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ANALYSIS OF CAPITAL BUDGETING GREEN INDUSTRY IN INNOVATIVE AND SUSTAINABLE POST-MINING PROGRAMS IN BELITUNG REGENCY

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ABSTRACT

Purpose: The main purpose of this article is to evaluate the feasibility of the re-mining project of the closure tin mine area which is then processed into silica products according to export specifications, which is simultaneous with the process of environmental management of the closure mining area.

Theoretical framework: Determining the capital budgeting of the project, financial indicators: Payback Period, NPV, Profitable Index, Internal Rate Return, and Return of Investment, and sensitivity

Design/methodology/approach: A quantitative approach will be used to analyze the capital budgeting calculations to build a green industry through re-mining and silica refinery activities in good environmental management, not only land rehabilitation and vegetation restoration activities but post-mining activities, however synergized through creating an innovative program.

Findings: Based on the results of investment calculations, the development of this green industry was declared technically and financially feasible through the management of re-mining, production of silica, and structuring the ex-mining area into a productive green area with a budget commitment that was mutually agreed upon before this activity was carried out.

Research, Practical & Social implications: The post-mining tin location in Belitung Province – Indonesia, still has the potential for non-metallic mineral content, which can be re-mined and refined for silica commodities. The ex-mining area was found to be still an open area and even barren, even though PT Timah Tbk has carried out environmental restoration activities.

Originality/value: In the study of capital budgeting for re-mining and silica refineries, the sensitivity of the analysis to changes in fuel costs and changes in selling prices has also been calculated.

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ANÁLISE DE INDÚSTRIA VERDE DE ORÇAMENTO DE CAPITAL EM PROGRAMAS PÓS-MINERAÇÃO INOVADORES E SUSTENTÁVEIS NA REGENCIA DE BELITUNG

RESUMO

Objetivo: O principal objetivo deste artigo é avaliar a viabilidade do projeto de re-mineração da área de fechamento da mina de estanho, que é então processada em produtos de sílica de acordo com as especificações de exportação, o que é simultâneo ao processo de gestão ambiental da área de fechamento da mina.
Estrutura teórica: Determinação do orçamento de capital do projeto, indicadores financeiros: Período de retorno do investimento, VPL, índice de lucratividade, taxa interna de retorno e retorno do investimento, e sensibilidade.
Projeto/metodologia/abordagem: Uma abordagem quantitativa será usada para analisar os cálculos de orçamento de capital para construir um setor verde por meio de atividades de re-mineração e refinaria de sílica em

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boa gestão ambiental, não apenas atividades de reabilitação de terras e restauração de vegetação, mas atividades pós-mineração, porém sinergizadas por meio da criação de um programa inovador.
Conclusões: Com base nos resultados dos cálculos de investimento, o desenvolvimento dessa indústria verde foi declarado técnica e financeiramente viável por meio do gerenciamento da remineração, da produção de sílica e da estruturação da antiga área de mineração em uma área verde produtiva com um compromisso orçamentário que foi mutuamente acordado antes da realização dessa atividade.
Implicações sociais, práticas e de pesquisa: O local de estanho pós-mineração na província de Belitung, na Indonésia, ainda tem potencial para conteúdo mineral não metálico, que pode ser reminerado e refinado para commodities de sílica. Descobriu-se que a antiga área de mineração ainda é uma área aberta e até estéril, embora a PT Timah Tbk tenha realizado atividades de restauração ambiental.
Originalidade/valor: No estudo do orçamento de capital para mineração e refinarias de sílica, a sensibilidade da análise às mudanças nos custos de combustível e nos preços de venda também foi calculada.

Palavras-chave: Orçamento de Capital, Indústria Verde, Pós-Mineração, Re-Mineração, Refinaria de Sílica.

ANÁLISIS DE LA INDUSTRIA VERDE DEL PRESUPUESTO DE CAPITAL EN PROGRAMAS POST-MINERÍA INNOVADORES Y SOSTENIBLES EN LA REGENCIA DE BELITUNG

RESUMEN
Propósito: El objetivo principal de este trabajo es evaluar la viabilidad del proyecto de volver a explotar la zona de cierre de la mina de estaño, que luego se transforma en productos de sílice según las especificaciones de exportación, lo que es simultáneo al proceso de gestión medioambiental de la zona de cierre de la mina.
Marco teórico: Determinación del presupuesto de capital del proyecto, indicadores financieros: plazo de amortización, VAN, índice de rentabilidad, tasa interna de rendimiento y rendimiento de la inversión, y sensibilidad.
Diseño/metodología/enfoque: Se utilizará un enfoque cuantitativo para analizar los cálculos del presupuesto de capital para la construcción de un sector ecológico mediante actividades de reextracción y refinería de sílice en buena gestión medioambiental, no sólo actividades de rehabilitación del terreno y restauración de la vegetación, sino actividades posteriores a la extracción, pero sinergizadas mediante la creación de un programa innovador.
Conclusiones: En base a los resultados de los cálculos de inversión, el desarrollo de esta industria verde fue declarado técnica y financieramente viable a través de la gestión de la reminería, la producción de sílice y la estructuración de la antigua zona minera en un sitio productivo greenfield con un compromiso presupuestario mutuamente acordado antes de esta actividad.
Repercusiones sociales, prácticas y de investigación: La antigua zona minera de estaño de la provincia de Belitung (Indonesia) aún tiene potencial de contenido mineral no metálico, que puede remineralizarse y refinarse para convertirlo en productos básicos de sílice. Se descubrió que la antigua zona minera sigue siendo un área abierta e incluso estéril, aunque PT Timah Tbk ha emprendido actividades de restauración medioambiental.
Originalidad/valor: En el estudio del presupuesto de capital para la minería y las refinerías de sílice, también se calculó la sensibilidad del análisis a los cambios en los costes del combustible y los precios de venta.

