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The Effect of Infrastructure Investment on the Indonesian Economy: An Analysis of the 2020 Input-Output Table

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ABSTRACT: The study aims to analyze the impact of infrastructure investment on the Indonesian economy using the 2020 Input-Output (I-O) Table approach. Infrastructure is a strategic sector that plays a crucial role in creating interconnections between economic sectors and generating multiplier effects on output, household income, and job creation. The focus of this study includes three main infrastructure sectors according to the classification of the Ministry of Finance, namely the electricity, gas, and water sector; construction; and transportation, warehousing, and communication. The analysis methods include calculating backward and forward linkage coefficients, dispersion indices, and multiplier analysis on output, income, and employment. The results indicate that the infrastructure sector has strong backward linkages and is identified as a key sector in the national economic structure. Infrastructure investment not only contributes directly to increased production but also drives growth in supporting sectors through improved efficiency and productivity. The 2020 Indonesian Input-Output Analysis shows that infrastructure investment of Rp 2,899 trillion can increase total economic output to Rp 756,09 trillion, with the constructio n, transportation, and electricity and gas supply sectors as the main contributors. However, on the other hand, household income decreased by Rp 110,62 trillion and there was a reduction in the workforce of 8,3 million people.

KEYWORDS: Infrastructure Investment, Input-Output Table, Sector Interdependence, Multiplier Effect, Indonesian Economy

I. INTRODUCTION

Increased investment in infrastructure can have an impact on increasing inputs and outputs in related sectors as well as other sectors (multiplier effect), so the impact created by infrastructure contributions can clearly contribute to national income growth. This is explained (Anisa et al., 2023) regarding the importance of robust infrastructure in boosting economic productivity, as an efficient transportation system enables companies to transport goods at low cost and in a timely manner. Additionally, good infrastructure reduces investment risks, enhances investor confidence, and creates new job opportunities.

Table 1. Realisation of Investment in the Indonesia Economic Sector in 2020

Realisation of Domestic Investment in the Economic Sector (US$ million) in 2020	Project	Investment
15. Motor Vehicle and Other Transportation Equipment Industry	541	2556.5
16. Other Industries	1183	2051
17. Electricity, Gas, and Water	1921	35518.8
18. Construction	6549	68289.3
19. Trade and Repair	38810	16748.4
20. Hotels and Restaurants	5448	10203.1
21. Transportation, Warehousing, and Telecommunications	4115	93282.8
TOTAL	**58567**	**228649.9**

Realisation of Foreign Direct Investment in the Economic Sector (US$ million) in 2020	Project	Investment
15. Motor Vehicle and Other Transportation Equipment Industry	1904	942
16. Other Industries	1381	294.1
17. Electricity, Gas, and Water	846	4613.9
18. Construction	856	189.5
19. Trade and Repair	12682	434.1
20. Hotels and Restaurants	5900	441.1
21. Transportation, Warehousing, and Telecommunications	1588	3580.4
TOTAL	**25157**	**10495.1**

Source: BPS (Badan Pusat Statistik), 2024

The realisation of PMDN in three economic infrastructure sectors has the highest investment value compared to other sectors, such as other industrial sectors, which have an investment value of US$2,051. Similar to PMDN, the realisation of investment in the infrastructure sector from PMA also has the highest value in sectors 17 and 21. However, in contrast sector 18 namely Construction, is the lowest compared to other sectors, with an investment value of only US$189.5.

The Effect of Infrastructure Investment on the Indonesian Economy: An Analysis of the 2020 Input-Output Table

The decline in the realisation of Foreign Direct Investment (FDI) in 2020 can be analysed through a combination of interrelated structural and situational factors. The main factor behind this phenomenon is the global impact of the COVID -19 pandemic, which has been the primary determining factor. According to (Suparta et al., 2025), the COVID-19 pandemic has had a significant negative impact on Indonesia's economic growth and reduced aggregate FDI inflows. Foreign investors have tended to hold back on expansion due to policy uncertainty and operational constraints during the global crisis. Conversely, domestic investors or Domestic Investment (PMDN) have relatively greater incentives and ease in allocating their investments as they do not face cross-border barriers.

Brenneman and Kerf (2002) in their study on 'Infrastructure and Poverty Linkages: A Literature Review' found that infrastructure in the fields of transportation, telecommunications, and energy has a very strong impact on growth. Meanwhile, the development of water and sanitation infrastructure has not had a significant impact.

Therefore, this study will focus on how the injection of funds through investment in physical economic infrastructure in the fields of transportation, communication, electricity, and other energy sectors affects economic growth. It will also examine whether water and sanitation infrastructure indeed have a limited effect on economic growth when applied in Indonesia using the 2020 Input-Output Table.

