

THE IMPACT OF INDUSTRIAL DOWNSTREAMING POLICY ON REGIONAL ECONOMIC GROWTH AND EMPLOYMENT ABSORPTION IN INDONESIA

Yuddy Chrisnandi¹
Universitas Nasional

Obsatar Sinaga²
Universitas Padjadjaran

Correspondence : (yuddy_chrisnandi@yahoo.com)

ABSTRACT

Indonesia's industrial downstreaming policy, anchored by the nickel ore export ban that took effect in January 2020, has reshaped the economies of the provinces that host smelters. This study examines whether the policy translated into faster regional economic growth and, more importantly, into proportional employment absorption. Using secondary data from Statistics Indonesia (BPS), the Ministry of Investment and Downstreaming, and the Ministry of Trade for 2018-2025, the study applies a descriptive-comparative quantitative design that combines a before-after growth differential, arc employment elasticity, and investment labour intensity. The results show that the gross regional domestic product (GRDP) of North Maluku grew by a cumulative 107.4% in 2019-2024 (an average of 15.7% per year), and Central Sulawesi grew by 65.9% (10.7% per year), compared with 18.0% (3.4% per year) nationally. Relative to their pre-policy trend, the two smelter provinces gained 10.5 and 5.7 percentage points of annual growth over the national economy. Iron and steel exports rose from USD 7.39 billion in 2019 to USD 27.97 billion in 2025, and downstreaming investment reached IDR 584.1 trillion in 2025, or 30.2% of national investment. Employment, however, responded weakly: the employment elasticity of North Maluku was 0.25, less than one third of the national elasticity of 0.80, and open unemployment fell by under one percentage point. The study concludes that downstreaming has produced high but capital-intensive growth, and it recommends local content and workforce programmes, linkage-building with local small and medium enterprises, and fiscal transfers that return more value to producing regions.

Keywords: industrial downstreaming; nickel; regional economic growth; employment absorption; employment elasticity; Indonesia.

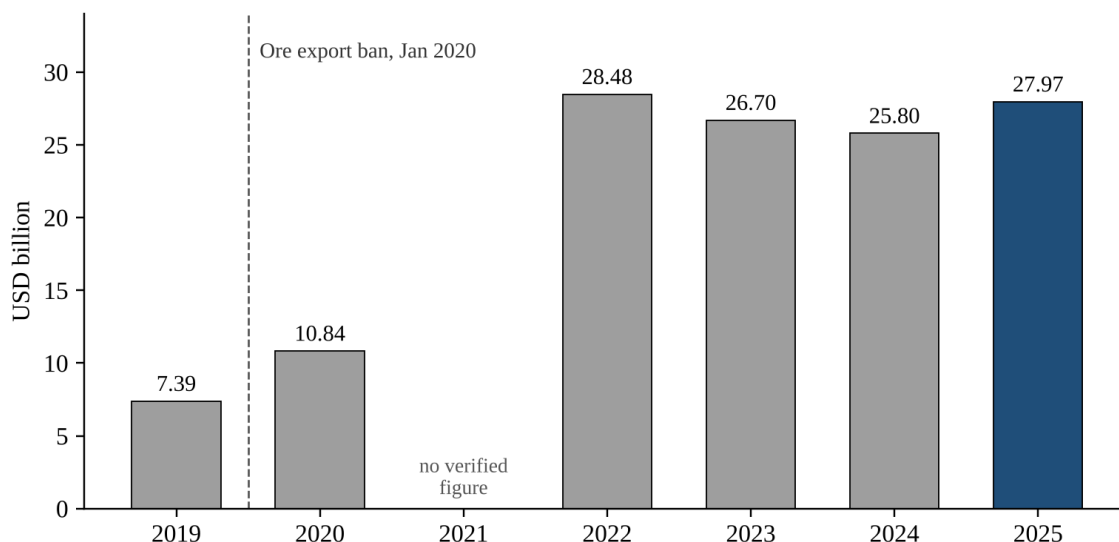
INTRODUCTION

Indonesia has made industrial downstreaming (*hilirisasi*) the centrepiece of its development strategy. Law No. 3 of 2020 on Mineral and Coal Mining requires domestic processing of mineral output, and Minister of Energy and Mineral Resources Regulation No. 11 of 2019 brought the nickel ore export ban forward to 1 January 2020. The logic is simple: instead of shipping raw ore, the country should capture the value added from smelting and refining at home. As the world's largest nickel producer, Indonesia used the ban to require importers, mainly Chinese firms, to build processing capacity inside the country (Warburton, 2024).

The trade results have been striking. Exports of iron and steel products, which are dominated by nickel pig iron and ferronickel, rose from USD 7.39 billion in 2019 to USD 28.48 billion in 2022 and USD 27.97 billion in 2025 (Figure 1). Indonesia moved from the 17th to the 5th largest iron and steel exporter in the world (BCA Sekuritas, 2026). Before the ban, only two

nickel smelters operated in the country; by 2021 at least 29 nickel refineries were running, with dozens more under construction (Guberman et al., 2024).