Palabras clave: Presupuestación de Capital, Industria Ecológica, Post-Minería, Re-Minería, Refinería de Sílice.

INTRODUCTION

Belitung Island, part of the largest tin-producing province in Indonesia which has been exploited since the 18th century (Sutedjo, S., 2007), is also experiencing an environmental crisis like other mining areas in Indonesia. The Ministry of Environment and Forestry of the Republic of Indonesia stated that 275,5000 hectares of land in the Bangka Belitung Islands Province were critical due to tin ore mining (Republika, 2017). Much earlier, the Critical Land Review report was dominated by ex-mining and land clearing; in Belitung Regency, the area of very critical

land reached 13,258 hectares, 20,364 hectares of critical land, 145,987 hectares of slightly critical land, and 116,167 hectares of potential crises (Haryadi et al, 2018).

This is also supported by the existence of an achievement strategy and policy directions for Bangka Belitung Province, which are to be achieved, including 1) Strengthening the supply of quality and sustainable industrial raw materials; 2) Developing industries for processing superior resources, which include pepper, fishery, rare earth minerals associated with tin, and palm oil with a strong and competitive industrial structure; 3) Improving support for strengthening human resources, business actor institutions and robust connectivity in the industrial structure between business units; 4) Increasing cooperation between related institutions (central-regional, research institutes, and local government).

Based on the above considerations, the researcher must conduct research with a business initiation approach that can provide added value from the utilization of tailings (mining waste material), which is currently neglected, into innovative products from the commodity refinery process for tailings re-mining activities, which can be marketed well, in Indonesia and the international market. The existence of an economic value from tailings will be a stimulant for investors or holders of Mining Business Permits - Production Operations (IUP-OP), in this case, PT. Timah Investasi Mineral (a subsidiary of PT. Timah, Tbk – a State-owned company) commits to carrying out post-mining reclamation activities by structuring ex-mining area zones to be utilized as productive areas while maintaining a green environmental balance. These ideas are, of course, inseparable from the commitment of the business world to continuously act ethically, operate legally and contribute to improving the economy, coupled with improving the quality of life of employees and their families as well as improving the quality of the local community and society more broadly (WBCSD, 1999).

According to Zulkifli (2014), land rehabilitation focusing on critical land recovery aspects involves more technical problems that can manipulate biophysical factors by selecting specific methods, usually carried out with an experiment with technical data calculations, so favorable conditions are created for specific needs. Based on this opinion, the plan for doing a green business to utilize tailing post-mining programs must be comprehensively studied, departing from the pragmatism outlined in the business plan or feasibility study and compiling a roadmap of the activity plan as a guide so that this activity can run optimally.

Setyawan & Hasbullah, (2020) entioned that investment is an important activity that costs money and reflects the long-term continuation of the venture. Using mining techniques the right decisions are needed to be made to avoid the mistakes that occur. One decision-making

technique is conducted upon conducting a feasibility study. In a feasibility study, capital budgeting is the right method to be applied that deals with good financial investment in identifying and making a choice and convincing the investors to go on to the next project. Capital Budgeting is a method used to analyze the feasibility of a project/type of investment in the long term that will be done by the company and is expected to produce benefits for more than one year. The re-mining activities and the construction of a silica smelter will utilize the remaining mining materials while simultaneously committing to repairing post-mining areas that have been unsuccessful so far.

The main purpose of this article is to evaluate the feasibility of the re-mining project of the closure tin mine area which is then processed into silica products according to export specifications, which is simultaneous with the process of environmental alignment of the closure mining area. The capital budgeting approach is a way to evaluate the feasibility of this project, by:

1. Synergy of post-mining management programs not only land rehabilitation and vegetation restoration activities but post-mining activities that initiate innovative, technology-based, and sustainable new economic growth around the post-mining reclamation area.
2. Calculating potential Silica re-mining resources, processing technology (refinery) approach models, and determining production capacity in realizing green business to optimize post-mining activities to produce Silica products with SiO_2 Content: of 99.5%, which can be sold on the international market.
3. Determining the capital budgeting of the project, financial indicators: Payback Period, NPV, Profitable Index, Internal Rate Return, and Return of Investment, and sensitivity analysis are used to analyze how sensitive the transportation tariff is towards the capital budgeting criteria.

LITERATURE REVIEW

Based on triple bottom line theory by Elkington (1997), companies must pay attention to the 3Ps – people, profit, and planet since its aim are for the actions of business entities regarding the environment and the social sphere to be treated like financial results – and thus clearly settled regarding the performance in these spheres. This aspiration is based on the assumption that we care only about what we look after and what we need to settle.

The evolution of manufacturing systems' excellence has not directly related to the application of sustainability (Edgeman et al, 1998). They highlighted the difficulty of integrating the three dimensions of sustainability of the triple bottom line (TBL) concept. The impacts on the environment caused by mining activity and the importance of mining to other industries, considering the assumptions of sustainable development (Gomes et al., 2018).