This study uses the 2020 Indonesian Input-Output Table to evaluate the overall impact of infrastructure investment through calculations of output formation, household income, and labour absorption. The existing research gap shows a lack of in -depth studies on the interaction between sectors due to infrastructure investment in Indonesia. With this approach, the study seeks to fill this gap to provide a more comprehensive analysis.

II. LITERATURE REVIEW

A. Investment

In the context of the Indonesian economy, investment or physical capital accumulation plays a significant role as a driver of economic growth. This can be seen from the direct relationship between economic growth and growth in capital stock accumulation (Maryaningsih, 2014).

Investment in infrastructure, as one form of investment, plays an important role in supporting economic activity and improving the quality of life of the community. Adequate infrastructure, such as roads, electricity, telecommunications, and clean water, can reduce transaction costs, increase efficiency, and attract further investment (Widayati, 2008).

According to Maryaningsih (2014), increased investment can drive an increase in output per worker under steady-state conditions, which in turn can increase per capita income. Additionally, investment plays a role in reducing disparities between regions. Regions with higher investment ratios tend to have higher per capita income, even if they have the same initial capital. However, Indonesia's infrastructure support is still considered weak, and improving the quality of this infrastructure can have a significant impact on sustainable economic growth.

According to Djulius (2017), in the context of globalisation, foreign direct investment (FDI) also plays an important role in economic growth. FDI can increase the productivity of domestic companies through technology transfer and efficiency improvements.

B. Infrastructure, Development, and Economic Growth

In the book Infrastructure: The Social Value of Shared Resources, Frischmann discusses the challenges faced on the demand side of infrastructure. Frischmann states three economic criteria for infrastructure resources, namely (i) they have no competition in consumption until there is sufficient demand, (ii) they encourage social demand, and (iii) they offer services and goods.

Based on these criteria, he classifies infrastructure into several types, such as commercial, public, social, and mixed infrastructure. He then discusses the concept of demand from the management commons based on two approaches: private strategy and public strategy. The private strategy approach tends to save on information and transaction costs and helps in developing cooperation with competitors, thereby maximising the value of infrastructure choices.

On the other hand, the public strategy approach enhances social welfare by serving two public functions: (i) alleviating political and market pressures, and (ii) empowering users to decide on the opportunities provided by infrastructure. Therefore, when users follow this public strategy, they can maintain the fundamental nature of infrastructure and avoid significant social opportunity costs. This can reduce the complexity of infrastructure use and generate greater social value in the future.

C. Input-Output Analysis

According to Miller and Blair (2009), the formulation of Input-Output analysis begins with the basis of economic transactions that the output of an activity or sector (Xi) can be used to meet intermediate input requirements (zi) for several other related activities or sectors, and the remainder can be used to meet final demand. The economic transaction relationship described can

be written as follows:

$X_i = Z_{i1}+Z_{i2}+\cdots+Z_{in}+Y_i, \quad i=1,2,\ldots,n$

The components zi on the right-hand side of the above equation are generally referred to as total sales to various related sectors (interindustry sales), while Yi represents total sales that meet final demand. Thus, the equation illustrates how the output of sector i is distributed. Since there are typically many sectors (n) in an economy, this distribution of production output covers all sectors. When applied appropriately, the input-output model can be a very useful tool for estimating the impact of changes in economic activity, such as changes in demand on a country's Gross Domestic Product (GDP) (Maidalena, 2023).

III. METHODOLOGY

This study uses a quantitative approach with the 2020 Indonesia Input-Output (I-O) Table analysis method to measure the impact of infrastructure investment on the Indonesian economy. Based on the theory of inter-sectoral linkages, this method analyses backward and forward linkages based on the method developed by Hirschmann from Leontif's ideas, and estimates the multiplier effect on output, income, and labour.

The data used includes the 2020 I-O Table, Foreign Direct Investment (FDI) and Domestic Direct Investment (DDI) data, 2020 SAKERNAS data from the Central Statistics Agency, and macroeconomic indicators from Bank Indonesia. The analysis was conducted using Microsoft Excel software to address the research questions.

Input-Output Analysis

In equation form, the Input-Output Table is presented as follows:

$$x_{11} + x_{12} + \cdots + x_{1n} + F_1 = X_1$$
$$x_{21} + x_{22} + \cdots + x_{2n} + F_2 = X_2$$
$$\vdots$$
$$x_{n1} + x_{n2} + \cdots + x_{nn} + F_n = X_n \quad \ldots\ldots\ldots\ldots\ldots (1)$$

