Chapter 5

Massive Infrastructure Development and Its Impact on Indonesia's Economy

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This chapter shows the multiplier effects of the *Proyek Strategis Nasional* implemented during 2016–2022 using an RAS-updated 2016 Input-Output Table reflecting the economy in 2019. It shows that the projects generated a total economic output of Rp1,933.21 trillion, added economic value of Rp891.41 trillion, and created total household income of Rp354.25 trillion. The projects also resulted in total employment of approximately 5.4 million man-years over the same period. Annually, the projects' potential economic value added and job opportunities corresponded to 0.23% of Indonesia's gross domestic product and 0.19% of the national workforce in 2022, respectively. Estimates for regional multiplier effects show that North Sumatra and South Sulawesi provinces had the highest multiplier values. Sectoral analysis then shows that economic and industrial zones, bridges and roads, and electric power had the greatest economic and labour impacts. Due to data availability, the study focusses on the impact of construction activities, although impacts from operations may increase the multiplier effects.

1. Background

Infrastructure development plays a vital role in economic growth both directly and indirectly. Many studies have shown the relationship between infrastructure development and economic growth, including Kessides (1993) and Srinivasu and Rao (2013).

Borrowing the framework in Barro (1990), infrastructure is an enabling resource in the context of economic growth. The availability of infrastructure affects the marginal productivity of capital and complements private capital (Kessides, 1993). Another study by Weil (2009) suggested that a gap in the availability of physical and human capital contributes to differences in economic growth amongst countries.

At the micro level, infrastructure development contributes to economic growth through lowered costs of production and transport to users who have better access to the infrastructure itself. Road infrastructure, for example, reduces prices of a community's inventory storage. It also increases companies' productivity via greater access to the labour market and agglomeration of economic activities (Duranton and Turner, 2012; Wan and Zhang, 2018).

Studies have also demonstrated that infrastructure can benefit a country's economy by increasing private sector productivity. Wan and Zhang (2018) found that infrastructure – such as roads, telecommunications servers, and cables – increased company productivity in China via agglomeration. Li, Wu, and Chen (2017) also posited that road investment in China increased company productivity, where the average annual rate of return during the research period (i.e. 1987–2007) was about 11.4%. Moreover, Holl (2016) concluded that roads significantly positively affected the productivity of manufacturing companies in Spain. In India, Mitra, Sharma, and

Varaoudakis (2016) noted that infrastructure and technology are strongly associated with the productivity and efficiency of the manufacturing industry. Manufacturing of transport equipment, textiles, chemicals, and metal – which are more vulnerable to foreign competition – were found to be more sensitive to infrastructure support.

Indonesia is an infrastructure-deficient economy, but beginning in 2016, infrastructure development has been a focus. In 2016, the Government of Indonesia issued Presidential Regulation No. 3 of 2016 with the objective of accelerating the development of strategic infrastructure projects. These projects, known as the *Proyek Strategis Nasional* (PSN), are expected to have sizeable economic impacts. The regulation defines the PSN as projects implemented by the central government, sub-national governments, or business entities that include a strategy for increasing growth and equitable development to improve welfare and regional development. The availability of infrastructure is expected to support the movement of people, goods, and services to stimulate regional development, narrow the development gap across regions, and increase economic growth in general.

From 2016 to 2022, 153 PSN projects were completed with an investment value of Rp1,040 trillion. Completed projects include those focussed on upstream oil and gas, railways, irrigation, technology, clean water and sanitation, dams, airports, electricity, toll roads, and seaports. There have been several project-specific impact estimates, including those of the West, Central, and East Palapa Ring Package project that serve 440 cities/regencies and construction of 48 dams targeting an increase of 2.67 billion cubic metres of raw water supply, reduction of flooding potential by 10,300.74 cubic metres per second, increase of 10,990 litres per second of raw water supply, irrigation of 283,000 hectares of rice fields, and generation of 143 megawatts of electricity (Coordinating Ministry of Economic Affairs, 2022). However, studies have yet to concentrate on the impact of all PSN projects in total.

This chapter analyses the economic impact of infrastructure projects classified under the PSN from 2016 to 2022. To measure the impact of these investments on the economy at the national level and on regional development, the 2016 Input–Output (IO) Table adjusted to the 2019 economic structure – known as the IO 2019 RAS – is used, and investment value data from 153 PSN projects completed during 2016–2022 are utilised. By updating the IO Table to reflect the 2019 economic structure as the baseline year, the pre-COVID-19 economic landscape is captured. The analysis examines the relationship amongst the PSN investment value, sectoral performance, and regional outcomes to gain insights about the broader implications of the PSN projects.

To quantify the economic impact of the 153 PSN projects on the Indonesian economy, data were collected from various sources including the Komite Percepatan Penyediaan Infrastruktur Prioritas (Committee for Acceleration of Priority Infrastructure Delivery, KPPIP), sectoral ministries, state-owned enterprises, and other governmental agencies responsible for PSN implementation. As several projects span multiple years, focus group discussions with relevant stakeholders were held

to obtain information on the stimulus value, financial disbursement timeframes, and local content of the PSN projects. This collaborative approach allowed more comprehensive data and insights to be gathered on each project.

2. Multiplier Model for Economic Impacts

The economic impact multiplier model employed in this analysis is the IO Table for 2016, updated using the non-survey method for 2019. Leontief introduced the IO model in the late 1930s. According to Miller and Blair (2009), the IO model is an arrangement of numbers in a table that is essentially a system of linear equations where each equation describes the distribution of industrial products through an economy. The framework of the IO analysis is provided in Appendix 5.1.