Regulation and Program of Mine Closure

According to Law No. 3 of 2020, concerning Mineral and Coal Mining, it is defined that Mine Reclamation is an activity carried out throughout the Mining Business stages to organize, restore, and improve the quality of the environment and ecosystem so that it can function again according to its designation. Post-mining activities, hereinafter referred to as Post-mining, are planned, systematic and continuing activities after part or all of the Mining Business activities to restore the functions of the natural environment and social functions according to local conditions throughout the Mining area. Furthermore, in Regulation of the Minister of Energy and Mineral Resources No. 25 of 2018, Concerning Mineral and Coal Mining Business Article 16 states that: Holders of Mining Business Licence – Operations Production (IUP-OP) are required to increase the added value of Minerals and Coal through activities: Processing and/or Refining for Non-Mineral mining commodities metal, as long as the technology is available and economically feasible.

The conceptual closure plan should also set out the target closure outcome and as many goals as practical to allow the operation's development (which culminates in construction and commissioning) to proceed in a manner that does not inadvertently disadvantage the company's later ability to minimize social, environmental and economic liabilities and in still sustainable benefits beyond closure (Bell et al, 2006). Closure goals should be as specific as possible. In a conceptual mine closure plan, the ability to specify closure goals is limited to the amount of information available and the extent of stakeholder engagement. The conceptual closure plan should be revisited and updated at intervals beginning with the pre-feasibility and continuing with the feasibility and construction, as the amount of decision-making information available typically increases at a rapid rate during this project development period.

The conceptual closure plan is the beginning of the process of planning for closure and is appropriate for the re-mining of Silica, feasibility, and construction refinery phases of an operation's life cycle. It will evolve as more information becomes available and is refined into a detailed closure plan as soon as possible after operations begin. The implementation plan of

this post-mining program can be started from the planning process to re-mine silica sand, plan the mining sequence, calculate mining feasibility, calculate the investment in refinery construction and carry out progressive reclamation activities in untapped areas. That is carried out simultaneously so that it becomes a green and sustainable operation life cycle without having to wait for the material activities of silica sand mines to be declared uneconomical to operate.

Concept of Green Manufacturing

The enterprise growth model refers to how an enterprise grows through internal and external expansion to achieve its goals, including increasing sales, maximizing profits, and increasing market share. The enterprise's green growth model, or EGGM for short, is a type of enterprise growth model, the goal of which is to coordinate "growth" with economic performance goals and "green" with environmental performance goals. In addition to the growth models based on "scale boundary," "enterprise life cycle," and "external environment change," EGGM is a collaborative development model based on "green and growth" aimed at coordinating the economic performance and environmental performance of enterprises and achieving high-quality, efficient, and sustainable development (Wang et al., 2022).

EGGM is the specific practice of green development concept at an enterprise level, establishing an innovation chain with different combinations of innovative production factors using new technologies and the new forms of the industry with the help of cooperation of various entities in the value network. It creates new business models to realize the coordination of business processes in value networks and the coordination of "growth" and "green," which is "driven by innovation ."Green manufacturing is developed along the value chain of products. Through new technologies and control measures, this approach creates manufactured products in the way of "using materials and processing processes with minimal negative environmental impact, saving energy and natural resources, ensuring the safety of employees, society and consumers, and reasonable economics" (Wang et al., 2022)

The enterprise green growth model aims to achieve sustainable competitiveness and coordination between green and growth by value chain reconstruction and green transformation. Implementing a green growth model for enterprises does not only raise costs and increase financial pressure. Kotler and Lee (2009) have identified six program options that companies can carry out initiatives and activities related to social issues in the form of corporate social responsibility, one of which is through Social Responsible Business Practices, which

seeks initiatives where companies adopt and carry out corporate social responsibility practices. Specific businesses and interventions aimed at collectively improving the quality of the community and protecting the environment. The synergy of a post-mining management program with new economic growth that involves local communities will form new industries and new business models generated by new technologies that make value chain actors seamlessly connected at low cost due to a significant reduction in transaction costs (Perboli, et al., 2021).

Progressive Restoration Through the Guiding Principle of Constructed Wetland Method

Constructed wetlands (CWs) are affordable and reliable green technologies for treating various types of wastewater. Compared to conventional treatment systems, CWs offer an environmental-friendly approach, are low cost, have fewer operational and maintenance requirements, and have a high potential for application in developing countries, particularly in small rural communities. It has been widely used to treat several types of wastewater, such as domestic sewage, industrial effluent, agricultural wastewater, landfill leachate, polluted river water, and urban runoff (Vymazal, 2014)

The water flow is continuously maintained below the surface of the inert material. CWs create a predominantly anoxic environment, rich in aerobic micro-sites close to plant roots, which operate as oxygen transfer systems from the atmosphere to the inside of the filter bed. In these systems, the wastewater passes through the inert material and is in contact with the macrophytes' rhizosphere, while the inert material adsorbs phosphorus and heavy metals. The plant species contribute to the purification process by favoring the development of an active aerobic microbial population in the rhizosphere and, secondly, through the action of atmospheric oxygen pumping from the emerged part of the root system to the surrounding ground portion. CWs create better oxidation of the wastewater and creation of alternating aerobic, anoxic, and anaerobic zones (Wu et al., 2015)

After years of studies and implementations, the scientific community has widely recognized that CWs are a reliable treatment technology. This review demonstrates that the advances in the design and operation of CWs accomplished over the years have significantly increased pollutant removal efficiency. The sustainable application of this treatment system has also been significantly improved (Gorgoglion & Torretta, 2018).

Currently, based on the Regulation of the Minister of Environment and Forestry No. 05 of 2022, concerning the Management of Wastewater Treatment for Mining Businesses and/or

Activities Using the Artificial Wetland Method, in Article 2 Paragraph (2) In carrying out Wastewater Treatment, the person in charge of the Business and/or Mining Activities may apply Standard Wastewater Treatment Technology using Constructed Wetlands.

