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The Impact Analysis of Bauxite Downstreaming on the Indonesian Economy: Case Study in PT Bintan Alumina Indonesia

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Abstract

This research analyzes the impact of investment and bauxite downstream activities by PT Bintan Alumina Indonesia (PT BAI) on the Indonesian economy using the input-output method applied to the Riau Islands Province, West Kalimantan Province and Indonesia. The imposition of stimulus on sectors related to the construction phase and operational phase of the alumina and aluminum industry in the Galang Batang SEZ is the concept that underlies how final demand in other sectors is affected. Economic improvement is characterized by increased output, GDRP, people's income, and the creation of job opportunities. During the construction phase of PT BAI (2016-2029), it generally had a positive impact on the increase in output, income, average GRDP, and average job creation in 52 industrial sectors in the Riau Islands Province. During the operational phase, calculated through three scenarios applied to the Riau Islands Province, West Kalimantan, and Indonesia, with the assumption of full downstreaming of PT BAI's products into the domestic market, shows the greatest impact. The impact includes the increase of Indonesia's output value until 2030 reaching IDR 547.07 trillion, an average annual GDP growth of 0.099 percent, a national income increases until 2030 reaching IDR 74.22 trillion, and an average job creation of 107,105 people per year in 52 industrial sectors in Indonesia. To achieve the optimal target of PT Bintan Alumina Indonesia's (BAI) presence in the domestic bauxite value chain, strengthening the downstream process and downstream industries of alumina and aluminum domestically is needed. Fiscal incentives, the establishment of pro-downstream regulations, and investor protection are crucial to implement.

Introduction

Indonesia has always been famous for its abundant natural resources, including the bauxite mining sector which is the basic material for the production of alumina and aluminum. In 2021, Indonesia is one of the largest bauxite producing countries in the world with a production level reaching 18 million tons per year, even according to data from the Central Statistics Agency (BPS), the realization of Indonesian bauxite production in 2021 reached the figure 25 million tonnes. However, with the high realization of bauxite production, bauxite mining industry entrepreneurs in Indonesia tend to prioritize export activities of raw bauxite commodities compared to domestic downstream efforts. In 2021, recorded bauxite exports reached 19 million tons or 77.24 percent of production. Meanwhile, with the large volume of bauxite exports, the volume of demand for Indonesian aluminum imports will reach 722,711.9 tons in 2021 and is projected to continue to increase every year.

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If we examine in more depth the value chain of bauxite to aluminum, we can see how big the impact will be on the downstream activities of the bauxite industry in the country. For raw bauxite, added value is obtained only from the extraction and washing processes (Datta & Nandi, 2021). The bauxite is exported for $49.17-$52.07 per wet metric ton (wmt). If bauxite is further processed into alumina, where 3 tons of bauxite on average produces 1 ton of alumina, it will increase the selling value to $327.80-$347.10 per ton. Furthermore, if alumina is processed back into aluminum ingots, where 2 tons of alumina produces 1 ton of aluminum ingots, the selling value can reach $2,474.00-$2,587.00 per ton.

If we deepen this further by calculating the loss of the potential loss of the bauxite downstream value chain, every 19 million tonnes of raw bauxite exported in 2021 at an average price of US$ 50.62 which when calculated is worth US$ 1,008.07 million or IDR 15.12 trillion, not comparable to the value of Indonesia's aluminum imports in 2021 which reached 722,711.9 tonnes with a world average price of US$2,475 which, when calculated, reaches US$1,787.99 million or IDR 26.82 trillion. So even though it has a large bauxite production capacity, foreign trade transactions on bauxite have so far not had much influence on the national income balance because bauxite production which is sold in raw form at low prices, is not comparable to the volume of alumina and aluminum imported at higher prices. to meet domestic market needs (Haryadi, 2015).

Further to this situation, the Indonesian Government through Law No. 4 of 2009 concerning Mineral and Coal Mining and Law No. 3 of 2020 concerning Amendments to Law no. 4 of 2009 concerning Mineral and Coal Mining as well as the National Industrial Development Master Plan (RIPIN) 2015-2035, launched a policy of prohibiting the export of raw mineral materials including bauxite and promoting a downstream program for industrial derivative products in Indonesia. As for the RIPIN document, the Government targets aluminum production to reach 2 million tonnes by 2035 to meet domestic market demand which is growing at around 10 percent per year, including the need for various purposes such as battery cells, electric vehicles, renewable energy and conventional aluminum. With this projection, aluminum demand in Indonesia is expected to reach 11 million tons in 2045 (Rachmadhani & Priyono, 2023).

Meanwhile, the aluminum production target for domestic needs in 2045 is estimated to reach 8 million tons, with the assumption that 30 percent can be met through recycled aluminum. So there is still a shortage of around 4 million tons of alumina needed to achieve total production of around 16.6 million tons of high grade alumina (Smelter Grade Alumina) in 2045. In 2022, there will only be four companies operating bauxite refining or alumina refinery facilities in Indonesia with a total input capacity in 2022 of 13.88 million tons of bauxite and a total production capacity of 4.2 million tons of alumina. Meanwhile, on the aluminum smelting side, until 2020 Indonesia only had one aluminum smelting company, namely PT Indonesia Asahan Aluminum (PT Inalum) which is located in Kuala Tanjung, North Sumatra with a production capacity of 250,000 tons per year (Anggrahini et al., 2020). This production capacity is still much lower than the volume of national aluminum metal demand, which in 2020 reached 1 million tons, resulting in the need to import 750,000 tons of aluminum metal to meet domestic market needs.