The IO model was initially used to analyse intersectoral relationships in an economy, allowing users to find output, income, and employment multipliers from analysed sectors to uncover the output impact values of a particular shock/stimulus to the economy. Thus, the IO model can assist in estimating gross domestic products (GDPs), household incomes, and job creation for specific historical periods.

3. The RAS Method

The non-survey or RAS method utilises the technology coefficient adjustment to capture current economic conditions. Stone (1961) developed the RAS method, which estimates a transaction matrix between specific years based on a transaction matrix in the past. Based on the RAS method, this study adjusts the 2016 IO Table of 52 sectors with national Statistics Indonesia publications. The detailed process for applying the RAS methodology is in Appendix 5.1.

Several assumptions are made in the calculation of the economic impact of the PSN projects:

(i) The figures for national local content are derived from reports provided by project implementers, whenever available. If such reports are not available, import share datasets from the 2016 IO Table are used.
(ii) National local content refers to goods and services supplied domestically.
(iii) The distribution of the annual investment value is also based on the reports from project implementers. If these reports are not available, the annual investment values are proportionally distributed based on project duration.

4. Multiplier Analysis of Input–Output 2016 and Input–Output 2019 RAS Results

This section discusses a comparison between the output multiplier values in the original IO 2016 and IO 2019 RAS tables. The multipliers are higher in the IO 2019 RAS Table than in the IO 2016 Table (Table 5.1). An increase in the multiplier number indicates that there was an increase in economic activities due to an increase in added values or output in a sector. The multiplier values for the secondary and tertiary sectors exhibit a faster rate of increase compared to primary sectors. Specifically, the output multiplier values for the basic, upstream, and construction industries demonstrate significantly higher multipliers for 2019.[1]

The higher multiplier values of the IO 2019 RAS Table implies higher impacts of these sectors on economic output whenever there is a stimulus/shock to the economy. A higher multiplier is consistently observed in the base sectors (i.e. basic metal, upstream, and construction), particularly those influenced by the development of the PSN. Notably, the multiplier value of the construction sub-sector experienced a significant increase in 2019 compared to 2016. These findings underscore the positive impacts of PSN investments in the construction phase, which not only benefit the economy but also demonstrate an increasing scale of their impact year after year – emphasising the overall economic benefits derived from such investments.

Table 5.1. Output Multiplier – Input–Output 2016 and Input–Output 2019 RAS

	Sector	National	
		2016	2019
Primary Sectors	Food Crop Agriculture	1.22	1.24
	Annual Horticultural Plant Farming, Annual Horticulture, and Others	1.22	1.24
	Seasonal and Annual Plantation	1.29	1.37
	Farm	1.56	1.61
	Agricultural and Hunting Services	1.33	1.38
	Forestry and Logging	1.19	1.37

[1] Basic metal industries encompass the processing of capital goods, such as machinery and chemicals, which are then used in other industries. Upstream industries involve the production of raw materials and auxiliary materials, such as iron and sheet steel. The construction industry includes the design and construction of buildings and structures.

	Sector	National	
		2016	2019
	Fishery	1.21	1.24
	Oil, Gas, and Geothermal Mining	1.36	1.41
	Coal and Lignite Mining	1.60	1.69
	Metal Ore Mining	1.41	1.65
	Mining and Other Quarrying	1.42	1.62
Secondary Sectors	Coal Industry and Oil and Gas Refining	1.50	1.89
	Food and Beverage Industry	1.90	2.03
	Tobacco Processing Industry	1.34	1.37
	Textile and Apparel Industry	1.72	1.98
	Leather Industry, Leather Goods and Footwear	1.77	1.89
	Wood Industry; Products from Wood and Cork; and Woven Products from Bamboo, Rattan, and the Like	1.80	1.91
	Paper and Paper Products Industry, Printing and Reproduction of Recorded Media	1.87	2.02
	Chemical, Pharmaceutical, and Traditional Medicine Industries	1.72	1.87
	Rubber Industry, Rubber, and Plastic Products	1.94	2.05
	Non-Metal Minerals Industry	1.89	2.04
	Basic Metal Industry	1.84	2.01
	Metal, Computer, Electronic Goods, Optical and Electrical Equipment Industries	1.64	2.03
	Machinery and Equipment Industry (Not Included in Others)	1.64	1.98
	Transport Equipment Industry	1.61	1.76
	Furniture Industry	1.79	1.88
	Other Processing Industry, Machinery and Equipment Repair and Installation Services	1.56	1.97
	Electricity	3.06	3.68
	Gas Procurement and Ice Production	1.48	1.52
	Water Procurement, Waste Management, Waste, and Recycling	1.64	1.77
	Construction	1.82	1.94

	Sector	National	
		2016	2019
Tertiary Sectors	Car Trade, Motorcycles, and Their Repair	1.42	1.50
	Wholesale and Retail, Not Autos and Motorcycles	1.44	1.50
	Rail Transport	1.97	2.16
	Land Transport	1.69	1.82
	Sea Freight	1.92	2.08
	River Lake and Crossing Transport	1.79	1.94
	Air Freight	1.81	1.98
	Warehousing and Transport Support Services, Post and Courier	1.72	1.87
	Provision of Accommodation	1.56	1.63
	Food and Drink Provision	1.84	1.92
	Information and Communications Services	1.59	1.71
	Financial Intermediary Services other than the Central Bank	1.36	1.40
	Insurance and Pension Funds	1.42	1.46
	Other Financial Services	1.49	1.56
	Financial Support Services	1.44	1.51
	Real Estate	1.36	1.40
	Company Services	1.59	1.67
	Government Administration, Defence, and Compulsory Social Security	1.70	1.80
	Education Services	1.52	1.60
	Health Services and Social Activities	1.74	1.87
	Other Services	1.56	1.66