In general, equation (1) above can be reformulated as:

$$\sum_{j=1}^{i} x_{ij} + F_i = X_i \text{ for } i = 1,2,3,\ldots,n$$

xij is the amount of output from sector i used as input by sector j, Fi is the final demand for sector i, and Xi is the total output of sector i. If the technical coefficient matrix is known:

$$a_{ij} = \frac{x_{ij}}{x_j} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

then if equation (2) is distributed to equation (1), the following equations are obtained:

$$a_{11}X_1 + a_{12}X_2 + \cdots + a_{1n}X_n + F_1 = X_1$$
$$a_{21}X_1 + a_{22}X_2 + \cdots + a_{2n}X_n + F_2 = X_2$$
$$\vdots$$
$$a_{n1}X_1 + a_{n2}X_2 + \cdots + a_{nn}X_n + F_n = X_n \quad \ldots\ldots\ldots\ldots\ldots (3)$$

In matrix form, equation (3) can be written as follows:

$$\begin{bmatrix} a_{11} & a_{12} & \cdots & a_{1n} \\ a_{21} & a_{22} & \cdots & a_{2n} \\ \vdots & \vdots & & \vdots \\ a_{n1} & a_{n2} & \cdots & a_{nn} \end{bmatrix} \begin{bmatrix} X_1 \\ X_2 \\ \vdots \\ X_n \end{bmatrix} + \begin{bmatrix} F_1 \\ F_2 \\ \vdots \\ F_n \end{bmatrix} = \begin{bmatrix} X_1 \\ X_2 \\ \vdots \\ X_n \end{bmatrix}$$

If written in equation form, it becomes:

$$AX + F = X \text{ or } (I - A)X = F \text{ or}$$

$$X = (I - A)^{-1} F \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (4)$$

Where:

I	= Identity Matrix
F	= Final Demand
X	= Total Output
(A – I)	= Leontief Matrix
$(A - I)^1$	= Leontief Inverse Matrix

Analysis of Correlation Coefficients and the Impact of Dispersion

The concept of interdependence includes forward linkages, where the output of one sector (sector i) is used as input for another sector (sector j), as well as backward linkages, which indicate that the input of one sector (sector i) comes from the output of another sector (sector j).

The diffusion analysis proposed by Rasmussen (1956) aims to identify sectors that have the potential to drive growth in both upstream and downstream sectors, either through transaction mechanisms in the output market or the input market.

Table 2. Analysis of Correlation Coefficients and the Impact of Dispersion

Analysis of Correlation Coefficients		Analysis the Impact of Dispersion	
of Backward Linkage (Total)	of Forward Linkage (Total)	Power of Dispersion (Pd)	Degree of Sensitivity (dS)
$BL_j = \sum_{i=n}^{n} aij$	$FL_j = \sum_{j=n}^{n} aij$	$Pd_j = \frac{n\sum_{i=1}^{n} \alpha_{ij}}{\sum_{i=1}^{n}\sum_{j=1}^{n} \alpha_{ij}}$	$Sd_j = \frac{n\sum_{j=1}^{n} \alpha_{ij}}{\sum_{i=1}^{n}\sum_{j=1}^{n} \alpha_{ij}}$

Source: Sahara et al. (2007) Description:

BLj	= Backward Linkage Indeks (Total) for Sector j
FLj	= Forward Linkage Index (Total) for Sector j
Pdj	= Power of Dispersion for Sector j
Sdj	= Degree of Sensitivty for Sector j
aij	= Open Leontief Inverse Matrix Element
n	= Total Sector

Analysis of Key/Priority Sector Determination

Once the Pd and dS indices have been determined, the next step is to assess and determine which sectors fall within the criteria for priority sectors among the 17 sectors in Indonesia. The determination can be seen in the table below.

Table 3. Criteria for Determining Rankings in Key Sectors

Power of Dispersion	**Degree of Sensitivity**	**Priority Ranking**
High (>1)	High (>1)	I
High (>1)	Low (<1)	II
Low (<1)	High (>1)	III
Low (<1)	Low (<1)	IV

Source: Widodo (2006)

Multiplier Effect Analysis

The multiplier analysis illustrates that an increase in the activity of a sector will increase the activity of that sector or other sectors by its multiplier. There are three types of multiplier calculations using Type I and II multipliers, namely Output, Income, and Labour, as follows:

$$Type\ I = \frac{Initial\ Effect\ +\ First\ Round\ Effect\ +\ Industry\ Support\ Effect}{Initial\ Effect}$$

$$Tipe\ II = \frac{Initial\ Effect\ +\ First\ Round\ Effect\ +\ Industry\ Support\ Effect + The\ Inducted\ Consumption\ Effect}{Initial\ Effect}$$