For this reason, ex-mining land has the opportunity to be used as a productive area to increase economic value and overcome post-mining environmental problems. Activities refinery or smelter with the target of high-end products, nature tourism, sports, agricultural land, and plantations which can be synergized with aspects of the socio-economic community so that environmental planning for land restoration activities using the Constructed Wetlands method is the most appropriate choice because water reserves will continue to be available in the subsurface soil so that plant roots can absorb nutrients optimally.

Capital Budgeting and Sensitivity Analysis

Capital Budgeting Investment Problems are the alternative decision to those involving relatively long-term differential capital investments. These expenditures and investments include projects such as building new infrastructure or investing in long-term businesses. Often, cash inflows and outflows from prospective projects are evaluated to determine whether the potential returns generated to meet the objectives or sufficient company standards, also known as "investment appraisal." Once the opportunity has been identified or chosen, the administration evaluates whether the project is desired (Anthony et al., 2011).

Capital budgeting is one of the most significant factors that influence and impact organizational sustainability issues. This involves the decision and desire to popularize corporate reputation within the financial limits of the organization. Capital budgeting is classified as a sustainable risk when it is meant to promote sustainability issues of an organization because it does not contribute directly to the revenue of the firm. Moreover, point out that financial decisions should look into the long-term development strategy of an organization (Zhang & Chen, 2017).

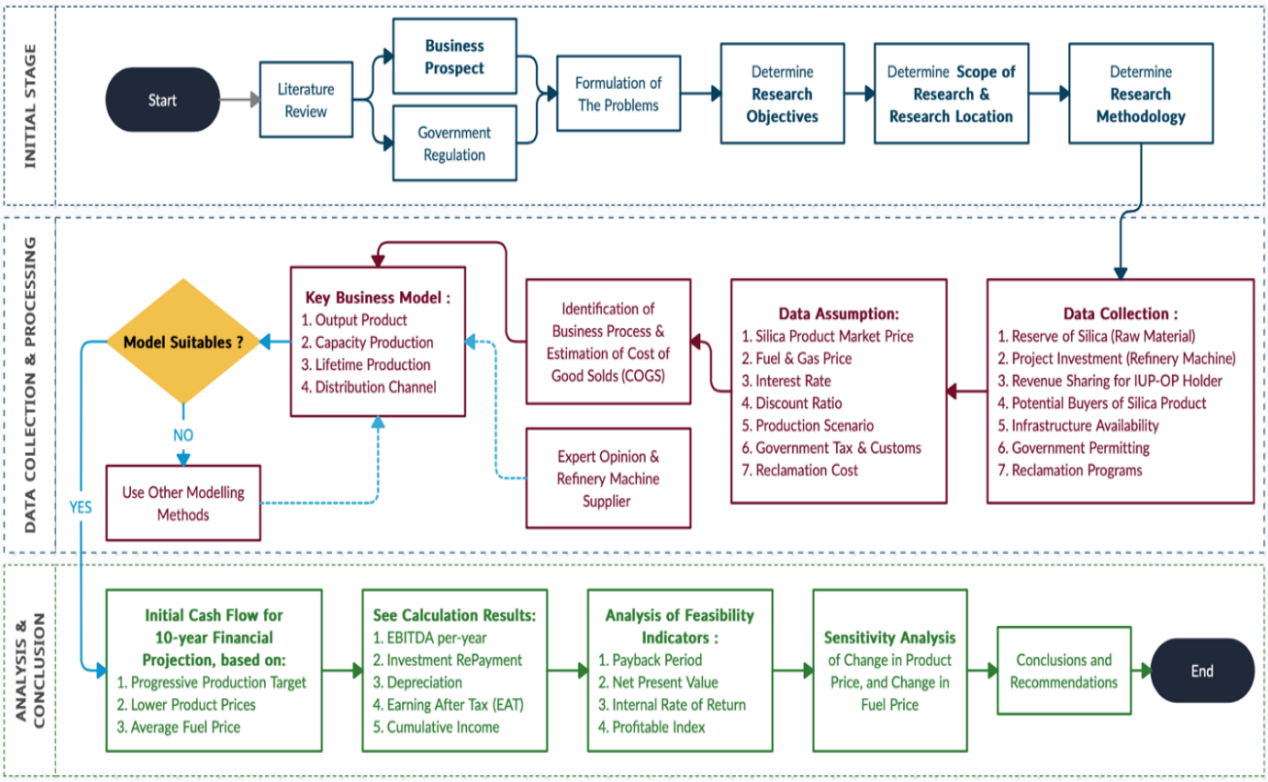
Sensitivity analysis is valuable means of analyzing the assumption examines how the change in an assumption will change the forecast. If changing a particular assumption has little impact on the forecast, then the assumption is not considered critical. If changing one assumption causes a significant change in the projected statements, then it is considered a critical variable that warrants further analysis and careful monitoring. The risk of looking only at the impact of one variable at a time is that simplifying some critical assumptions may need

to be addressed. To concentrate on the key factors, analysts frequently design different scenarios and different sets of assumptions about the future (Mentari et al., 2018).

METHOD

A quantitative approach will be used to analyze the feasibility of investment by re-mining the mineral content of tin mining tailings into other products or commodities, namely Silica, through the construction of a silica refinery or smelter to be sold as processed silica commodities with a purity of 99.5 % SiO_2. Capital budgeting model and sensitivity analysis were used to calculate the time frame and profitability of the project to compare with the expected result with several scenarios. Details can be seen in the following research methodology diagram in Figure 1.