Figure 1. Indonesia's Iron and Steel (HS 72) Exports, 2019-2025 (USD billion)



Source: BPS via Bisnis.com (2024a, 2024b), CNBC Indonesia (2021), and BCA Sekuritas (2026). No verified figure was found for 2021.

Investment followed the same path. Realised downstreaming investment reached IDR 375.4 trillion in 2023, IDR 407.8 trillion in 2024, and IDR 584.1 trillion in 2025, when it accounted for 30.2% of all investment in Indonesia (Bisnis.com, 2026; Investortrust, 2024a). The regions that host the smelters grew at rates rarely seen in Indonesia: North Maluku grew by 20.49% in 2023 and Central Sulawesi by 11.91%, against 5.05% nationally (Bisnis.com, 2024c). Warburton (2024) notes that growth along the nickel belt has exceeded three times the national average.

Whether this growth reaches workers is far less clear. In Morowali, the hub of the Indonesia Morowali Industrial Park (IMIP), the employment elasticity of output was only 0.115, and difference-in-differences estimates found no significant gain in employment relative to the rest of Central Sulawesi (Muhyiddin et al., 2026). Open unemployment in North Maluku stood at 4.31% in 2023, even as its economy expanded by a fifth (Investortrust, 2024b). The Centre for Research on Energy and Clean Air and CELIOS project that job gains from smelter construction will be outweighed by losses in agriculture and fisheries after the construction phase (CREA & CELIOS, 2024). These concerns echo broader evidence that value added in Indonesian manufacturing has grown faster than labour absorption in most subsectors (Nababan & Purba, 2023).

Existing studies leave three gaps. First, many are qualitative or descriptive policy reviews (Botutihe & Paksi, 2024; Nugroho & Azizah, 2026). Second, quantitative studies tend to focus on a single region, such as North Maluku (Herawan & Susilo, 2024) or Morowali (Muhyiddin

et al., 2026), or on exports and foreign exchange rather than on jobs (Purwana et al., 2026). Third, few studies examine growth and employment together across provinces with data up to 2024 and 2025. This study addresses these gaps by asking three questions: (1) How much faster did the main smelter provinces grow after the 2020 export ban relative to their own pre-policy trend and to the national economy? (2) How far did that growth translate into employment absorption? (3) How labour-intensive is downstreaming investment compared with investment in general? The answers matter for the next phase of downstreaming, which the government plans to extend to bauxite, copper, palm oil, and fisheries.

LITERATURE REVIEW

Industrial Policy and Resource-Based Industrialisation

Industrial policy refers to government action that deliberately shifts the composition of economic activity towards particular sectors. After decades of scepticism, the economics profession has returned to the topic. Juhász et al. (2024) argue that the new empirical literature, which relies on better data and causal methods, finds that well-designed industrial policies can change the structure of an economy, although success depends on state capacity and on disciplining the firms that receive support. Structural change theory gives the underlying rationale: development means moving labour and capital from low-productivity activities, such as subsistence agriculture and raw commodity extraction, to higher-productivity manufacturing (Todaro & Smith, 2020).

Resource-based industrialisation applies this logic to countries rich in minerals. Instead of exporting ore, the country processes it domestically and climbs the value chain from ore to intermediate products, such as nickel pig iron and nickel matte, and eventually to final products, such as stainless steel and battery cells. Export restrictions are a common but controversial instrument. Guberman et al. (2024) show that the Indonesian nickel ban moved exports from raw ore to processed products but also raised trade disputes with the European Union, environmental concerns, and labour conflicts. Warburton (2024) describes the resulting industrial parks as "nationalist enclaves": they satisfy the goal of domestic value added but remain dependent on a narrow network of foreign and politically connected domestic capital.

Growth Poles, Linkages, and Regional Growth

Growth pole theory holds that investment concentrated in a leading industry at a specific location can drive the growth of the surrounding region through demand for inputs, services, and infrastructure (Todaro & Smith, 2020). Whether the pole spreads growth outward depends on the strength of its backward linkages, which are purchases from local suppliers, and forward linkages, which are sales to local users. Input-output analysis of North Maluku shows that the gains from nickel downstreaming are largest when processing extends into electric vehicle

batteries rather than stopping at intermediate products (Herawan & Susilo, 2024). At the national level, downstream processing, export volume, and investment all significantly increased export foreign exchange, although fiscal incentives reduced government revenue and most products remain intermediate goods (Purwana et al., 2026). The rapid arrival of investment and workers has also transformed small towns in Morowali, Weda Bay, and Obi Island into industrial cities faster than local governments can plan and provide services (Nugroho & Azizah, 2026).

Employment Absorption and Employment Elasticity

Employment absorption is the number of workers that an economy or sector takes up as it grows. The standard summary measure is the employment elasticity of output, which is the percentage change in employment associated with a one percent change in output (Mankiw, 2022). An elasticity close to one means that growth is broadly shared through new jobs; an elasticity close to zero means that output rises mainly through capital deepening and higher productivity, a pattern often described as jobless growth. Capital-intensive industries, such as smelting, tend to have low elasticities because each unit of output requires large investments in furnaces, power plants, and equipment but relatively few workers.