In an effort to increase investment potential, one of the special strategies that has been designed by the Indonesian Government is to prepare Special Economic Zones (KEK) which have economic and geostrategic advantages as well as tax incentives and ease of business permits for investors in order to maximize industrial activities, exports and imports in Indonesia (Afida & Widodo, 2023; Fauzi et al., 2022). The KEK program then attracted investment interest from foreign investment companies, one of which was PT Bintan Alumina Indonesia, which is the

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first bauxite downstream company in the Riau Islands Province with production output in the form of Smelter Grade Alumina (SGA) (Hidayat & Negara, 2020). Riau Province itself is one of the regions with the largest bauxite resources in Indonesia with estimated bauxite resource reserves reaching 508 million tons.

PT Bintan Alumina Indonesia has built a vertically integrated alumina refinery facility which is not only limited to the process of refining bauxite into alumina, but will also be targeted to have a smelter capacity to produce aluminum ingots (Milovanoff et al., 2021). This is one of PT BAI's advantages compared to other bauxite downstream companies in Indonesia currently, where this integration is expected to increase the efficiency of alumina and aluminum ingot production in one location.

Since starting operations in 2019, PT Bintan Alumina Indonesia (PT BAI) has made very rapid progress in the bauxite downstream industry in Indonesia. In July 2021, PT BAI succeeded in carrying out its first export of 70,000 tons of SGA alumina commodities to Malaysia and by January 2022 it had reached 550,000 tons of SGA or worth USD 212 million. In the future, PT BAI targets to produce 2 million tons of SGA which will then be reprocessed into aluminum ingots. This target is planned to be realized in 2027 with the development stage of aluminum ingot production starting in 2025 at 250,000 tons and will reach a capacity of 1 million tons in 2030. It is hoped that the presence of PT BAI will also have an impact on the domestic bauxite downstream value chain by meeting the needs of the alumina and aluminum ingot market together with existing alumina refinery and aluminum smelter companies in Indonesia.

However, in an effort to encourage the downstream bauxite industry carried out by PT BAI, it is necessary to consider the challenges and obstacles that arise, both in terms of supply of production factors and demand for alumina and aluminum output in local and global markets. Since the operation of PT BAI in 2019, PT BAI has experienced difficulties in terms of the availability of local bauxite raw materials in the Riau Islands Province which has a quality Al2O3 content according to company standards, namely a minimum of 46 percent. Due to these limitations, PT BAI had to obtain washed bauxite raw materials with an Al2O3 content of 46 percent imported from Sanggau Regency, West Kalimantan Province. PT BAI's dependence on bauxite supplies from West Kalimantan Province has an impact on the high risk of the alumina production process being hampered if there are problems at the delivery stage or other force majeure circumstances.

From the demand side, the limited aluminum smelter industry in Indonesia and the presence of PT BAI in the Galang Batang SEZ area which is designated as an export trade area causes large taxes to be imposed on domestic transactions, this has an impact on the selling price of PT BAI's alumina which is unable to compete with alumina production other domestic and imported alumina from Australia. Until now, PT BAI's smelter grade alumina sales have been allocated entirely to the export market so that the bauxite downstream value chain is not fully effective within the country. In addition, competition in the global market for bauxite derivative industrial products, such as alumina and aluminum ingots, is quite tight. If the products produced by PT BAI are not able to compete in terms of quality and price with similar products from other countries, this will have an impact on PT BAI's achievements not being optimal in meeting sales targets.

Furthermore, the presence of PT BAI in the economy of the Riau Islands does not only need to be seen for its positive impacts (Hidayat & Negara, 2020), but also other side effects that have the potential to have negative effects on the regional and national economy. PT BAI's status as a foreign investment company (PMA) receiving tax holiday incentives for a period of 15 years, also has an impact on state revenue receipts where the profits obtained by PT BAI during

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operations are not directly received by the Indonesian Government in the form of corporate income tax. This needs to be considered as a limitation in calculating the impact of investment on the domestic economy. So it can be indicated that the implementation of a full export sales scenario for PT BAI's alumina and aluminum production results cannot yet be calculated as a stimulus for the domestic sector to increase economic growth optimally.

Based on the portrait of the development of PT BAI's bauxite mineral industry, further studies need to be carried out whether it is true that the existing situation implemented by PT BAI has played an optimal role in the domestic bauxite downstream value chain which has had an impact on increasing economic growth in the Riau Islands Province and nationally or whether there are other alternative scenarios. which can increase the optimization of the impact of economic growth in the Riau Islands Province and nationally through analysis of the impact of bauxite downstreaming on the Indonesian economy in the case study of PT Bintan Alumina Indonesia with several projection scenario simulations using the Input-Output model. The use of the Input-Output model is expected to provide an overview of the influence of the development of one particular activity on other activities which are sectors in overall economic activity. This impact analysis will use the Input-Output (IO) analysis model utilizing the 2016 Riau Islands Province Input-Output matrix, the 2016 West Kalimantan Province Input-Output matrix, and the 2016 National Input-Output matrix.