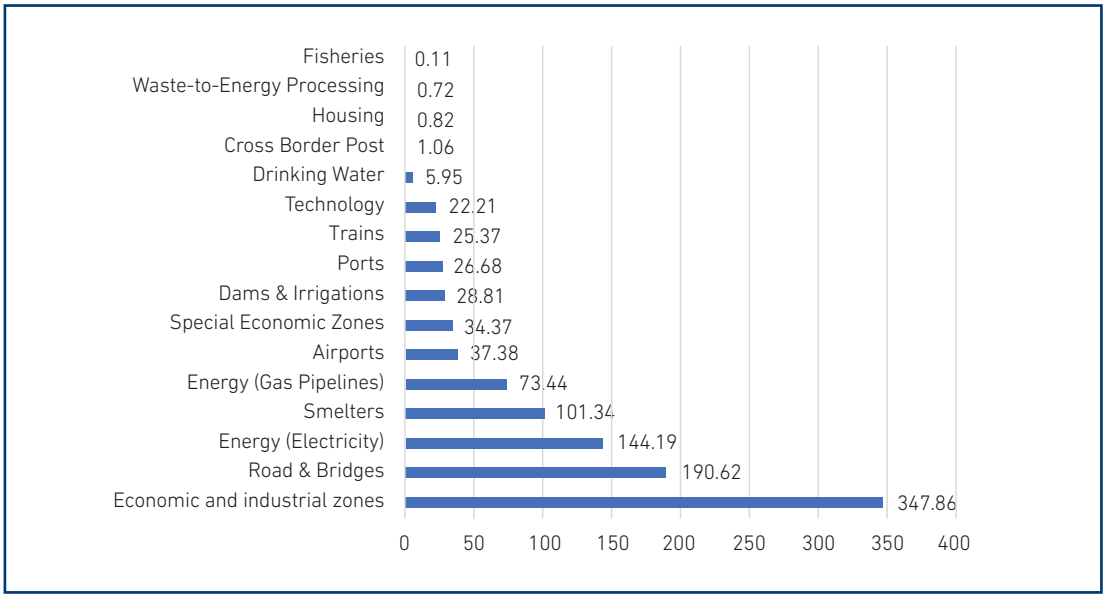
Source: Authors' calculations.

5. Proyek Strategis Nasional

The PSN has several essential elements, including national strategic interests, relevance to the long-term development plans, shared values of sectors and regions, and economic feasibility. Its projects are expected to help realise *Vision of Indonesia 2045*, especially the third pillar of equitable development. In implementing the PSNs, the government revised Presidential Regulation No. 3 of 2016 three times through Presidential Regulations No. 58 of 2017, No. 56 of 2018, and No. 109 of 2020. The latest amendment includes additional projects and changes to the scope of the PSN without any projects being removed. Based on the latest implementing regulation, there are 200 PSN projects and 12 PSN programmes comprising 14 clusters: roads, dams and irrigation, areas, plantations, railways, energy, ports, clean water and sanitation, airports, tourism, housing, education, embankment beaches, and technology (KPPIP, 2022).

As of April 2023, 153 PSN projects were completed in 2022 with an investment value of Rp1,040 trillion. Investment realisation for PSN development was highest in 2022, with an investment value of Rp320 trillion (KPPIP, 2023). Although the COVID-19 pandemic halted progress briefly in 2021, acceleration continued in 2022. Figure 5.1 shows that the special economic and industrial zones cluster had the highest investment value. Meanwhile, roads and bridges, and electricity had the next highest values.

Figure 5.1. PSN Investment Value
(Rp trillion)

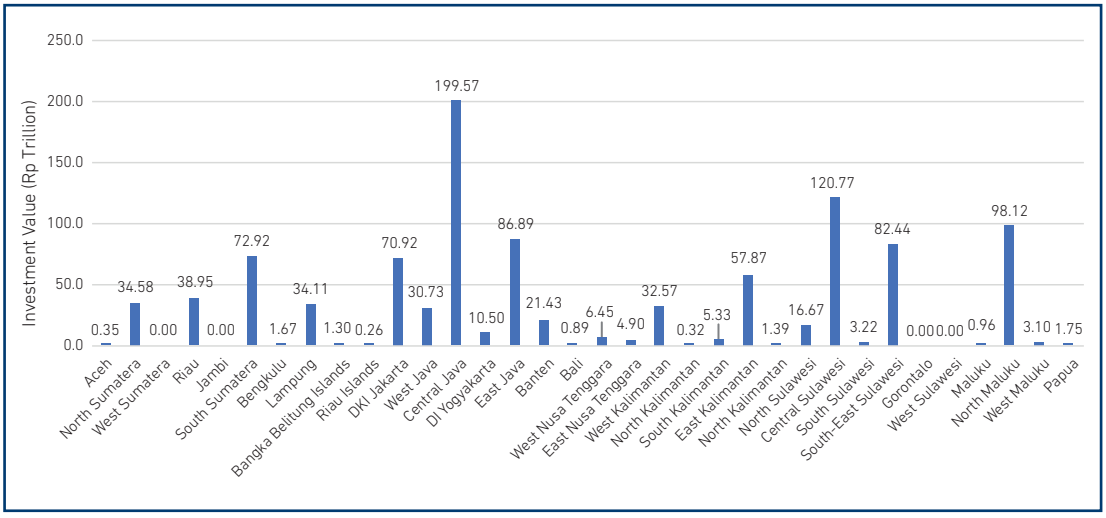


Source: KPPIP (2022) and authors.