Figure 1. Research methodology diagrams



Source: Prepared by the authors (2023)

The steps used are: (1) Study the project opportunity; (2) Set the research objectives; (3) Determination data assumptions based on factual conditions during the study, (4) Setting production targets and capacity to determine the essential Cost of Goods Sold operational costs, (5) Calculating the capital budgeting of the project; the result is: Payout Time, NPV, NPV Index, IRR, ROI; (6) Make decision the project is feasible or not; (7) If the project is feasible,

the sensitivity analysis is used to analyze how sensitive the transportation tariff towards the capital budgeting criteria. Based on the result of the quantitative method, it is decided whether this project is feasible or not, fulfilling the requirement of the company or investor's project standard. Once the analysis is concluded, all the research activities are made.

RESULT AND DISCUSSION

IUP – OP Location and Silica Mine Resources

PT. Timah Investasi Mineral prospect area located in Bantan Village, Membalong District, Belitung Regency, Bangka Belitung Islands Province has an area of ± 60.56 Hectares of Non-metallic Mineral Mining Business Permits and Quartz Sand Commodity Rocks (Silica) with Number: 188.4/443/ESDM/DPMPTSP/2019.

The shape and dispersal of quartz sand in the investigation area can be formed due to weathering of igneous acid deposits such as granite, gneiss, and other igneous rocks containing silica minerals (SiO_2) then undergoing transportation processes and sedimentation processes in the settling zone. The spread of quartz sand deposits at the investigation site was spread laterally in almost all areas of the IUP Region. The quality of sand deposits is greatly influenced by other minerals and will then be influenced by the washing process. At the general research site, quartz sand has a high percentage between 86.13% - 98.5%, so it has a good quality quartz sand for the cement or ceramic industry.

PT. Timah Investasi Mineral was drilled at 48 points scattered throughout the IUP-OP area, and laboratory tests were carried out on samples obtained from the core drilling results with the X-ray fluorescence (XRF) test method to analyze the elements contained in the material qualitatively and quantitatively, especially silica content (SiO_2). Based on the results of geological mapping and drilling, it shows that the distribution of rocks at the exploration site is homogeneous, namely silica sand in the form of deposits and contains almost the entire IUP covering an area of 60.56 ha, the details of the reserves are presented in Table 1.

Table 1. Resource Estimate of Silica Mine

Resource	Tonase	Quality	
Inferred	21.525.298,9	SiO2	>90%
Indicated	11.958.499,4	SiO2	>90%
Measured	6.643.610,8	SiO2	>90%
TOTAL	**40.127.409,1**	**SiO2**	**>90%**

Source : PT. Timah Investasi Mineral, 2020

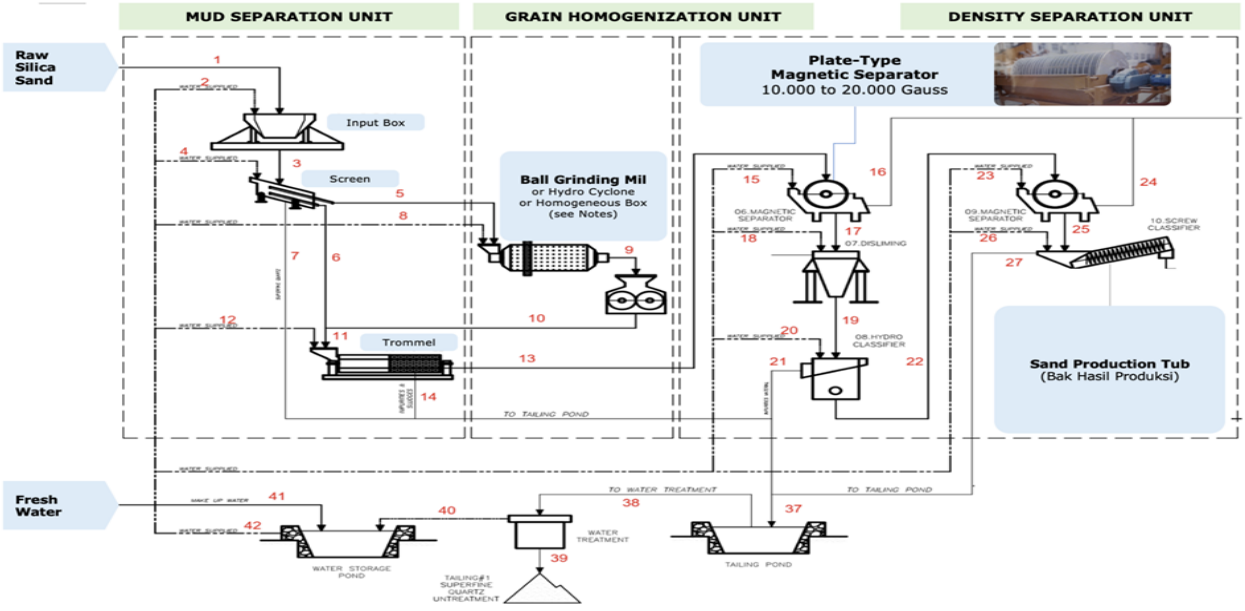
For the port location used for silica sales, Tanjung Batu Port is a multi-purpose port located 14 km from the silica processing site, and a rental stockpile has been prepared at the port location to anticipate delays in transportation to the mother vessel.

Silica Refinery Technology

In answering the needs of the international market, the quality or specifications of the processed products are the absolute things. Minimum requirements for export sales with the following levels: SiO2 (>99.5%), Fe2O3 (<0.012%), Al2O3 (<0.20%), and TiO2 (<0.13%). The target of this raw material re-mining activity is around 54,600 MT per month (MT: metric tons) with an investment value of IDR 43,126,200,000 (USD 2,875,000) consisting of: refinery plant IDR 37,126,200,000 (USD 2,475,000) and supporting facilities IDR 6,000,000,000 (USD 400,000).