Methods

Conceptual Framework

Based on a portrait of the development of PT BAI's bauxite mineral industry and an overview of previous research, this impact analysis will use the Input-Output (IO) analysis model utilizing the 2016 Riau Islands Province Input-Output matrix, the 2016 West Kalimantan Province Input-Output matrix, and 2016 National Input-Output Matrix. The steps to be taken in this research are as follows.

Secondary data collection, namely the 2016 Riau Islands Province Input-Output Table (52 Sectors), the 2016 West Kalimantan Province Input-Output Table (52 Sectors), and the National Input-Output Table (52 Sectors) obtained from the Central Statistics Agency (BPS). This Input-Output data will then become the basis for processing analysis of inter-sector linkages and analysis of the impact of bauxite downstreaming by PT BAI in the Riau Islands Province, West Kalimantan Province and Nationally. Collection of secondary data regarding the amount of PT Bintan Alumina Indonesia (BAI) investment allocation obtained from the 2017 to 2021 Special Economic Zone Development Report published by the KEK National Council. The allocation figures listed in the report and several previous studies will be the basis for stimulus (shock) assumptions, especially during the construction period for the construction of PT BAI in the Galang Batang KEK. Preparation of a baseline situation analysis of the absence of investment in the Galang Batang KEK on economic growth in the Riau Islands Province and nationally. Preparing an analysis of the impact of the presence of PT Bintan Alumina Indonesia in the domestic bauxite downstream value chain on economic growth in the Riau Islands Province, West Kalimantan Province and nationally, taking into account the stimulus or shock during the construction and operational periods. The stimulus or shock during the construction period takes into account the amount of PT BAI's investment as a tenant of the Bauxite Processing Industry company in the Galang Batang SEZ in the Riau Islands Province. The detailed assumptions for the amount of investment/stimulus costs during the construction period are as follows:

Alumina Refinery Investment Costs are assumed to be IDR 476,362 million and infrastructure development costs are assumed to be IDR 189,662 million based on the SEZ End of Year

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Report (2021) with assumed cost proportions referring to the SME Mineral Processing and Extractive Metallurgy Handbook (Kawatra & Young, 2019). Aluminum Smelter Investment Costs with stimulus costs focus on the assembly, installation and construction costs of the smelter foundation with investment costs assumed to be IDR 11,178,000 million based on CBI study data (2006) and the average investment cost of PT Inalum. The estimated cost of building a Coal Gas Plant is IDR 428,583 million. This assumption is calculated based on the SEZ End of Year Report by Toledano & Maennling (2018) with the proportion of cost assumptions referring to the Economic Analysis of Coal Gasification Plant for Electrical and Thermal Energy Supplies in indonesia (Zuldian et al., 2017). The cost of building a Steam Power Plant (PLTU) with an investment amount assumed to reach IDR 11 trillion which is calculated based on this assumption is calculated based on the SEZ End of Year Report by Toledano & Maennling (2018) with the assumed cost proportion referring to the Investment Feasibility and Risk Analysis of PT PLN's Indramayu PLTU Construction Project (Dachyar, 2012). This investment is classified in the Construction sector group on the Input-Output matrix.

Stimulus or shock during the operational period is calculated using a dynamic economic impact scheme in three regions, namely Riau Islands Province, West Kalimantan Province and Indonesia through three projection scenarios in different situations during the analysis period which is 10 (ten) years of PT BAI's operational period (2021-2030). Prices for bauxite, alumina and aluminum ingots refer to the projected prices in the Pandey & Prakash (2020) report. The Rupiah exchange rate against USD uses a constant exchange rate of IDR 15,000/USD. The operational scenarios that will be simulated in detail are as follows:

Scenario Without PT BAI (Baseline)

The scenario without PT BAI is used as an assumption in calculating the difference in impact between the presence and absence of the downstream operational phase of the bauxite industry carried out by PT BAI in the Riau Islands Province on the economy of the Riau Islands Province and the National economy. Riau Islands Province's bauxite production calculated in the impact analysis is assumed to be constant during 2016-2030 at 6,000 KTPA. This analysis is based on the number of bauxite mining companies that have Mining Business Permits (IUP) in the Riau Islands Province in 2020, namely 6 companies with an average production of 1,000 KTPA per IUP. Referring to Law Number 4 of 2009 concerning Mineral and Coal Mining, bauxite production in the Riau Islands Province is assumed to be exported to other provinces within Indonesia and not exported abroad.

Scenario – 1 (Existing)

Scenario I describes the existing situation where PT BAI obtains a complete supply of bauxite from West Kalimantan Province to produce aluminum ingots of 1 million tons per year (KTPA) in 2030. As with the function of the Galang Batang SEZ which is export-oriented, PT BAI implements an export trade policy for the entire production output of alumina and aluminum ingots. This has an impact on the domestic demand for alumina and/or aluminum ingots not being met by PT BAI's production in the Galang Batang SEZ. The final demand will be in the form of alumina (2021-2029) and aluminum ingots (2027-2030) which will be distributed 100 percent to the export market.