PSN construction sites are spread across Indonesia; projects with the highest values are in Java. The top five provinces that receive the highest PSN investments are Central Java (Rp200 trillion), Central Sulawesi (Rp121 trillion), North Maluku (Rp98 trillion), East Java (Rp87 trillion), and South-East Sulawesi (Rp82 trillion).

The development of PSNs in these regions is crucial to foster new centres of economic growth and to reduce economic disparities between different parts of the country. They underscore the importance of investing in areas with robust basic infrastructure and a skilled workforce. These investments have the potential to yield significant returns, benefitting not only the leading sectors but also generating a positive impact on the surrounding areas. This aligns with the concept of a trickle-down effect (Hirschman, 1958).

Figure 5.2. PSN Investment Values by Province
(Rp trillion)



Source: KPPIP (2022) and authors.

Coordinating Minister Decree No. 21 of 2022 described that out of the Rp5,746.4 trillion investment value of the PSNs, 12.8% should be derived from the State Budget, 19.7% from state and regional government-owned enterprises, and the remaining 67.5% from the private sector. When considering the number of projects, 46% of PSN projects rely on the State Budget scheme for funding. The allocation of resources from different funding schemes reflects the goal of collaborative efforts amongst various stakeholders, including private entities, public–private partnerships, and state funding, to support the implementation and development of the PSN projects.

6. Economic Impact

The largest share of PSN investment is spent domestically, so it is treated as an economic stimulus when estimating the economic impact of PSN projects. Based on the amount of imported intermediate inputs used in each PSN project[2] and proportion of imports in the final demand available in the IO 2016 Table of 95.12%, out of the total investment of Rp1,040 trillion, it is estimated that Rp1,011 trillion was used as domestic stimulus.

Specifically, in relation to economic and industrial zones, the following approach is applied to determine the investment value. For special economic zones Sei Mangkei and Bitung, the reported actual investment values are used. For other special economic zones, it is assumed that the realisation of the investment target is approximately 50%, as the projects are not yet finished. For industrial zones, the investment target is assumed to be fully implemented – 100% – implying that the entire planned investment for these industrial zones was accomplished. By adopting these assumptions, the varying degrees of progress in investment realisation across different economic and industrial zones is captured. It is important to consider these distinctions to accurately assess the economic impact and multiplier effects associated with the economic and industrial zone sector.

The IO model analysis reveals that the completed PSN projects have yielded significant investment outcomes. Table 5.2 shows that a total stimulus of Rp1,011 trillion generated an economic output of Rp1,993 trillion, resulting in an impact multiplier value of 1.97. This means that for every unit of stimulus, the economic output nearly doubled. Additionally, the PSN projects created added value of Rp891 trillion and household income of Rp354 trillion. These projects have also contributed to the creation of up to 5.4 million new jobs.[3]

[2] The value is based on the project implementers' reporting of local content for most projects.

[3] To provide a comparative analysis and to ensure the reliability of the estimation results, the latest IO table is used – the IO 2016 Table –to calculate the economic impact. The findings indicate a production value of Rp1,859 trillion, a value added of Rp865 trillion, and a household income of Rp345 trillion. Furthermore, the assessment reveals a substantial employment potential of 5.7 million jobs.

Table 5.2. Total Estimation of the PSN Investment Impact

	Stimulus (Rp billion)	**Output** (Rp billion)	**Added Value** (Rp billion)	**Income** (Rp billion)	**Labour** (number of jobs)	**Impact Multiplier***	**Against National Producer Database 2022**** (%)	**Against National Workforce 2022** (%)
Total	1,011,156	1,993,214	891,406	354,248	5,430,734	1.97	0.23	0.19
Average	50,558	99,661	44,570	17,712	271,537			

* Output value/stimulus.

** Average percentage of value added to national gross domestic product in 2022.

Source: Authors.

The estimation results reinforce the importance of continued investment in infrastructure and implementation of strategic projects such as PSNs. By leveraging multiplier effects and creating a positive economic ripple effect, these projects contribute to Indonesia's economic growth trajectory, improve the welfare of Indonesian people, and pave the way for a more prosperous and inclusive Indonesia.

The impact of the PSN projects at the provincial level are also examined. Table 5.3 illustrates the distribution of PSN investment impact across provinces, showing that Central Java received the highest PSN investment. Meanwhile, based on the magnitude of the impact multiplier, North Sumatra and South Sulawesi have the highest impact multiplier values. PSN projects in these provinces had stronger backwards and forwards links with other sectors and produced more results for a similar amount of investment than in other provinces. The strong infrastructure built as part of these projects – tailored to the specific economic structure of each province – has had a substantial impact on other sectors. The significant investments made to the PSN, combined with the relatively smaller size of the regional economies, contributed to larger economic multiplier values in these two provinces, highlighting the effectiveness of the PSN in driving economic growth and development in these provinces and reinforcing the importance of strategic infrastructure investments in fostering regional economic expansion.