Indonesian evidence supports this concern. Nababan and Purba (2023) find that in 21 of 24 manufacturing subsectors, value added grew faster than labour absorption over 2012-2020, a pattern they call regressive. In Gresik, a manufacturing hub, manufacturing contributed 51.25% of GRDP in 2024 but employed only 35.33% of workers (Kurniawan et al., 2026). For the nickel industry specifically, Muhyiddin et al. (2026) estimate an employment elasticity of 0.115 for Morowali in 2015-2024 and find that industrialisation raised the share of formal employment by more than 14 percentage points without a significant increase in total employment relative to a control region.

Previous Studies on Downstreaming

Table 1 summarises the studies on Indonesian nickel downstreaming that are most relevant to this paper. They agree that downstreaming raised exports, investment, and output, but they disagree on how widely the benefits are shared.

Table 1. Selected Previous Studies on Nickel Downstreaming in Indonesia

Study	Focus and location	Method	Main finding
Pandyaswargo et al. (2021)	Electric vehicle and battery industry, national	Policy review and SWOT analysis	The export ban attracts battery investment, but technology and environmental standards remain weak
Botutihe and Paksi (2024)	Nickel investment strategy, national	Qualitative, library research	Downstreaming raised investment, exports, and job creation
Herawan and Susilo (2024)	North Maluku	Input-output analysis with four scenarios	Gains are largest when nickel feeds an electric vehicle battery ecosystem
Warburton (2024)	Nickel industrial parks	Political economy analysis	Parks function as enclaves with unevenly distributed benefits

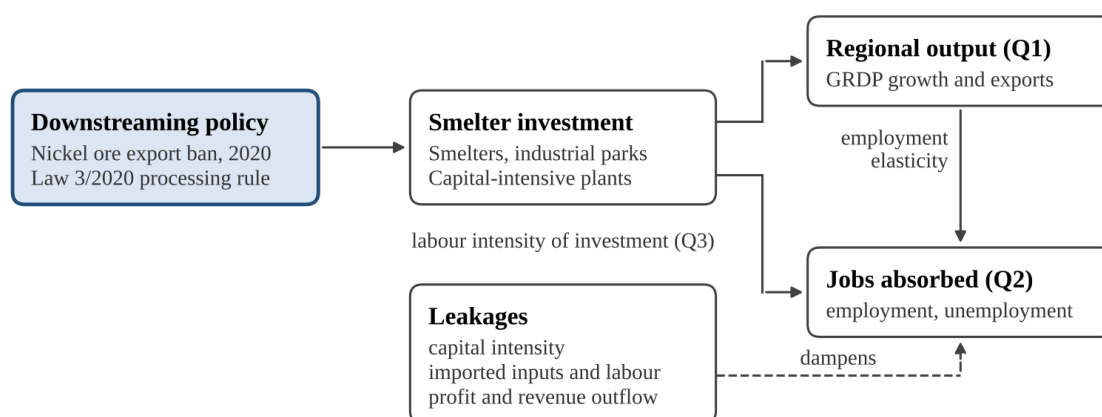
Study	Focus and location	Method	Main finding
Guberman et al. (2024)	Export ban, national	Trade data analysis	Exports shifted to processed products; trade disputes and environmental concerns rose
CREA and CELIOS (2024)	Central Sulawesi, Southeast Sulawesi, North Maluku	Economic and health impact modelling	Job gains occur during construction, then fall as farm and fishery losses grow
Muhyiddin et al. (2026)	Morowali	Panel data, employment elasticity, difference-in-differences	Elasticity of 0.115; formal jobs rose, total jobs did not rise significantly
Nugroho and Azizah (2026)	Morowali, Weda Bay, Obi Island	Qualitative case study	Industrial urbanisation outpaces local planning capacity
Purwana et al. (2026)	National, 2017 to Q1 2024	Mixed methods with regression	Downstreaming increased export foreign exchange; products remain intermediate

Source: Compiled by the authors.

Conceptual Framework

Figure 2 summarises the framework that guides the analysis. The export ban and processing mandate attract smelter investment, which raises regional output directly. How much of that output becomes local employment depends on the employment elasticity and on leakages: the capital intensity of smelting, the use of imported inputs and foreign labour, and the outflow of profits and tax revenue to other regions. The study therefore expects (1) a positive growth differential in smelter provinces after 2020, and (2) an employment elasticity in those provinces that is lower than the national elasticity.

Figure 2. Conceptual Framework of the Study



Source: Developed by the authors from the literature reviewed.

METHOD

Research Design and Scope

This study uses a descriptive-comparative quantitative design based on secondary data. The units of analysis are three provinces and the national economy. North Maluku and Central Sulawesi are the treated provinces because they host the two largest integrated nickel industrial parks, the Indonesia Weda Bay Industrial Park (IWIP) and the Indonesia Morowali Industrial Park (IMIP). Southeast Sulawesi is a comparison province: it is also a major nickel mining region but has a smaller share of integrated processing. The national economy serves as the

benchmark. The pre-policy period is 2018-2019 and the post-policy period is 2020-2024, with the export ban taking effect on 1 January 2020. Investment and export data extend to 2025.