Scenario – II (Alternative - 1)

Scenario II depicts another alternative situation where PT BAI also obtains Bauxite supplies from two regions, namely West Kalimantan Province and Riau Islands Province to produce aluminum ingots of 1 million tons per year (KTPA) in 2030. In addition to carrying out the function of the Galang Batang oriented KEK exports, PT BAI also implemented a sales policy for smelter grade alumina and aluminum ingots for the domestic market. This has an impact

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on reducing domestic demand for alumina and aluminum ingots for imported products. The final demand will be in the form of smelter grade alumina (2021-2029) which will be distributed proportionally according to the projected supply capacity of other domestic smelter grade alumina (SGA) and the absorption capacity of domestic aluminum smelters in Indonesia. It is simulated that PT BAI can carry out domestic SGA downstreaming in a varying range of 15 percent to 75 percent of total production per year. In this research, it is assumed that there are 3 SGA alumina refinery companies and 3 aluminum smelter companies which will operate in stages until 2030. Sales of PT BAI's aluminum ingot production (2027-2030) will be distributed proportionally according to the projected supply capacity of domestic aluminum smelting companies. others and the absorption capacity of the primary aluminum market in Indonesia. It is simulated that PT BAI can carry out domestic downstreaming of aluminum ingots in a varying range of 30 percent to 65 percent of total production per year. In this research, it is assumed that there are 3 aluminum smelter companies that will operate in stages until 2030 and that primary aluminum market demand in 2020 will be 700,000 tons per year with constant growth at 10 percent per year.

Scenario – III (Alternative - 2)

Scenario III depicts another alternative situation where PT BAI obtains its full bauxite supply from the Riau Islands Province to produce aluminum ingots of 1 million tons per year (KTPA) in 2030. In this scenario, PT BAI fully implements the sales policy for smelter grade alumina and aluminum. ingots for the domestic market. This has an impact on meeting domestic needs for alumina and aluminum ingots with domestic products. The final demand will be in the form of smelter grade alumina (2021-2029) which will be fully distributed and is assumed to be absorbed by the smelter by the domestic market in Indonesia.

Input-Output Table Analysis Method

For analysis purposes, in this section several mathematical equations will be presented which can be formulated using the Input-Output table as follows:

Output Multiplier Impact

The Inverse Leontief Matrix and/or the inverse Goshian transpose matrix are used to calculate measures of economic linkages between sectors and between regions. In the analysis, the exogenous transaction is final demand (F). The amount of output value due to final demand is formulated as follows:

$X = \{(I-A)^{-1} + ((I-\vec{B})^{-1})' - I)\} \times F$

In this case:

X = Total impact of upstream (*Leontief)* and downstream (*Goshian Transpose*) outputs

I = Identity Matrix

A = Matrix cophysin input/teknis

$\vec{B}$ = Output usage allocation matrix for intermediate demand

F = Stimulus

Impact of Revenue Multiplier

The income *multiplier effect* is a concept in Input-Output analysis that describes how changes in the expenditure of one sector of the economy can affect the income of other sectors of the economy. The calculation of sectoral revenue multipliers can be obtained through the following formula:

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$Z = \{ V (I-A)^{-1} + (V ((I-\vec{B})^{-1})' - I)\} \times F$

In this case:

Z = Total upstream (*Leontief)* and downstream (*Goshian Transpose*) revenue impact

V= income coefficient matrix (ratio of wages and salaries to total inputs)

Impact of Gross Value-Added Multiplier

Gross Value-Added Multiplier *is a* concept in Input-Output (IO) analysis that measures the economic impact of a sector on the economy as a whole through its effect on increasing gross value added in other sectors. The calculation of the gross value-added multiplier can be obtained through the following formula:

$VA = \{ \hat{V} (I-A)^{-1} + (\hat{V} ((I-\vec{B})^{-1})' - I)\} \times F$

In this case:

VA= Total gross value-added impact upstream *(Leontief)* and downstream (*Goshian Transpose*)

$\hat{V}$ = Gross Value-Added coefficient matrix

Impact of Employment/Employment Opportunity Multiplier

Employment Creation *multiplier* is a concept in Input-Output (IO) analysis that measures the economic impact of a sector on the economy as a whole through its effect on increasing employment opportunities in other sectors. The calculation of the job opportunity multiplier can be obtained through the following formula:

$TK = \{ L (I-A)^{-1} + (L ((I-\vec{B})^{-1})' - I)\} \times F$

In this case:

TK = Total impact of upstream (*Leontief)* and downstream (*Goshian Transpose*) employment opportunities

L = Employment/Employment coefficient matrix.

Results and Discussion

Analysis of the Impact of PT Bintan Alumina Indonesia's Investment in the Construction Phase

By applying an economic multiplier model based on the Input-Output Model, the presence of PT BAI in the domestic bauxite downstream value chain in the Construction Phase has a positive impact on increasing components of total output, income, gross added value or GRDP, and the creation of job opportunities. Accumulatively, the impact on increasing the output value in the Riau Islands Province reached IDR 26.49 trillion with an average annual achievement of IDR 1.89 trillion. In the scope of the impact of increasing the Gross Regional Domestic Product of the Riau Islands Province, which is calculated by analyzing the gross value added (NTB) multiplier figure, it can reach an accumulation in 2029 of IDR 14.88 trillion with an average annual achievement of IDR 1.06 trillion which, if taken into account with the percentage increase in the total GDP of the Riau Islands Province reaching an average of 0.31 percent per year.