Table 5.3. Estimation of the PSN Investment Impact at the National Level from Each Province

No.	Province	Stimulus (Rp billion)	Output (Rp billion)	Added Value (Rp billion)	Income (Rp billion)	Labour (number of jobs)	Multiplier Impacts
1	Aceh	329,000	638,000	290,000	118,000	1,823	1.94
2	North Sumatra	34,456	73,629	30,790	10,920	155,328	2.14
3	West Sumatra						
4	Riau	37,479	72,605	33,016	13,417	209,302	1.94
5	Jambi						
6	South Sumatra	69,976	135,581	61,648	25,050	389,882	1.94
7	Bengkulu	1,413	2,706	1,250	512,000	7,831	1.92
8	Lampung	37,536	72,604	33,051	13,447	212,899	1.93
9	Bangka Belitung Islands	1,237	2,397	1,090	443,000	6,848	1.94
10	Riau Islands	246,000	478,000	217,000	88,000	1,364	1.94
11	DKI Jakarta	67,439	132,172	57,786	23,112	351,031	1.96
12	West Java	28,765	55,588	25,345	10,318	162,432	1.93
13	Central Java	199,155	385,817	175,460	71,304	1,110,105	1.94
14	DI Yogyakarta	8,270	15,846	7,320	2,998	45,852	1.92
15	East Java	86,139	166,853	75,880	30,840	481,506	1.94
16	Banten	23,614	45,758	20,805	8,453	131,389	1.94
17	Bali	812,000	1,573	715,000	291,000	4,496	1.94
18	West Nusa Tenggara	6,004	11,616	5,295	2,154	33,258	1.93
19	East Nusa Tenggara	4,622	8,922	4,079	1,662	25,605	1.93
20	West Kalimantan	29,684	61,718	26,421	9,764	142,104	2.08
21	North Kalimantan	273,000	522,000	241,000	99,000	1,511	1.92
22	South Kalimantan	4,819	9,297	4,254	1,734	26,700	1.93
23	East Kalimantan	55,646	107,826	49,026	19,920	309,668	1.94
24	North Kalimantan	1,174	2,249	1,039	425,000	6,507	1.92
25	North Sulawesi	17,384	33,641	15,305	6,225	98,520	1.94
26	Central Sulawesi	114,717	232,921	101,760	38,887	579,057	2.03
27	South Sulawesi	3,064	6,592	2,741	962,000	13,482	2.15
28	South-East Sulawesi	78,344	156,237	69,316	27,142	410,480	1.99
29	Gorontalo						
30	West Sulawesi						

No.	Province	Stimulus (Rp billion)	Output (Rp billion)	Added Value (Rp billion)	Income (Rp billion)	Labour (number of jobs)	Multiplier Impacts
31	Maluku	917,000	1,773	807,000	328,000	5,247	1.93
32	North Maluku	93,188	187,045	82,528	32,036	481,819	2.01
33	West Papua	2,949	5,716	2,598	1,055	16,331	1.94
34	Papua	1,508	2,894	1,333	545,000	8,357	1.92
Total		1,011,156	1,993,214	891,406	354,248	5,430,734	1.97

Note: Amongst the 34 provinces, 4 – Gorontalo, Jambi, West Sulawesi, and West Sumatra – are not directly involved in PSN projects.

Source: Authors.

The direct and indirect impacts of the PSN at the provincial level are then evaluated. Table 5.4 shows that although some provinces did not receive PSN investments, they still received positive spill-over effects thanks to the development of PSN projects in neighbouring provinces. These effects can be attributed to the interregional links established between provinces, which facilitate the flow of goods, services, and resources. Indeed, the presence of PSNs in one province can stimulate economic activities and create opportunities for collaboration with its neighbouring provinces, leading to more efficient allocation of resources, increased productivity, and enhanced competitiveness at the regional level. The interplay between provinces through interregional links and regional specialisation contributes to a more balanced and integrated economic landscape, helping reduce regional disparities by promoting economic growth in both PSN-receiving provinces and those indirectly benefiting from the interregional connections.

Table 5.4. Estimation of the Net PSN Investment Impact at the Provincial Level with Spill- Over Effects from Other Provinces

No.	Province	Output (Rp billion)	Added Value (Rp billion)	Income (Rp billion)	Labour (number of jobs)
1	Aceh	1,683	927,000	370,000	11,778
2	North Sumatra	64,911	26,511	9,966	166,285
3	West Sumatra	6,116	3,315	1,480	31,414
4	Riau	69,329	32,880	12,941	167,638
5	Jambi	6,603	3,908	1,342	23,712
6	South Sumatra	122,322	55,103	22,672	332,300
7	Bengkulu	2,709	1,301	535,000	14,319
8	Lampung	65,728	29,893	12,561	213,742
9	Bangka Belitung Islands	3,351	1,711	709,000	14,597

No.	Province	Output (Rp billion)	Added Value (Rp billion)	Income (Rp billion)	Labour (number of jobs)
10	Riau Islands	4,217	1,888	890,000	8,888
11	DKI Jakarta	183,803	84,985	37,484	259,549
12	West Java	106,856	49,971	19,937	300,102
13	Central Java	335,211	145,069	60,306	1,081,156
14	DI Yogyakarta	14,093	6,799	2,577	53,057
15	East Java	195,719	91,673	39,469	584,053
16	Banten	60,482	26,528	9,187	165,353
17	Bali	2,722	1,402	627,000	12,149
18	West Nusa Tenggara	9,981	4,595	2,017	35,769
19	East Nusa Tenggara	6,906	3,141	1,377	28,394
20	West Kalimantan	50,013	19,588	7,711	139,348
21	North Kalimantan	2,537	1,384	504,000	25,154
22	South Kalimantan	9,118	4,201	1,596	32,068
23	East Kalimantan	109,107	50,129	18,475	212,601
24	North Kalimantan	5,849	3,266	1,652	13,258
25	North Sulawesi	37,741	18,907	10,558	109,692
26	Central Sulawesi	178,512	73,737	24,835	443,651
27	South Sulawesi	20,334	10,249	3,229	61,824
28	South-East Sulawesi	138,663	62,658	24,387	392,698
29	Gorontalo	210,000	117,000	54,000	2,679
30	West Sulawesi	507,000	325,000	157,000	5,418
31	Maluku	2,270	1,163	218,000	10,737
32	North Maluku	162,491	67,147	22,413	451,188
33	West Papua	7,964	3,968	1,305	15,577
34	Papua	5,157	2,967	705,000	10,585
Total		**1,993,214**	**891,406**	**354,248**	**5,430,734**

Note: The spill-over effects are estimated using the 2016 Interregional Input–Output Table (IRIO). Each province could be contributing to and receiving from other provinces.