Data and Sources

Table 2 lists the variables, their units, and their sources. All data are official statistics or official figures reported in reputable media when the original release could not be accessed directly.

Table 2. Variables and Data Sources

Variable	Unit	Period	Source
GRDP growth at constant 2010 prices, by province	% per year	2018-2024	BPS, via the Aceh Province open data portal (2018-2022), Bisnis.com (2024c) for 2023, BPS Central Sulawesi (2025) and Databoks (2025) for 2024
National GDP growth	% per year	2018-2024	BPS
Employed persons, open unemployment rate (TPT), formal share	thousand persons, %	August 2019 and August 2024	BPS provincial and national releases (Sakernas)
Iron and steel (HS 72) exports	USD billion	2019-2025	BPS, via Bisnis.com, CNBC Indonesia, and BCA Sekuritas
Downstreaming investment and total investment	IDR trillion	2023-2025	Ministry of Investment and Downstreaming (BKPM), via Investortrust, Antara, and Bisnis.com
Workers absorbed by realised investment	persons	2023-2025	BKPM, via Investortrust and Viva
IMIP workforce	persons	2024-2025	IMIP (2025)

Source: Compiled by the authors.

Analytical Tools

First, cumulative growth over the post-policy period is computed from annual growth rates:

$$G_i = \prod (1 + g_{i,t}) - 1, \quad t = 2020, \dots, 2024$$

where g is the annual GRDP growth rate of region i in year t . The compound annual growth rate (CAGR) is $(1 + G)$ raised to the power $1/5$, minus one.

Second, a growth differential compares each province's change in average growth between the two periods with the change in national growth. It works like a simple difference-in-differences on period averages:

$$GD_i = (\bar{g}_i^{post} - \bar{g}_i^{pre}) - (\bar{g}_N^{post} - \bar{g}_N^{pre})$$

A positive value means that the province accelerated more than the national economy after the ban.

Third, the arc employment elasticity measures how strongly employment responded to output over 2019-2024:

$$\varepsilon_i = \% \Delta E_i / \% \Delta Y_i = [(E_{i,2024} / E_{i,2019}) - 1] / G_i$$

where E is the number of employed persons in August and Y is real GRDP. A log version, $\ln(1 + \% \Delta E)$ divided by $\ln(1 + G)$, is reported as a robustness check. Fourth, investment labour intensity is the number of workers absorbed per IDR 1 trillion of realised investment in year t .

Limitations of the Design

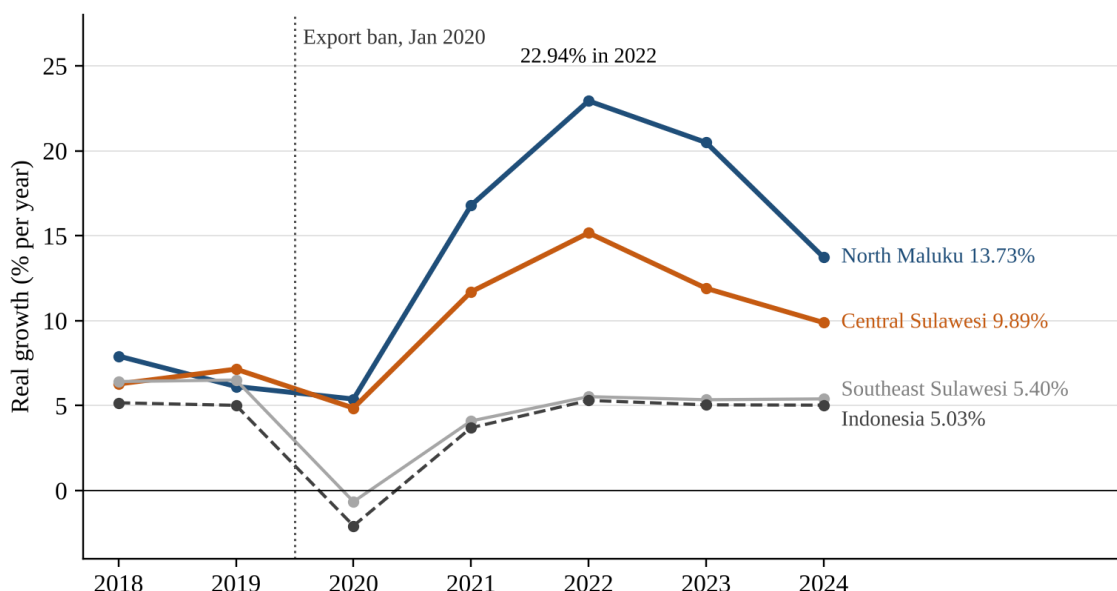
The design is descriptive and does not identify causal effects. The post-policy period begins with the COVID-19 recession of 2020, which affected regions differently, and BPS periodically revises labour force weights, so small differences in unemployment rates should be read with caution. Provincial employment data for Central Sulawesi in August 2024 could not be obtained in full, so its employment elasticity is not calculated; district-level evidence for Morowali from Muhyiddin et al. (2026) is used instead.