For this reason, this processing process must be carried out so that the minimum specifications can be compliant and reduce the risk of the product being rejected by the market, resulting in losses for the company. The silica refinery process begins with a mud separator unit or physical washing using water, then the primary separation (screen) is carried out where the coarse material will be homogenized at the Grinding Mill first while the material that passes the screen is processed on the trommel for drying the material along with the material that has been mashed. The following Figure 2 is a diagram of the production process in silica refinery activities.

Figure 2. the Silica Green Manufacture Process Diagram



Source: Basic Design - Silica Refinery Industry, PT. Tlatah Billiton Wirabhumi, 2022.

The next stage is the density separation unit used for material impurities separation that can reduce silica levels, namely by using a magnetic separator to separate the existing metal content. Then this process is continued with the removal of slimes from larger particles, usually with the aid of water sprays. Advanced separation stage with a magnetic separator to optimize the separation of impurities content based on specific gravity. The metal content that has a specific gravity heavier than Silica will be separated. At the end of the process, the classification of product silica sizes will be carried out based on the specifications of the mesh with a target silica product output of 35.490 MT/ month (equivalence 1 Mini Mother Vessel).

All uses of process water will be made a circulation system to the water pond, settling pond, and constructed wetlands as a natural waste processing process that functions double, namely treating wastewater from the refinery and maintaining water supply in the post-mining area, which has been designed using the horizontal flow constructed wetlands technique. Water needs will be obtained from rainwater harvesting, which is accommodated in a holding pond prepared from the results of land arrangements from former tin mines in the past.

Capital Budgeting Investment

The economic feasibility of investing in re-mining and refinery silica at the IUP-OP location in Bantan Village is determined using capital budgeting analysis. The source of funds to be used is 20%, a deposit from an investor named PT. Tlatah Billiton Wirabhumi (PT. TBW), and 80% get a loan from a bank for working capital that will be repaid within three years. According to data from the Financial Services Authority (OJK) for the last five years, the annual interest rate for corporate loans from banks that request payment assistance for six months during construction is roughly 12%. The industrial fuel price of PT. Pertamina (the official fuel supply from the state) since September 2022 is roughly IDR 17,000 per liter, according to statistics from Bank Indonesia on the average dollar exchange rate for the previous six months of IDR 15,000/USD.

The royalty price that must be paid is USD 3.2 / MT, and the reclamation fee that must be budgeted for in this activity is IDR 7,500 / MT, as stated in the collaboration agreement between PT. TBW and PT. TIM. Furthermore, based on letters of interest that TBW got from numerous confirming buyers, the selling price of processed Silica ranges from USD 30 to 38 /MT fixed on board (FOB) mother vessel.

For the ten-year financial projection, the production scenario planned by PT. TBW will be carried out in stages in the first year, effective only for six months, starting from 40%

during the first operation and increasing to 10% every month. The condition of 100% production capacity is achieved in the second year, with an operating period of 26 working days/month and 300 working days for one year, including national holidays in Indonesia.

In facilitating the calculation of capital budgeting, the first step must be to determine the Cost of Goods Sold (COGS) in USD/metric tons of raw material from the re-mining operation and refinery plant activities of USD 20.09/MT, which has taken into account all costs from the mining process to the transportation to the mother vessel, including the costs of the post-mining reclamation program which is the primary commitment in sustainable environmental management. Table 2 below provides details on COGS re-mining and refinery operations.

Table 2. Cost Of Goods Sold (COGS) Re-Mining and Refinery Plant Operation

Assumptions			
	Montly Raw Ore	54.600	MT/month
	Montly Finished Goods	35.490	MT/month
	Exchange Rate	15.000	IDR/USD
	Selling Price	30	USD/MT
		450.000	IDR/MT

NO	ITEM DESCRIPTIONS	UNIT COST (/Month)			UNIT COST (/MT)	
		IDR	USD	Unit	IDR	USD
1	**Capital Expenses**	43.126.200.000	2.875.080	lumpsum (36-month repayment)		
2	**Operating Expenses**					
	- Royalty Fee	2.620.800.000	174.720	monthly	48.000	3,20
	- Operations	4.735.250.000	315.683	monthly	86.726	5,78
	- Labor	1.301.500.000	86.767	monthly	23.837	1,59
	- Equipment Rent	2.096.000.000	139.733	monthly	38.388	2,56
	- Maintenance	162.096.000	10.806	monthly	2.969	0,20
	- Packaging	425.880.000	28.392	monthly	7.800	0,52
	- Reclamation Program	266.175.000	17.745	monthly	4.875	0,33
	Sub-Total	11.607.701.000	773.847	monthly		
	COGS FOB Stockpile-Jetty Loading				212.595	**14,17**
3	**Trading Expenses**					
	- Stockpile and Jetty				30.000	2,00
	- Barge Loading				3.000	0,20
	- Trading Documents Preparation				2.000	0,13
	- Surveyor at Barge				1.000	0,07
	- Transshipment				10.000	0,67
	- Stevedooring				5.000	0,33
	- Export Documents				2.000	0,13
	- Surveyor at MV				4.000	0,27
	- Export Tax				6.750	0,45
	- Insurance				2.500	0,17
	- Government Fee (PNBP)				12.500	0,83
	- Operation at MV				5.000	0,33
	- Miscellaneous				5.000	0,33
	Sub-Total (3)				88.750	**5,92**
	COGS FOB MV				301.345	**20,09**

Source: Prepared by the authors (2023)

The calculation of the profit and loss balance must be done to determine the feasibility of the investment by taking into account income, operational costs, and applicable taxes. Machine and tool depreciation is also calculated so that the tool used is ten years old according to the financial projection period. This calculation uses the lowest selling price benchmark (USD 30/MT) as a minimum basis for assessing potential losses for TBW during the operation of this business. One of the easiest and safest solutions is to determine a buyer above this price with a long contract system and a direct payment system (minimum Usance LC) so that the company's cash flow is maintained. Based on Table 3, the EBITDA obtained is around 9.11 % per year, and EAT is 7.75 % per year after repaying the loan to the bank.