The impact on increasing the income of the Riau Islands Province cumulatively until 2029 will reach IDR 8.09 trillion or IDR 578 billion per year. Furthermore, in terms of impact on increasing job opportunity creation, PT BAI's construction phase activities and Galang Batang

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KEK operations are targeted to increase the average job opening for 2,378 people spread across 52 industrial sectors in the Riau Islands Province.

Table 1. Impact of PT BAI's Existence in Construction Phase in Riau Islands Province

Year	Impact on Increasing Output Value (IDR Million)	Impact on Increasing GDP (IDR Million)	% Increase in Total GRDP of Riau Islands (%)	Impact on Revenue Increase (IDR Million)	Impact on Job Creation (People)
2016	80.032	44.973	0,02%	24.462	101
2017	342.047	192.209	0,08%	104.546	430
2018	342.047	192.209	0,08%	104.546	430
2019	342.047	192.209	0,07%	104.546	430
2020	342.047	192.209	0,08%	104.546	430
2021	1.594.670	895.868	0,33%	487.123	2.003
2022	1.497.086	841.046	0,27%	457.314	1.881
2023	1.318.323	740.619	0,23%	402.708	1.656
2024	2.469.579	1.387.382	0,42%	754.381	3.102
2025	2.469.579	1.387.382	0,41%	754.381	3.102
2026	2.469.579	1.387.382	0,40%	754.381	3.102
2027	3.348.461	1.881.128	0,52%	1.022.853	4.207
2028	4.939.158	2.774.764	0,75%	1.508.762	6.205
2029	4.939.158	2.774.764	0,72%	1.508.762	6.205
Total	**26.493.813**	**14.884.146**		**8.093.312**	
Average	**1.892.415**	**1.063.153**	**0,31%**	**578.094**	**2.378**

Source: Processed from Input-Output Matrix Year 2016, 2023

Impact Analysis of PT Bintan Alumina Indonesia's Bauxite Downstream Activities in the Operational Phase

Analysis of the Impact of PT Bintan Alumina Indonesia's Bauxite Downstream Activities in the Operational Phase on the Economy of Riau Islands Province

Based on the results of input-output matrix processing, the baseline situation without the existence of PT BAI has an accumulative output impact in 2030, namely IDR 59.66 trillion, an average increase in GRDP each year of IDR 3.82 trillion or 1.12 percent, an increase the average annual income is IDR 1.93 trillion, and the average job creation is 7,698 people each year. The following baseline situation assumptions refer to the stimulus for activities in the mining sector and trade in raw bauxite metal ore out of the Riau Islands Province which is assumed to still be operating.

PT BAI's bauxite downstream activities in the operational phase in Scenario I have a relatively higher impact than the baseline situation. Accumulatively, the difference in impact on increasing output value in the Riau Islands Province in Scenario I compared to the Scenario Without PT BAI reached IDR 47.59 trillion with an average annual achievement of IDR 4.76 trillion. In the scope of the impact of increasing the Gross Regional Domestic Product of the Riau Islands Province, which is calculated by analyzing the gross value added (NTB) multiplier, the difference in the impact of the increase in the average GDP achievement each year is IDR 102 billion or 0.029 percent per year. The difference in impact on increasing the income of the Riau Islands Province cumulatively until 2029 will reach IDR 4.99 trillion or IDR 499 billion per year. Furthermore, in terms of the impact on increasing job opportunity creation, the existence of PT BAI's operational phase activities in scenario I has an impact on creating higher employment opportunities compared to the scenario without PT BAI, namely 7,666 people per year spread across 52 industrial sectors in the Riau Islands Province .

Furthermore, PT BAI's bauxite downstream activities in the operational phases of Scenarios II and III provide a higher positive impact on the growth of total output, income, gross value

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added (GRDP), and job creation in the Riau Islands Province compared to Scenario I. Accumulatively , the impact on increasing output value in the Riau Islands Province in Scenarios II and III compared to the scenario without PT BAI reached IDR 48.41 trillion with an average annual achievement of IDR 4.84 trillion. In terms of the impact of increasing the Gross Regional Domestic Product of the Riau Islands Province, the average annual increase in GRDP is IDR 104 billion or 0.030 percent per year. The difference in impact on increasing the income of the Riau Islands Province cumulatively until 2029 will reach IDR 5.76 trillion or IDR 576 billion per year. Furthermore, in terms of the impact on increasing the creation of job opportunities, the existence of PT BAI's operational phase activities in scenarios II and III has an impact on creating higher employment opportunities compared to the scenario without PT BAI, namely 7,760 people spread across 52 industrial sectors in the Riau Islands Province.