Source: Authors.

Then, whether the economic and employment impacts differed across clusters of PSN projects is evaluated. Table 5.5 shows that the PSN clusters that received the highest investments – economic and industrial zones, bridges and roads, and electricity – had the most substantial economic and employment impact. This indicates the critical role played by these sectors in driving economic growth and creating job opportunities. Investments in these clusters should thus be prioritised to maximise their positive impacts on the overall economy.

Table 5.5. Estimation of PSN Investment Impact by Cluster

Sector	Stimulus (Rp billion)	Output (Rp billion)	Added Value (Rp billion)	Income (Rp billion)	Labour (number of jobs)	Multiplier Impacts
Roads and bridges	209,324	404,922	184,252	74,961	1,192,610	1.93
Airports	31,177	59,737	27,592	11,299	172,847	1.92
Ports	22,784	44,164	20,077	8,156	126,183	1.94
Energy (gas pipelines)	69,858	135,411	61,559	25,006	386,891	1.94
Cross-border post	1,005	1,949	886	360	5,568	1.94
Dams and Irrigation	27,401	53,113	24,146	9,808	151,753	1.94
Energy (electricity)	137,151	265,850	120,858	49,094	759,575	1.94
Trains	24,133	46,778	21,266	8,638	133,652	1.94
Special economic zones	32,693	63,372	28,809	11,703	181,063	1.94
Industrial zones	330,884	641,379	291,576	118,441	1,832,518	1.94
Smelters	96,391	219,957	87,030	27,680	357,210	2.28
Fisheries	101	195	89	36	558	1.94
Technology	21,129	42,586	16,985	6,514	90,842	2.02
Drinking water	5,658	10,955	4,987	2,027	31,336	1.94
Housing	784	1,520	691	281	4,343	1.94
Waste-to-energy processing	683	1,324	602	244	3,782	1.94
Total with economic and industrial zones	1,011,156	1,993,214	891,406	354,248	5,430,734	1.97
Total without economic and industrial zones	647,579	1,288,463	571,020	224,104	3,417,153	1.99

Source: Authors.

When considering the impact multiplier value, the smelter and technology clusters exhibit the highest multiplier values of 2.28 and 2.02, respectively. These clusters stand out as high-skilled projects as they can generate output, value added, and income with more efficient utilisation of the workforce. The higher impact multiplier values in these clusters can be attributed to their reliance on knowledge-intensive processes and advanced technologies. Thus, the sectors receiving the highest investments have played a vital role in driving economic growth and employment generation. Their higher impact multiplier values highlight their efficiency in utilising resources and generating economic and labour impacts. By focussing on these sectors and promoting knowledge-intensive activities, policymakers can further enhance the positive effects of investments and foster sustainable economic development.

7. Conclusions and Policy Implications

Using the IO 2016 Table, which has been updated with the RAS method to incorporate 2019 economic conditions, this analysis reveals that the PSN projects implemented between 2016 and 2023 have had significant economic impacts on Indonesia. The PSN projects contributed to a total economic output of Rp1,993 trillion, generating an economic value added of Rp891 trillion, and creating total household income of Rp354 trillion. Moreover, approximately 5.4 million man-years of employment opportunities were created over the same period. Annually, the economic value added and job opportunities associated with the PSN accounted for 0.23% of Indonesia's GDP and 0.19% of national workforce in 2022. The analysis also highlights that North Sumatra and South Sulawesi provinces have the highest multiplier values, indicating the potential large economic impact of the stimulus. Evaluating the different impacts across PSN projects, economic and industrial zones, bridges and roads, and electricity projects had the greatest economic and labour impacts.

Several conclusion can thus be drawn.

(i) There is an overall increase in the output multiplier values for the sub-sectors in secondary and tertiary sectors, particularly basic metals, upstream, and construction, from 2016 to 2019. This indicates that the influence of the sector on the economy is ultimately larger.

(ii) Economic and employment impacts of the PSN projects were different across provinces and sectors. This indicates that the various nature of project requirements and objectives resulted in different economic and welfare impacts. Interregional linkages amongst provinces also affect outcomes of the PSN projects.

(iii) Broader economic impact should be measured in terms of the impact of construction and operational activities on the economy. The analysis in this chapter focusses only on the former, however, as it is not possible to capture the operational activities of all projects. Thus, the effect of post-construction impacts may be higher, particularly if the operational stage is optimal.
(iv) PSN projects had different economic impacts depending on the sectoral multiplier at the provincial level. Economic and industrial zones may also have a considerable economic impact when their investment potential is realised.