Table 3. Profit – Loss Statement for Financial Projection at 10 Years (in IDR x 1.000,-)

Description	Year				
	1	2	3	4	5
Payment From Buyer	**62.284.950**	**191.646.000**	**191.646.000**	**191.646.000**	**191.646.000**
Operational Expenditure	56.609.355	174.182.631	174.182.631	174.182.631	174.182.631
Earning Before Interest and Tax.	**5.675.595**	**17.463.369**	**17.463.369**	**17.463.369**	**17.463.369**
% of Sales	*9,11%*	*9,11%*	*9,11%*	*9,11%*	*9,11%*
Installment & Interest	*9.111.015*	*18.222.029,65*	*18.222.029,65*	*9.111.014,83*	
Earning Before Tax (EBT)	**(3.435.420)**	**(758.661)**	**(758.661)**	**8.352.354**	**17.463.369**
% of Sales	*-5,52%*	*-0,40%*	*-0,40%*	*4,36%*	*9,11%*
Corporate Tax	**(515.313)**	**(113.799)**	**(113.799)**	**1.252.853**	**2.619.505**
15,00%					
Earning After Tax (EAT)	**(2.920.107)**	**(644.862)**	**(644.862)**	**7.099.501**	**14.843.864**
% of Sales	*-4,69%*	*-0,34%*	*-0,34%*	*3,70%*	*7,75%*
Cummulative Earning	**(3.435.420)**	**(4.080.281)**	**(4.725.143)**	**2.374.358**	**17.218.222**
Depreciation of Refinery	2.156.310	4.312.620	4.312.620	4.312.620	4.312.620
Valuable Asset	40.969.890	36.657.270	32.344.650	28.032.030	23.719.410
EAT & Valuable Asset	**38.049.783**	**36.012.408**	**31.699.788**	**35.131.531**	**38.563.274**

Description	Year				
	6	7	8	9	10
Payment From Buyer	**191.646.000**	**191.646.000**	**191.646.000**	**191.646.000**	**191.646.000**
Operational Expenditure	174.182.631	174.182.631	174.182.631	174.182.631	174.182.631
Earning Before Interest and Tax.	**17.463.369**	**17.463.369**	**17.463.369**	**17.463.369**	**17.463.369**
% of Sales	9,11%	9,11%	9,11%	9,11%	9,11%
Installment & Interest					
Earning Before Tax (EBT)	**17.463.369**	**17.463.369**	**17.463.369**	**17.463.369**	**17.463.369**
% of Sales	9,11%	9,11%	9,11%	9,11%	9,11%
Corporate Tax	**2.619.505**	**2.619.505**	**2.619.505**	**2.619.505**	**2.619.505**
15,00%					
Earning After Tax (EAT)	**14.843.864**	**14.843.864**	**14.843.864**	**14.843.864**	**14.843.864**
% of Sales	7,75%	7,75%	7,75%	7,75%	7,75%
Cummulative Earning	**32.062.085**	**46.905.949**	**61.749.813**	**76.593.676**	**91.437.540**
Depreciation of Refinery	4.312.620	4.312.620	4.312.620	4.312.620	4.312.620
Valuable Asset	19.406.790	15.094.170	10.781.550	6.468.930	2.156.310
EAT & Valuable Asset	**34.250.654**	**29.938.034**	**25.625.414**	**21.312.794**	**17.000.174**

Source: Prepared by the authors (2023)

Based on the calculation of COGS and Profit-Loss statements that have been projected for the next ten years and the WACC (*Weighted Average Cost of Capital*) value that has been set by PT. TBW is 11,2%. The calculation of Capital Budgeting Investment can be assessed for its feasibility, with several indicators, namely Net Present Value > 0, profitable index > 1, and Internal Rate Return > WACC.

Table 4 shows the results of capital budgeting calculations stating that this project is FEASIBLE to be financed and pursued with Pay Out Time for four years and 11, 7 months. All financial feasibility indicators have exceeded the minimum investment feasibility requirements with a moderate scenario: the selling price follows the lowest price and the average fuel price refers to industrial market conditions in Belitung Island.

Table 4. Capital Budgeting Model Calculation Resul

Investment Budget		
Capital Expenditures	IDR x 1000	43.126.200
Working Capital	IDR x 1000	11.607.701
Pre-Operating Cost	IDR x 1000	2.414.000
Total Project Investment	IDR x 1000	**57.147.901**

Source of Fund		
Investor Paid Up : 20%	IDR x 1000	11.429.580
Bank Loan : 80%	IDR x 1000	45.718.321
Total Project Funding Requirement	IDR x 1000	**57.147.901**

Price Assumption		
Power Price	IDR/ KWH	1.500
Gas Price	IDR/M3	18.000
USD Kurs	IDR/ USD	15.000
Silika Selling Price	USD/ Ton	30
Reclamation Cost	IDR/ Ton	7.500
Fuel Price	IDR/ Liter	17.000
Interest	%. P.a	12%
Working Days	Days/month	26
Working Hour	Hour/ Day	20
Number of Line Machine Process	Unit	3