Table 2. Impact of PT Bintan Alumina Indonesia's Existence in the Operational Phase in Riau Islands Province in 2021-2030

		Impact on Increasing Output Value	**Impact on increasing GDP**	**% Increase in Total GDP of the Riau Islands**	**Impact on Increased Income**	**Impact on Job Opportunity Creation**
Scenario		**(IDR Million)**	**(IDR Million)**	**%**	**(IDR Million)**	**(Person)**
Without PT BAI	Total	59.660.103	38.283.997	-	19.362.597	-
	Average	5.966.010	3.828.400	1,12%	1.936.260	7.698
Scenario I	Total	107.250.323	39.307.096	-	24.357.867	-
	Average	10.725.032	3.930.710	1,15%	2.435.787	15.364
Scenario I and III	Total	108.071.907	39.326.224	-	25.126.827	-
	Average	10.807.191	3.932.622	1,15%	2.512.683	15.458
Difference between Scenario I and Without PT BAI	Total	47.590.221	1.023.099	-	4.995.269	-
	Average	4.759.022	102.310	0,029%	499.527	7.666
Difference between Scenarios II-III and Without PT BAI	Total	48.411.805	1.042.227	-	5.764.229	-
	Average	4.841.180	104.223	0,030%	576.423	7.760

Source: Processed from Input-Output Matrix Year 2016, 2023

Analysis of the Impact of PT Bintan Alumina Indonesia's Bauxite Downstream Activities in the Operational Phase on the Economy of West Kalimantan Province

PT BAI's bauxite downstream activities in the operational phase of Scenario I had a positive impact on the growth of total output, income, gross value added (GRDP), and job creation in West Kalimantan Province. In accumulation, the increase in output value reached IDR 54.97 trillion with an annual average of around IDR 5.5 trillion. The impact on the average increase in West Kalimantan Province's GRDP will reach IDR 3.08 trillion in 2030, with average growth of around 1.06% per year. The increase in income for West Kalimantan Province until 2030 will reach IDR 22.02 trillion or around IDR 2.20 trillion per year. In addition, PT BAI's operational phase activities in Scenario I are estimated to create an average of 22,147 jobs per year in 52 industrial sectors in West Kalimantan Province.

On the other hand, PT BAI's bauxite downstream activities in the operational phase of Scenario II also had a positive impact, but at a lower level on the growth of total output, income, gross added value (GRDP), and job creation in West Kalimantan Province. In accumulation, the increase in output value reached IDR 27.48 trillion with an annual average of around IDR 2.75 trillion. The impact on the GRDP of West Kalimantan Province will reach IDR 15.42 trillion in 2030, with an average growth of around 0.53% per year. The increase in income for West

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Kalimantan Province until 2030 will reach IDR 11.01 trillion or around IDR 1.10 trillion per year. In addition, PT BAI's operational phase activities in Scenarios II and III are estimated to create an average of 11,074 jobs in 52 industrial sectors in West Kalimantan Province.

Table 3. Impact of PT Bintan Alumina Indonesia's Existence in the Operational Phase in West Kalimantan ProvinceYear 2021-2030

		Impact on Increasing Output Value	**Impact on increasing GDP**	**% Increase in total GDP of West Kalimantan**	**Impact on Increased Income**	**Impact on Job Opportunity Creation**
Scenario		**(IDR Million)**	**(IDR Million)**	**%**	**(IDR Million)**	**(Person)**
Scenario I	Total	59.968.623	30.845.865	-	22.023.473	-
	Average	5.496.862	3.084.587	1,06%	2.202.347	22.147
Scenario I and III	Total	27.484.311	15.422.933	-	11.011.737	-
	Average	2.784.431	1.542.293	0,53%	1.101.174	11.074
Difference between scenario I and Scenario II	Total	27.484.311	15.422.311	-	11.011.737	-
	Average	2.784.431	1.542.293	0,531%	1.101.174	11.74

Source: Processed from Input-Output Matrix Year 2016, 2023

Analysis of the Impact of PT Bintan Alumina Indonesia's Bauxite Downstream Activities in the Operational Phase on the Indonesian Economy

The baseline situation or scenario without the existence of PT BAI has an accumulative output impact in 2030, namely IDR 68.51 trillion, an average increase in GDP each year of IDR 4.48 trillion or 0.021 percent, an increase in average income each year of IDR 1 .29 trillion, and an average job creation of 9,086 people every year. The following baseline situation assumptions refer to the stimulus for activities in the mining sector and trade in raw bauxite metal ore out of the Riau Islands Province and West Kalimantan Province which are assumed to still be operating.

PT BAI's bauxite downstream activities in the operational phase in Scenario I have a higher national impact than the baseline situation. Accumulatively, the difference in impact on increasing the value of Indonesia's output in Scenario I and the Scenario without PT BAI reaches IDR 60.31 trillion with an average annual achievement of IDR 6.03 trillion. In the scope of the impact of increasing Indonesia's Gross Domestic Product, the difference between Scenario I and the Scenario without PT BAI is an average of IDR 3.95 trillion each year, which when calculated with the percentage increase in total national GDP is an average of 0.018 percent per year. The impact on the cumulative increase in national income until 2030 will reach IDR 11.34 trillion or IDR 1.13 trillion per year. Furthermore, in terms of the impact on increasing job opportunity creation, PT BAI's operational phase activities in scenario I have an impact on creating 7,893 more job opportunities in 52 industrial sectors than in the scenario without PT BAI.