The results suggest some policy implications. First, there is a need for continued support and prioritisation of PSN projects, particularly in sectors such as economic and industrial zones, bridges and roads, and electric power, which demonstrated the highest economic and labour impacts. These sectors should receive adequate funding and resources to maximise their potential for driving economic growth and job creation. Second, the findings emphasise the importance of interregional linkages and sectoral variations in determining economic impacts of the PSN projects. Policymakers should consider these factors when designing and implementing future projects to ensure a balanced distribution of benefits across provinces and sectors. This could involve identifying and promoting sectors with high multiplier effects and leveraging interregional synergies for optimal outcomes.

Furthermore, the analysis underscores the need to expand beyond the construction phase and to focus on optimising the operational aspects of a PSN project. By enhancing post-construction activities and leveraging the full potential of the projects, long-term economic impacts can be maximised, resulting in sustained economic benefits and job creation. Lastly, policymakers should prioritise investment in regions with good basic infrastructure and strong human resources, as these factors contribute to higher multiplier values and greater economic impacts. This highlights the importance of strategic planning and resource allocation to ensure that investments are directed towards areas with the potential for significant economic growth and development.

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Appendix 5.1. Input–Output Table Framework

Table 5A.1. Input–Output Model

Input–Output		Intermediate Demand (Quadrant I)				Final Demand (Quadrant II)	Total Output
		Production Sectors					
		1	2	...	N		
Production Sectors	1	X11	X12	...	X1n	F1	X1
	2	X21	X22	...	X2n	F2	X2
	...	...	...	...	...	...	...
	N	Xn1	Xn2	...	Xnn	Fn	Xn
Gross Added Value (Quadrant III)		V1	V2		Vn		
Total Input		X1	X2	...	Xn		

Source: Statistics Indonesia (2021).

where X_{ij} are inputs originating from sector i that are used to generate sector j output, Vj is the gross added value of sector j, X_j is the total input of sector j, X_i is the total output of sector i, and Fi is the final demand of sector i.

To calculate the sectoral and regional output impact of a certain intervention (i.e. output multiplier), first, the intermediate input coefficient matrix (A) is prepared. From the symbols in Table 4A.1, matrix A is constructed, which is the intermediate input coefficient containing $[a_{ij}]$, which is the proportion of production inputs from sector j originating from the output of sector i (Miller and Blair, 2009) with the formula:

$$A = [a_{ij}], a_{ij} = \frac{x_{ij}}{X_j} \quad (1)$$

The formula for finding the output multiplier matrix from matrix A is:

$$a_{ij}X_j + F_i = X_i$$
$$AX + F = X$$
$$(I - A)X = F$$
$$X = (I - A)^{-1}F$$

where $(I-A)^{-1}$ is Leontief's inverse matrix, nxn. The stimulus vector, $nx1$, contains the final demand vector. The final demand vector includes investment or capital expenditures (CAPEX) and sales.

The formula for finding the total output multiplier per sector backwards and forwards is:

$$M_B = u'(I - A)^{-1} \quad (2)$$
$$M_F = u'(I - \vec{A})^{-1} \quad (3)$$

where M_B is the backwards output-multiplier per sector, 1xn; M_F is the forward output-multiplier per sector, 1xn; $(I - A)^{-1}$ is Leontief's inverse matrix, n×n; $(I - \vec{A})^{-1}$ is Ghosian's inverse matrix, n×n; u' is the unit vector, containing number one, 1xn; A is the intermediate input coefficient matrix; and I is the identity matrix of size nxn.

After obtaining the multiplier matrix, the impact of creating output is measured with:

$$X_B = (I - A)^{-1}F \quad (4)$$
$$X_F = (I - \vec{A})^{-1}F \quad (5)$$
$$\text{GDP} = \widehat{C_g}\,(I - A)^{-1}F \quad (6)$$
$$\text{HHI} = \widehat{C_h}\,(I - A)^{-1}F \quad (7)$$
$$L = \widehat{C_l}\,(I - A)^{-1}\widehat{C_l}^{-1}Li \quad (8)$$

where X_B, X_F are the vectors of sectoral output impact values, nx1; $(I - A)^{-1}$ is Leontief's inverse matrix, nxn; $(I - \vec{A})^{-1}$ is Ghosian's inverse matrix, nxn; F is the stimulus vector, nx1, which can mean CAPEX or export sales or domestic sales; GDP is the gross domestic product (GDP) vector, nx1; $\widehat{C_g}$ is the GDP coefficient matrix, diagonal, nxn; HHI is the household income (HHI) vector, nx1; $\widehat{C_h}$ is the HHI coefficient matrix, diagonal, nxn; L is the labour impact vector, nx1; $\widehat{C_l}$ is the labour coefficient matrix, diagonal, nxn; and L_i is the labour stimulus vector, nx1.

Basic Concept of Economic Indicators in the Input–Output Model

Employment. This indicator illustrates the additional jobs created by economic growth due to increased final demand from consumption, investment, government spending, or exports. This indicator is the most popular measure of economic impact because it is easier to understand than monetary figures. However, the employment addition has two limitations: (i) it does not reflect the quality of workers, and (ii) it only sometimes reflects the 'physical' addition of people entering the labour market.

Aggregate personal income. The aggregate income of a person increases in line with the increasing salary or wages and increasing number of employees. Both factors emerge because of the escalating business or business revenue. This measure is underestimated from the actual impact, considering business profits are paid as personal dividends. Dividends or personal incomes are then spent on final goods and services, reinvestment in buildings, capital goods, and tools. This transaction enables businesses to expand and to improve their productions and services, which generates new resources for production because of the earned salary and profit dividends.