Technical Assumsion		
Capacity of Raw Material	Ton/month	54.600
Capacity of Finish Goods	Ton/month	35.490

Project Financial Highlight		
Internal Rate of Return (IRR)		**21%**
Net Present Value (NPV)	IDR x 1000	**21.420.003**
Profitability Index		**1,4**
Pay Out Time (POT)	Year, and	**4**
	Month	**11,7**
Break Event Point (BEP)	44,54%	**85.352.117**
Average EBITDA per year	IDR x 1000	**16.284.592**

Source: Prepared by the authors (2023)

Based on the sensitivity simulation analysis of changes in the selling price of Silica at USD 29.2/MT, this is the minimum point so that investors can avoid losses. In contrast, if the selling price is USD 29/MT, this project is declared impossible. On the other hand, if the price is above USD 30/MT, the profit potential will be more significant, and the payback period will be faster.

There are two main factors that affect the balance sheet: changes in selling prices and fuel prices which are subject to change at any time because fuel is 70% of the components that affect production costs, so these two factors will analyze their sensitivity to capital budgeting. Changes in the purchase price of fuel are one thing that is also crucial to the company's operations, where this fuel is the dominant cost component of expenses because all activities use fuel.

The increase in fuel prices reaching IDR 18600/ liter became a critical point in the silica sales price of USD 30/ ton. Meanwhile, this investment is very risky to suffer losses with IRR only 8% and Profitable index 0.8 point so that steps must be taken to restructure loan payments or strictly enforce efficiency to operations if there is a decrease in the selling price at USD 29/ ton followed by an increase in fuel prices of IDR 17500/ liter; see Table 5.

Table 5: Selling Price and Fuel Price Sensitivity Analysis Result

No	Description	Operating Cost (IDR x 1000)	EBITDA (IDR x 1000)			Pay of Time		IRR	Profitable Index
			Year 1	Year 2	Year 3	Year	Month		
	Selling Price (SP) Change at Fuel Price IDR 17000/ Liter								
1	Selling Price USD 31/ Ton	14.523.205	7.720.617	23.755.746	23.755.746	4	1,9	29,5%	1,9
2	Selling Price USD 30/ Ton	14.515.219	5.675.595	17.463.369	17.463.369	4	11,7	21,0%	1,4
3	Selling Price USD 29,2/ Ton	14.508.831	4.039.577	12.429.467	12.429.467	6	1,2	13,0%	1
4	Selling Price USD 29/ Ton	14.507.234	3.630.572	11.170.992	11.170.992	6	7,2	10,7%	0,9
	Fuel Price (FP) Change at Selling Price USD 30/ Ton								
5	Fuel Price IDR 17000/ Liter	14.515.219	5.675.595	17.463.369	17.463.369	4	11,7	21,0%	1,4
6	Fuel Price IDR 18000/ Liter	14.777.219	4.653.795	14.319.369	14.319.369	5	7,7	16,0%	1,2
7	Fuel Price IDR 18600/ Liter	14.934.419	4.040.715	12.432.969	12.432.969	6	2,2	12,8%	1
8	Fuel Price IDR 19000/ Liter	15.039.219	3.631.995	11.175.369	11.175.369	6	7,6	10,6%	0,9
	Mix Change (Fuel Price & Selling Price)								
9	SP USD 29/Ton & FP IDR 17500/Liter	14.638.234	3.119.672	9.598.992	9.598.992	7	3,6	8,0%	0,8
10	SP USD 31/Ton & FP IDR 18000/Liter	14.785.205	6.698.817	20.611.746	20.611.746	4	6,2	24,0%	1,6
11	SP USD 31/Ton & FP IDR 19000/Liter	15.047.205	5.677.017	17.467.746	17.467.746	5	-	21,0%	1,4
12	SP USD 31/Ton & FP IDR 20000/Liter	15.309.205	4.655.217	14.323.746	14.323.746	5	8,1	16,0%	1,2

Source: Prepared by the authors (2023)

CONCLUSION

The post-mining management program can be synergized with silica re-mining and refinery activities to provide added value for IUP-OP holders. The commitment to green environmental management activities can be carried out and financed through this re-mining and refinery investment activity by allocating funds for green environmental management, repairing mine voids for water storage, and implementing horizontal flow constructed wetlands at the location of plantation planting areas that have dual functions for wastewater treatment and fertilizing plantation crops.

The production capacity of re-mining silica raw materials is 54,600 MT/month with a production target of 35,490 MT/month, enough to fulfill one shipment with a mini mother vessel every month. So that cooperation contracts with buyers can be carried out on this scale. Increasing the potential of internal resources, namely financial literacy, makes business owners experience a process of subjectivity to become entrepreneurs who can utilize available resources (R. D Ayu Parmitasari; Rusnawati, 2023).

Calculation of capital budgeting on the condition of a selling price of USD 30/MT and a fuel price of IDR 17,000/liter states that this project is FEASIBLE to be financed with a NPV value of IDR 21,420,003,000, IRR: 21%, payout time: 4 years 11.7 months, and average EBITDA: IDR 16,284,592,000/ year. Two factors affect investment sensitivity: the selling price of the product and the fuel price. From the sensitivity calculation, it is found that at USD 29.2/MT and the fuel price reaches IDR 18,600/liter, the company will potentially experience losses if there are no other efforts to overcome these two external factors. The results of the study are in line with (Quality et al., 2023) those showing that the Capital Adequacy Ratio and Loan to Deposit Ratio have a positive effect on Return On Assets.

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