an organizational standpoint, this approach demands the establishment of a risk governance structure that is not only administrative, but also operational and strategic. This structure must involve JV partners and creditors to ensure that risks are equitably distributed and effectively controlled.

This research not only provides an empirical illustration of risk management issues in ferronickel project financing but also offers an implementation model for mitigation based on ISO and PMBOK approaches, which can be adopted by similar companies. The practical contribution of this study lies in the formulation of specific mitigation strategies (such as hedging, optimal capital structuring, and financial covenants), which have rarely been explored in depth in the context of nickel downstreaming projects in Indonesia.

CONCLUSION AND SUGGESTION

Based on the research findings, it can be concluded that the financing strategy for the Venus Project at PT Nikel Maju Bersama (PT NMB) is exposed to several key risks that must be carefully identified and mitigated. These risks include financing delays or shortfalls, capital cost overruns, unintegrated stakeholder governance, cash flow mismatches for repayment, interest rate and currency fluctuations, uncertainty in securing product off-takers, as well as unclear break-even point (BEP) and return on investment (ROI). The study reveals that PT NMB currently lacks a comprehensive risk management framework to address these challenges effectively. In response, this research has developed a structured risk management documentation, detailing the processes of risk assessment, mitigation, and monitoring, which aim to enhance the project's success rate in terms of timely, on-budget completion and sustainable profitability. Furthermore, the study proposes specific, actionable, and measurable mitigation strategies, along with implementation timelines and monitoring mechanisms, to be adopted by designated stakeholders. The author believes that by applying the risk management framework and implementation plan outlined in this study, PT NMB can secure the necessary financing and ensure the Venus Project is developed sustainably while delivering the expected economic returns. Ultimately, this research contributes to enriching the body of knowledge on risk management in project financing, particularly for capital-intensive ventures such as ferronickel projects. Future studies are encouraged to explore more focused areas, such as

stakeholder engagement or resource and supply chain optimization, in managing risks for high-capital projects.

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