Gross value added. This amount is equivalen t to the GDP or gross regional domestic product and is an extension of the impact measurement on aggregate personal income. This amount describes the sum of (i) workers' wages or salaries, (ii) profits of the companies operating at a project site, (iii) government revenue from taxes and non-taxes, (iv) depreciation expenditure on capital goods, and (v) subsidies from the government as a deduction for value added. In short, gross value added is the sum of the income received by all actors in an economy, embracing businesspersons (entrepreneurs), workers (labourers), factors of production (investors), and the government (regulators). In a global economic environment characterised by interregional or intercountry mobility of labour, capital goods, and capital owners, value added is an economic impact measurement that is overestimated for a given area. Part of the workers' income or profits generated at a project site will not stay in this area, as the workers and owners of capital will send them outside of the area or abroad. Therefore, an increase in added value in an area does not yet reflect an increase in the welfare levels of the population. Nonetheless, value added is a more comprehensive impact indicator and is most frequently used by governments and regional macroeconomic observers.

Business output. The business output differs from value added or gross value added. Business output is the gross business revenue or sales value from the activities producing goods or services. Some gross revenues pay materials, services, and labour costs, while some are for business income or profit. Value added is a certain fraction of business output, so the figure is more minor than business output. The amount of business output is misleading if it measures economic impact or benefits for economic development. Business output needs to differentiate between activities that produce high value added and those generating low value added (i.e. produce relatively small profits and wages or salaries from the same sales scale).

The RAS Method

An existing method used to update the National Input–Output (IO) Table is a mathematical method for finding the diagonal matrices r and s employing output data, intersectoral sales, and sectoral added value in a given year and matrix A for the previous year. After the matrices r and s are found, matrix A for a particular year is then found using the following formula:

$$\mathbf{A_t = rAs}$$

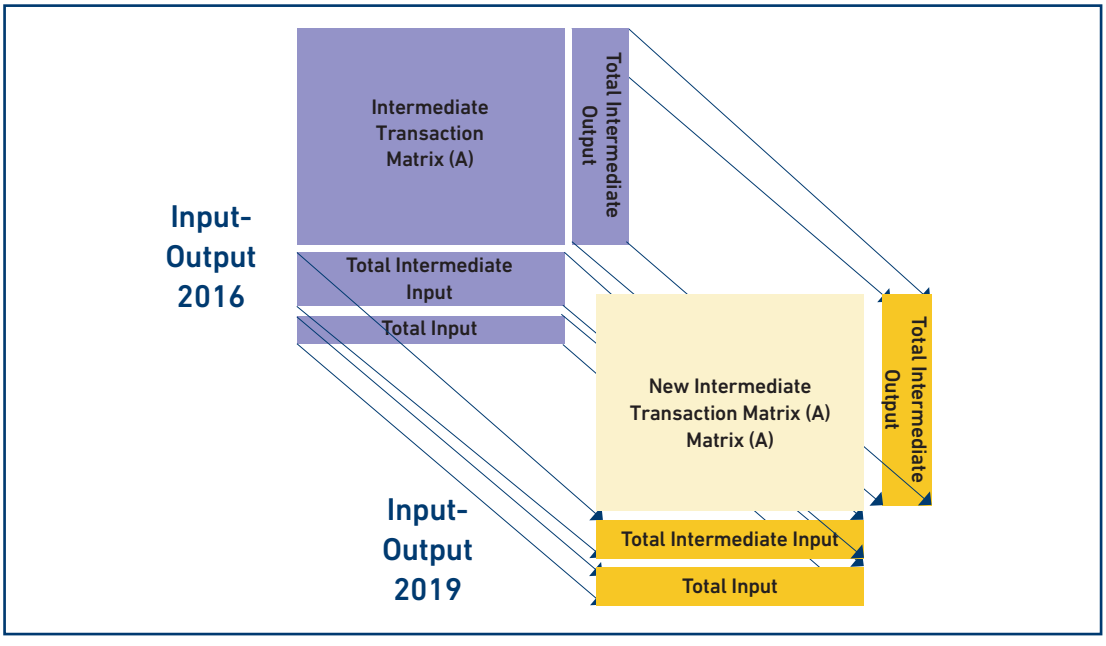
The factor r in the diagonal of the matrix is a substitution factor, which causes a change in the proportion of input use through a substitution effect. Because a different r value is used for each coefficient in a particular column, each coefficient experiences different changes. If r1 = 0.5 and r2 = 2.0 and the value of s is equal to 1.0, then the proportion of input 1 in year t is half the use of the same input in the base year, while input 2 is doubled.

The s factor in the diagonal matrix above shows changes in the proportion of the use of intermediate and primary inputs in the production of specific sectors. If s equals 0.5 for any column, then the number of intermediate inputs becomes half the amount shown in the base year, and thus the number of primary inputs must be changed to keep the sum of the two proportions equal to 1.

The update method using the current survey method to update the National IO Table is too expensive for making IO transaction matrices. Besides, the questions that the business sector must answer are very detailed and challenging, causing the update process to be costly. However, the non-survey or RAS method is often considered too simple to capture regional economic conditions. Nevertheless, this method serves as an alternative to updating the National IO Table.

Figure 4A.1 shows the methods to estimate new intermediate transaction matrix from 2016 to 2019, estimating the 2019 coefficients of the technology matrix from the existing coefficients in the IO 2016 Table. The IO Table is updated using the RAS method by considering last year's sectoral and national data, 2019 data, including GDP, national employment survey (Sakernas), large and medium-sized industries survey, investment and export data, and import data. The RAS method is a sequential adjustment process on the technology matrix A(0) to create the latest technology matrix A(1). The iterative process will pause for a moment to reach the specified convergence criteria.

Figure 5A.1. Basic Principles of the RAS Method



Source: Authors.