In Scenario II, cumulatively compared with the scenario without PT BAI, the impact on increasing the value of Indonesia's output reaches IDR 216.47 trillion with an average annual

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achievement of IDR 21.65 trillion. In terms of the impact of increasing Indonesia's Gross Domestic Product, which is calculated by analyzing the gross value added multiplier (NTB), the average annual achievement is IDR 9.79 trillion, which when calculated with the percentage increase in total national GDP is an average of 0.043 percent per year. The impact on the cumulative increase in national income until 2030 will reach IDR 30.94 trillion or IDR 3.09 trillion per year. Furthermore, in terms of the impact on increasing job opportunity creation, PT BAI's operational phase activities in scenario II have an impact on increasing job openings compared to the scenario without PT BAI, namely 40,414 people in 52 industrial sectors in Indonesia.

Meanwhile, a comparison of Scenario III with the Scenario without PT BAI shows that the difference in impact on increasing the value of Indonesia's output reached IDR 547.07 trillion with an average annual achievement of IDR 54.70 trillion. In the scope of the difference in the impact of increasing Indonesia's Gross Domestic Product, which is calculated by analyzing the gross value added (NTB) multiplier figure, the difference in the impact of achievement each year is IDR 2.30 trillion, which when calculated with the percentage increase in total national GDP is an average of 0.099 percent per year. The impact on the cumulative increase in national income until 2029 reaches IDR 74.22 trillion or IDR 7.42 trillion per year. Furthermore, in terms of the impact on increasing job opportunity creation, the existence of PT BAI's operational phase activities in scenario III has an impact on increasing job openings which is higher than in the scenario without PT BAI, namely 107,105 people spread across 52 industrial sectors in Indonesia.

Table 4. Impact of PT Bintan Alumina Indonesia's Existence on the Operational Phase on the Indonesian Scale 2021-2030

Indonesia						
Scenario		**Impact on Increasing Output Value**	**Impact on increasing GDP**	**% Increase in Total Indonesian GDP**	**Impact on Increased Income**	**Impact on Job Opportunity Creation**
		(IDR Million)	**(IDR Million)**	**%**	**(IDR Million)**	**(Person)**
Leontief Impact Analysis						
Without PT BAI	Total	68.514.071	44.822.067		12.888.094	
	Average	6.851.407	4.482.207	0,021%	1.288.809	9.086
Scenario I	Total	128.823.436	84.304.859		24.228.594	
	Average	12.882.344	8.430.486	0,039%	2.422.859	16.979
Scenario II	Total	98.661.724	64.566.378		18.555.590	
	Average	9.866.172	6.456.638	0,021%	1.855.590	13.004
Scenario III	Total	68.500.012	44.827.898		12.883.207	
	Average	6.850.001	4.482.790		1.288.321	9.028
Goshian Impact Analysis						
Without PT BAI	Total	-	-	-	-	-
	Average	-	-	-	-	-
Scenario I	Total	-	-	-	-	-
	Average	-	-	-	-	-
Scenario II	Total	186.320.954	78.207.328		25.279.974	
	Average	18.632.095	7.820.733	0,034%	2.527.997	36.496
Scenario III	Total	574.086.311	229.636.858		74.228.515	
	Average	54.708.631	22.963.686	0,099%	7.422.852	
Total Impact Analysis						
Without PT BAI	Total	68.514.071	44.822.067		12.888.094	
	Average	6.851.407	4.482.207	0,021%	1.288.809	9.086
Scenario I	Total	128.823.436	84.304.859		24.228.594	

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	Average	12.882.344	8.430.486	0,039%	2.422.859	16.979
Scenario II	Total	284.982.678	142.773.706		43.835.875	
	Average	28.498.268	14.277.371	0,064%	4.383.587	49.500
Scenario III	Total	615.586.323	274.464.765		87.111.722	
	Average	61.558.632	27.446.476	0,120%	8.711.172	116.191
Difference between scenarios I and without PT BAI	Total	60.309.365	39.482.792	-	11.340.500	-
	Average	6.030.936	3.948.279	0,018%	1.134.050	7.893
Difference between Scenario II and Without PT BAI	Total	216.468.607	97.951.640	-	30.947.781	-
	Average	21.646.861	9.795.164	0,043%	3.094.778	40.414
Difference between Scenario III and Without PT BAI	Total	547.072.252	229.642.690	-	74.223.629	-
	Average	54.707.225	22.964.269	0.099%	7.422.363	107.105

Source: Processed from Input-Output Matrix Year 2016, 2023

Policy Implications of the Results of the Analysis of the Impact of Bauxite Downstream on the Indonesian Economy

Based on the results of calculations analyzing the impact of PT BAI's presence in the domestic bauxite downstream value chain on the Indonesian economy using the Input-Output Model, it was found that the operation of PT BAI in the Riau Islands Province will have an impact on increasing output value, income, GRDP and GDP, as well as creating fields. Work. This impact occurs both accumulatively in the 2021-2030 period and in an annual average that is greater than conditions without PT BAI.