RESULTS AND DISCUSSION

Regional Economic Growth

The two smelter provinces accelerated sharply after the export ban, while the comparison province and the national economy slowed (Figure 3). North Maluku's growth peaked at 22.94% in 2022 and stayed above 13% through 2024. Central Sulawesi grew by more than 9.8% every year from 2021 to 2024. Southeast Sulawesi, a mining province with less integrated processing, contracted in 2020 and then grew at roughly the national rate.

Figure 3. Real GRDP Growth of the Study Provinces and Real GDP Growth of Indonesia, 2018-2024



Source: BPS, via the Aceh Province open data portal (2018-2022), Bisnis.com (2024c), BPS Central Sulawesi (2025), and Databoks (2025).

Table 3 quantifies the change. Over 2020-2024, the real GRDP of North Maluku more than doubled (cumulative growth of 107.4%), and that of Central Sulawesi rose by 65.9%, against 18.0% for Indonesia. After netting out the national slowdown, North Maluku gained

10.5 percentage points of annual growth relative to its pre-policy trend and Central Sulawesi gained 5.7 points. Southeast Sulawesi recorded a negative differential of 0.8 points, which suggests that mining alone, without large-scale processing, did not lift growth.

Table 3. Growth Before and After the Export Ban

Region	Average growth 2018-2019 (%)	Average growth 2020-2024 (%)	Cumulative growth 2020-2024 (%)	CAGR 2020-2024 (%)	Growth differential (pp)
North Maluku	7.03	15.87	107.4	15.70	+10.53
Central Sulawesi	6.71	10.71	65.9	10.65	+5.68
Southeast Sulawesi	6.46	3.95	21.2	3.92	-0.83
Indonesia	5.09	3.40	18.0	3.37	0.00

Source: Calculated by the authors from BPS data.

The growth came from manufacturing and exports. In Central Sulawesi, manufacturing was the fastest-growing sector in 2024 at 19.12%, and exports of goods and services were the fastest-growing expenditure component at 18.87% (BPS Central Sulawesi, 2025). In North Maluku, mining and quarrying grew by 49.06% in 2023 (Investortrust, 2024b).

Exports and Investment

The national trade and investment data confirm that downstreaming is concentrated in mineral processing. Iron and steel exports almost quadrupled between 2019 and 2025 (Figure 1). Table 4 shows that nickel smelters alone absorbed IDR 153.2 trillion of investment in 2024, or 37.6% of all downstreaming investment, up from IDR 136.6 trillion in 2023. In 2025, minerals accounted for IDR 373.1 trillion of the IDR 584.1 trillion total, and foreign investors supplied IDR 429.6 trillion, or 73.6% (Bisnis.com, 2026).

Table 4. Realised Downstreaming Investment by Commodity (IDR trillion)

Commodity or sector	2023	2024
Nickel smelters	136.6	153.2
Copper smelters	70.5	68.5
Bauxite smelters	9.7	21.8
Tin smelters	0.0	1.6
Palm oil and oleochemicals	50.8	67.1
Pulp and paper	51.8	64.0
Petrochemicals	46.3	23.1
Electric vehicle batteries	9.7	8.4
Total downstreaming	375.4	407.8

Source: BKPM, via Investortrust (2024a) and Antara (2025). The 2024 items sum to IDR 407.7 trillion because of rounding in the source. No tin investment was reported separately for 2023.

Employment Absorption

Employment grew far more slowly than output. Table 5 compares labour market indicators in August 2019 and August 2024. The number of employed persons in North Maluku rose by 26.6%, from 522.4 thousand to 661.49 thousand, while real GRDP rose by 107.4%. This gives an arc employment elasticity of 0.25 (0.32 in log form), less than one third of the

national elasticity of 0.80 (0.81 in log form). District-level evidence points the same way: the elasticity for Morowali, the IMIP host district, was only 0.115 (Muhyiddin et al., 2026).

Table 5. Labour Market Indicators, August 2019 and August 2024

Indicator	North Maluku 2019	North Maluku 2024	Central Sulawesi 2019	Central Sulawesi 2024	Indonesia 2019	Indonesia 2024
Employed persons (thousand)	522.4	661.49	1,440	n.a.	126,510	144,640
Open unemployment rate (%)	4.97	4.03	3.15	2.94	5.28	4.91
Formal employment share (%)	38.58	35.24	n.a.	n.a.	44.28	42.05
Employment growth 2019-2024 (%)		26.6		n.a.		14.3
Employment elasticity 2019-2024		0.25		0.115 (Morowali)		0.80

Source: BPS North Maluku (2019, 2024), BPS Palu (2019), BPS Central Sulawesi (2024), Cabinet Secretariat (2019), BPS (2024); elasticities calculated by the authors; Morowali elasticity from Muhyiddin et al. (2026). n.a. = not available.

Unemployment fell, but only modestly: by 0.94 percentage points in North Maluku and 0.21 points in Central Sulawesi, compared with 0.37 points nationally. The formal share of employment in North Maluku even declined from 38.58% to 35.24%, and in 2024 the largest increase in jobs came from wholesale and retail trade (10.19 thousand persons), not from industry (BPS North Maluku, 2024). The industrial parks themselves are large employers in absolute terms: IMIP employed 83,272 Indonesian workers in 2024 and 85,423 in May 2025 (IMIP, 2025). Yet relative to the scale of output, the employment response is small.

Investment as a whole has also become only slightly more labour-intensive. Table 6 shows that each IDR 1 trillion of realised investment absorbed about 1,285 workers in 2023, 1,433 in 2024, and 1,404 in 2025, even as the downstreaming share of investment rose to 30.2%.

Table 6. Investment, Downstreaming Share, and Labour Absorption

Year	Total investment (IDR trillion)	Downstreaming investment (IDR trillion)	Downstreaming share (%)	Workers absorbed (persons)	Workers per IDR 1 trillion
2023	1,418.9	375.4	26.5	1,823,543	1,285
2024	1,714.2	407.8	23.8	2,456,130	1,433
2025	1,931.2	584.1	30.2	2,710,532	1,404

Source: BKPM, via Investortrust (2024a, 2024c), Antara (2025), Bisnis.com (2026), and Viva (2026); ratios calculated by the authors.

Discussion

The results support the first expectation of the framework. The export ban turned North Maluku and Central Sulawesi into growth poles whose output expanded three to five times faster than the national economy, a finding consistent with Warburton (2024) and with the input-output gains reported by Herawan and Susilo (2024). The contrast with Southeast

Sulawesi suggests that the growth effect comes from processing, not from mining as such, which is precisely the value-added argument behind downstreaming.

The results also support the second expectation. Employment elasticities of 0.25 for North Maluku and 0.115 for Morowali are far below the national 0.80, confirming that smelter-led growth is capital-intensive. This matches the regressive pattern of labour absorption that Nababan and Purba (2023) document for Indonesian manufacturing and the jobless-growth diagnosis of Muhyiddin et al. (2026). Three leakages explain the gap. First, smelters and their captive power plants need large capital outlays and relatively few workers per unit of output. Second, much of the value created leaves the region: imports of raw materials and auxiliary inputs offset part of the export gain (Investortrust, 2024b), foreign investors supplied 73.6% of downstreaming investment in 2025, and the Morowali area recorded a net money outflow of IDR 2.31 trillion in 2024 (IMIP, 2025). Third, local workers often lack the technical skills that smelters require, so the new formal jobs are filled partly by migrants, while local job growth concentrates in trade and informal services, as the North Maluku data show.

Downstreaming has nevertheless improved the quality of some jobs. In Morowali, industrialisation raised the formal employment share by more than 14 percentage points over 2015-2024 (Muhyiddin et al., 2026), and the 2025 sectoral minimum wage reached IDR 3,957,673 per month (IMIP, 2025). The policy challenge is therefore not whether downstreaming creates growth, but how to convert that growth into broad-based local employment and to manage the environmental and livelihood costs that CREA and CELIOS (2024) warn about.

CONCLUSION

Indonesia's industrial downstreaming policy has delivered strong regional growth but weak employment absorption. After the nickel ore export ban of 2020, North Maluku and Central Sulawesi grew at compound rates of 15.7% and 10.7% per year in 2020-2024, against 3.4% nationally, and gained 10.5 and 5.7 percentage points of annual growth relative to their pre-policy trends. Southeast Sulawesi, where processing is less integrated, did not accelerate, which indicates that the growth dividend comes from processing rather than mining. Nationally, iron and steel exports rose from USD 7.39 billion in 2019 to USD 27.97 billion in 2025, and downstreaming attracted IDR 584.1 trillion of investment in 2025.

Employment, however, responded weakly. North Maluku's employment elasticity of 0.25 and Morowali's 0.115 are far below the national 0.80, unemployment fell by less than one percentage point, and the formal share of employment in North Maluku declined. Downstreaming growth is therefore high but capital-intensive, and a large part of the value it

creates leaks out of the producing regions through imported inputs, foreign ownership, and money outflows. Four policy implications follow:

1. **Build local skills before plants open.** Vocational schools and polytechnics in host districts should be linked to smelter operators through apprenticeship and certification programmes, with targets for the share of local workers in technical positions.
2. **Deepen local linkages.** Industrial parks should be required to source services, food, transport, and maintenance from local small and medium enterprises, so that more of the purchasing power stays in the region.
3. **Return more value to producing regions.** Revenue-sharing and fiscal transfer formulas should reflect the scale of downstream output, and part of the revenue should finance infrastructure, health, and education in host districts.
4. **Move further down the value chain and protect livelihoods.** Incentives should favour stainless steel, battery precursors, and battery cells, which create more skilled jobs than intermediate products, while environmental standards and compensation schemes protect farmers and fishers.

This study has limitations. The design is descriptive and cannot establish causality; the 2020 pandemic shock overlaps with the start of the policy; and provincial labour data for Central Sulawesi in 2024 were incomplete. Future research should use district-level panel data and quasi-experimental methods, such as synthetic control or staggered difference-in-differences, to estimate the causal effect of each new smelter on local employment, wages, and poverty.