However, it was found that in scenario I or the existing scenario currently being implemented by PT BAI, namely a scenario where all of PT BAI's production output is sold entirely for export, it has a lower impact on the economy compared to the alternative scenario, namely continuing product downstreaming. domestic. Based on the assumptions applied in this research, the implementation of scenario I only takes into account the impact of upstream linkages where there is an increase in demand for bauxite by PT BAI to West Kalimantan Province which is calculated using the leontief multiplier figure and initial downstream linkages in the base metal industry sector in Riau Islands Province which are calculated through goshian multiplier number with a stimulus amount equal to the bauxite value that will be processed by PT BAI. This scheme is used with the consideration that PT BAI is a foreign investment company (PMA) which until the 2030 period will still receive tax holiday incentives. Meanwhile, with the existence of PT BAI which is located in an exclusive Special Economic Zone (enclave) area, and uses machining technology that requires a minimum of local labor, the company's large profits from selling alumina cannot be considered significant Indonesian income. Furthermore, this existing scenario does not have any impact on import activities of alumina, aluminum ingots and their derivatives to meet domestic needs.

Meanwhile, in scenario II or the first alternative scenario, it is assumed that PT BAI implements a policy of selling alumina and aluminum ingot products to the Indonesian market as a substitute for imported products in accordance with the absorption capacity of the domestic base metal industry. Based on the results of data processing, scenario II has a 2.21 times greater impact on the accumulative increase in output value in 2021-2030 compared to scenario I; 1.69

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times greater impact on the average annual increase in GDP compared to scenario I, 1.81 times greater impact on the accumulative increase in income (wages/salaries) in 2021-2030 compared to scenario I; and has a 2.92 times greater impact on the average increase in job opportunity creation each year compared to scenario I.

Furthermore, in maximizing PT BAI's potential for Indonesia's economic growth, this research also includes scenario 3 or the second alternative scenario where it is assumed that all of PT BAI's production output can be sourced domestically in Indonesia and fully absorbed by the base metal industry sector to become products. So. Assuming this scenario, PT BAI plays a role in implementing substitutes for imported alumina and aluminum ingot products which, if calculated based on the results of data processing, will have an impact of 4.78 times greater on the accumulative increase in output value in 2021-2030 compared to scenario I; 3.26 times greater impact on average annual GDP increase compared to scenario I; 3.60 times greater impact on accumulative increase in income (wages/salaries) in 2021-2030 compared to scenario I; and has a 6.84 times greater impact on the average increase in job opportunity creation each year compared to scenario I.

Based on the impact analysis carried out in this research, it can be seen that the potential impact of downstream bauxite industry in Indonesia is still very large in supporting domestic economic growth. However, it cannot be denied that Indonesia's dependence on developed countries through foreign investment as a catalyst for domestic high-tech industry is still very large. Referring to the dependency theory of structuralism, in an economic context it is a theory or perspective that focuses attention on the relationship between developing countries and countries that are still in the development or underdeveloped stage. The existing scenario implemented by PT BAI shows that Indonesia is still depend on developed countries in terms of processing natural resources using high technological capacities owned by foreign parties. Even though the end result is alumina products, the impact on the domestic economy is not significant.

Implementing scenarios II and III through Government policy efforts is also not without risk. Indonesia's position, which was previously at the level of exporter of raw goods (bauxite) and is currently at the level of exporter of semi-finished goods (smelter grade alumina) in the global value chain (GVC) of the bauxite industry, is at risk of causing problems in the realm of international trade and geopolitics, namely retaliation or retribution. from trading partner countries that have been importers of these commodities. This is similar to the case of the European Union's lawsuit through the World Trade Organization (WTO) regarding the nickel ore export ban policy, which illustrates the complexity and risks that can arise in the context of international trade policy, which need to be managed carefully to maintain the stability of Indonesia's trade relations at the global level (Wouters & Hegde, 2022).

Apart from that, the implementation of scenarios II and III also requires Government support in order to encourage investment for existing companies to build smelters and industrial facilities in the form of fiscal incentives and legal regulations that support downstreaming to ensure adequate protection for investors. Furthermore, the Government needs to implement a series of strategic steps, including maintaining the flow of domestic industrial business processes, starting from consistently maintaining the availability of raw materials for industrial processing; creating storage facilities for downstream industrial commodity output, both for domestic and international markets to secure the smooth distribution of downstream products; creating a conducive investment environment, maintaining domestic political stability; as well as creating a forum for collaboration between investors and regional business actors, including Micro, Small and Medium Enterprises (MSMEs), in carrying out industrial downstreaming.

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Conclusion

Based on the results of the analysis of the impact of PT Bintan Alumina Indonesia's bauxite downstreaming on the economy of the Riau Islands Province, West Kalimantan Province and Indonesia, which includes increasing output value, income, GRDP and job creation, it can be concluded that during the construction phase PT BAI had a positive impact positive impact on increasing output, income, increasing average GRDP, and average job opportunity creation in 52 industrial sectors in the Riau Islands Province. In the operational phase, scenario III shows the largest positive impact nationally, with an increase in the value of Indonesia's output until 2030 reaching IDR 547.07 trillion, average GDP growth of 0.099 percent per year, an increase in national income reaching IDR 74.22 trillion until 2030, and creation of job opportunities on average 107,105 people per year in 52 industrial sectors in Indonesia. Based on the results of analysis using the Input-Output model on a national scale, the assumption that all PT BAI smelter grade alumina and aluminum ingot output is downstream as import substitutes in the domestic market can be a policy with the most optimal impact.

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