REFERENCES

- Aceh Province Open Data Portal. (n.d.). *Laju pertumbuhan PDRB menurut provinsi* [Data set, sourced from BPS]. <https://data.acehprov.go.id/dataset/laju-pertumbuhan-ekonomi-aceh/resource/8ab0f17e-f95e-4bcb-a951-6f2513be40d3>
- Antara. (2025, January 31). *Investasi hilirisasi 2024 capai Rp407,8 triliun, terbanyak smelter nikel*. <https://kalsel.antaranews.com/berita/450194/investasi-hilirisasi-2024-capai-rp4078-triliun-terbanyak-smelter-nikel>
- BCA Sekuritas. (2026, February 4). *RI masuk lima besar negara eksportir besi baja dunia berkat hilirisasi*. <https://bcasekuritas.co.id/en/latest-news/news/ri-masuk-lima-besar-negara-eksportir-besi-baja-dunia-berkat-hilirisasi>
- Bisnis.com. (2024a, January 26). *Konsumsi baja China diramal melemah, bagaimana nasib ekspor RI?* <https://ekonomi.bisnis.com/read/20240126/257/1735760/konsumsi-baja-china-diramal-melemah-bagaimana-nasib-ekspor-ri>
- Bisnis.com. (2024b, July 12). *Siasat Kemendag dongkrak penjualan komoditas baja RI*. <https://ekonomi.bisnis.com/read/20240712/9/1781617/siasat-kemendag-dongkrak-penjualan-komoditas-baja-ri>
- Bisnis.com. (2024c, February 5). *Daftar 10 provinsi dengan pertumbuhan ekonomi tertinggi sepanjang 2023*. <https://ekonomi.bisnis.com/read/20240205/9/1738501/daftar-10-provinsi-dengan-pertumbuhan-ekonomi-tertinggi-sepanjang-2023>

- Bisnis.com. (2026, January 15). *Hilirisasi sumbang 30,2% total investasi, realisasi Rp584,1 triliun*. <https://ekonomi.bisnis.com/read/20260115/9/1944501/hilirisasi-sumbang-302-total-investasi-realisasi-rp5841-triliun>
- Botutihe, A. N., & Paksi, A. K. (2024). The impact of Indonesia's nickel investment strategy on domestic economic growth. *ILTIZAM Journal of Shariah Economics Research*, 8(2), 178-192. <https://doi.org/10.30631/iltizam.v8i2.2769>
- BPS-Statistics Indonesia. (2024, November 5). *Unemployment rate was 4.91 percent and the average monthly wage of employees was 3.27 million rupiahs*. <https://www.bps.go.id/id/pressrelease/2024/11/05/2373/unemployment-rate-was-4-91-percent-and-the-average-monthly-wage-of-employees-was-3-27-million-rupiahs-.html>
- BPS-Statistics Indonesia Central Sulawesi Province. (2024, November 5). *Agustus 2024: Tingkat pengangguran terbuka (TPT) sebesar 2,94 persen, tingkat partisipasi angkatan kerja (TPAK) sebesar 71,10 persen*. <https://sulteng.bps.go.id/en/pressrelease/2024/11/05/1305/>
- BPS-Statistics Indonesia Central Sulawesi Province. (2025, February 5). *Economic growth of Sulawesi Tengah in the fourth quarter 2024*. <https://sulteng.bps.go.id/en/pressrelease/2025/02/05/1338/pertumbuhan-ekonomi-sulawesi-tengah-triwulan-iv-2024.html>
- BPS-Statistics Indonesia North Maluku Province. (2019, November 7). *Agustus 2019: Tingkat pengangguran terbuka (TPT) Maluku Utara sebesar 4,97 persen*. <https://halutkab.bps.go.id/en/pressrelease/2019/11/07/238/>
- BPS-Statistics Indonesia North Maluku Province. (2024, November 5). *The open unemployment rate (TPT) in North Maluku Province is 4.03 percent*. <https://halutkab.bps.go.id/en/pressrelease/2024/11/05/502/>
- BPS-Statistics Indonesia Palu Municipality. (2019, November 5). *Tingkat pengangguran terbuka (TPT) Agustus 2019 sebesar 3,15 persen*. <https://palukota.bps.go.id/en/pressrelease/2019/11/05/708/>
- Cabinet Secretariat of the Republic of Indonesia. (2019, November 5). *Jumlah orang bekerja naik 2,50 juta, Kepala BPS: Dari 100 angkatan kerja terdapat 5 penganggur*. <https://setkab.go.id/?p=174015>
- CNBC Indonesia. (2021, January 15). *10 komoditas RI paling banyak diekspor di 2020, ini daftarnya*. <https://www.cnbcindonesia.com/news/20210115155714-4-216349/10-komoditas-ri-paling-banyak-diekspor-di-2020-ini-daftarnya>
- CREA & CELIOS. (2024, February 20). *Debunking the value-added myth in nickel downstream industry* [Press release]. Centre for Research on Energy and Clean Air. https://energyandcleanair.org/wp/wp-content/uploads/2024/02/Press-release_CREA_Celios_Nickel-downstreaming_02-2024_EN.pdf
- Databoks. (2025). *Top 10 provinces with highest economic growth in 2024: North Maluku takes the lead*. Katadata. <https://databoks.katadata.co.id/en/economics-macro/statistics/67a54feb60d2e/top-10-provinces-with-highest-economic-growth-in-2024-north-maluku-takes-the-lead>
- Guberman, D., Schreiber, S., & Perry, A. (2024). *Export restrictions on minerals and metals: Indonesia's export ban of nickel* (Working Paper ICA-104). U.S. International Trade Commission. https://www.usitc.gov/publications/332/working_papers/ermm_indonesia_export_ban_of_nickel.pdf

- Herawan, J., & Susilo, Y. S. (2024). Impact of nickel downstreaming in North Maluku: Input-output analysis. *Journal of Business and Information Systems*, 6(2), 294-304. <https://doi.org/10.31316/jbis.v6i2.261>
- Indonesia Morowali Industrial Park. (2025, June 2). *Potensi peredaran uang di lingkaran industri IMIP capai Rp338 M sebulan* [Press release]. https://imip.co.id/wp-content/uploads/2025/06/SIARAN-PERS_Potensi-Peredaran-Uang-di-Lingkar-Industri-IMIP-Capai-Rp338-M-Sebulan_02062025.docx.pdf
- Investortrust. (2024a, January 24). *Kontribusi positif hilirisasi, sumbang 26,5% realisasi investasi 2023*. <https://investortrust.id/macro/11780/kontribusi-positif-hilirisasi-sumbang-26-5-realisasi-investasi-2023>
- Investortrust. (2024b, February 12). *Ekonomi Indef: Ekonomi Maluku Utara tumbuh, tapi belum serap pengangguran*. <https://investortrust.id/macro/8002/ekonomi-indef-ekonomi-maluku-utara-tumbuh-tapi-belum-serap-pengangguran>
- Investortrust. (2024c). *Investasi tahun 2023 serap 1.823.543 TKI*. <https://investortrust.id/macro/13479/investasi-tahun-2023-serap-1823543-tki>
- Juhász, R., Lane, N., & Rodrik, D. (2024). The new economics of industrial policy. *Annual Review of Economics*, 16, 213-242.
- Kurniawan, A., Komara, B. D., & Alhemyari, A. H. A. (2026). Manufacturing-led growth and employment transformation: Evidence from Gresik Regency, Indonesia. *Vantage: International Journal of Management Insight*, 1(2), 100-113. <https://journal.umg.ac.id/index.php/ijmi/article/view/12415>
- Mankiw, N. G. (2022). *Macroeconomics* (11th ed.). Worth Publishers.
- Ministry of Energy and Mineral Resources of the Republic of Indonesia. (2019). *Regulation of the Minister of Energy and Mineral Resources No. 11 of 2019 on the second amendment to Regulation No. 25 of 2018 on mineral and coal mining business*.
- Muhyiddin, M., Mendatu, A., Amrizal, M. D. R., & Akbar, M. (2026). Jobless growth or structural transformation? Labor market dynamics in Morowali, Indonesia's nickel-based industrialization hub. *Jurnal Perencanaan Pembangunan: The Indonesian Journal of Development Planning*, 10(1), 29-50. <https://doi.org/10.36574/jpp.v10i1.838>
- Nababan, T. S., & Purba, E. F. (2023). *Labour absorption in manufacturing industry in Indonesia: Anomalous and regressive phenomena* (arXiv:2311.01787). arXiv. <https://arxiv.org/abs/2311.01787>
- Nugroho, H., & Azizah, N. S. (2026). Resource-driven industrial urbanization: Nickel development and the transformation of mining processing towns in Indonesia. *Jurnal Perencanaan Pembangunan: The Indonesian Journal of Development Planning*, 10(1), 5-28. <https://doi.org/10.36574/jpp.v10i1.832>
- Pandyaswargo, A. H., Wibowo, A. D., Maghfiroh, M. F. N., Rezqita, A., & Onoda, H. (2021). The emerging electric vehicle and battery industry in Indonesia: Actions around the nickel ore export ban and a SWOT analysis. *Batteries*, 7(4), 80. <https://doi.org/10.3390/batteries7040080>
- Purwana, A. S., Nurkhamid, M., & Rachman, M. C. (2026). The Indonesian nickel downstream industry: Analysis and economic impacts. *Jurnal Ekonomi dan Studi Pembangunan*, 18(1), 1-25. <https://doi.org/10.17977/um002v18i12026p001>
- Republic of Indonesia. (2020). *Law No. 3 of 2020 on the amendment to Law No. 4 of 2009 on mineral and coal mining*.
- Todaro, M. P., & Smith, S. C. (2020). *Economic development* (13th ed.). Pearson.

- Viva. (2026, January 20). *Investasi 2025 jadi angin segar pasar kerja*.
<https://techno.viva.co.id/platform/24239-investasi-2025-jadi-angin-segar-pasar-kerja>
- Warburton, E. (2024). Nationalist enclaves: Industrialising the critical mineral boom in Indonesia. *The Extractive Industries and Society*, 20, 101564.
<https://doi.org/10.1016/j.exis.2024.101564>