Table 4. Multiplier Equations for Output, Income, and Employment

Score	Multiplier		
	Output	**Income**	**Labour**
Initial Effects	aij	hi	ei
First Round Effects	∑i aij	∑i aij hi	∑i aij ei
Industrial Support Effects	∑i αij-1-∑i aij	∑i αij hi-hi-∑i aij hi	∑i αij ei - ei -∑i aij ei
Consumption Induction Effects	∑i α*ij -∑i αij	∑i α*ij hi -∑i αij hi	∑i α*ij ei -∑i αij ei
Total Effects	∑i α*ij	∑i α*ij hi	∑i α*ij ei
Follow-up Effects	∑i α*ij - 1	∑i α*ij hi - hi	∑i α*ij ei - ei

Source: Bappeda (2004), cited in East Java Economic Journal Vol.2 No.1 (2018) Explanation:

aij = Output Coefficient

hi = Household Income Coefficient

ei = Labour Coefficient

αij = Leontief Inverse Matrix of the Open Model

α*ij = Leontief Inverse Matrix of the Closed Model

Investment Impact Analysis

Investment impact analysis aims to analyse the output, income and labour that occur in the sector as a result of infrastructure investment growth (Miller and Blair, 1985: pp. 243-257):

Impact on Output Formation

$$\Delta X = (I - A^d)^{-1}\,\Delta Y$$

Impact on Household Income

$$\Delta I = a_{n+1}(I - A^d)^{-1}\,\Delta Y$$

Impact on Employment

$$\Delta L = W_{n+1}(I - A^d)^{-1}\,\Delta Y$$

where:

ΔX = Impact on output formation

ΔI = Impact on household income

ΔL = Impact on labour absorption

ΔY = Sectoral investment

$(I-A^d)^{-1}$ = Closed Leontief inverse matrix

α_{n+1} = Income coefficient

W_{n+1} = Labour coefficient

IV. RESULT AND DISCUSSION

This study uses a quantitative approach with the Indonesian Input-Output (I-O) Table analysis method for 2020 to measure the impact of infrastructure investment (shock) amounting to Rp 2,899 trillion on the economy. Based on Leontief and Hirschman's theory of inter-sectoral linkages, the analysis focuses on backward and forward linkages as well as estimating the multiplier effects on output, income, and employment.

A. Structure of Input Demand and Output Supply Infrastructure

This table shows the structure of inter-sectoral dependencies, which forms the basis for analysing sectoral linkages and calculating the impact of changes in final demand on overall output formation.

Table 4. Highest Input-Output Value in the Infrastructure Sector for the Indonesian Economy in 2020 (Millions of Rupiah)

Infrastructure Sector	Request for Input	Request for Output
Electricity and Gas Supply	Electricity and Gas Supply	Electricity and Gas Supply
	338,566,608 (58.69%)	338,566,608 (59.16%)
Supply, Waste Management, Waste and Recycling	Processing Industry	Processing Industry
	727,835,7 (33.86%)	335,795,4 (18.20%)
Construction	Processing Industry	Construction
	574,510,571	542,156,29
	(33.41%)	(21.18%)
Transportation and Warehousing	Processing Industry	Construction
	293,302,535 (41.36%)	186,388,666 (23.44%)
Information and Communication	Information and Communication	Information and Communication
	155,180,064 (40.47%)	155,180,065 (25.00%)

Source: Indonesia's 17 Sector Input-Output Table (2020), 2025 (processed)

From the input demand side, it can be seen that most infrastructure sectors are highly dependent on the manufacturing sector as their main input provider. For example, the construction sector absorbs inputs from the manufacturing industry amounting to Rp 574,510,571 million or 33.41% of its total input requirements. This indicates that construction requires a large supply of industrial products such as cement, steel, metals, and other materials for construction activities.

Furthermore, the electricity and gas supply sector, as well as the information and communication sector, exhibit strong internal interdependencies, as evidenced by input demand percentages of 58.69% and 40.47% respectively from their respective sectors. This phenomenon indicates a process of internalisation or high dependence on internal resources and infrastructure within the operational activities of these sectors.

Meanwhile, the construction sector is the primary recipient of outputs from the other two infrastructure sectors, namely water supply, waste management, recycling, and transportation and warehousing, at 18.20% and 23.44%, respectively. This underscores that construction activities not only require physical goods but also utility and logistics services as supporting components.

B. Analysis of Forward and Backward Linkage Total Coefficients

The overall forward and backward linkage indices for 17 sectors provide an overview of the impact of changes in the output of a sector on its own inputs and on other economic sectors that serve as downstream industries for those sectors.

Table 5. Backward Linkage Value Total and Forward Linkage Total Indonesian Sectors in 2020 Classification of 17 Sectors

Sector	Backward Linkage Indeks Total		Forward Linkage Indeks Total	
	Score	Ranking	Score	Ranking
Agriculture, Forestry, and Fisheries	1.29	17	2.02	5
Mining and Quarrying	1.51	12	2.28	3

Manufacturing	1.78	6	1.66	9
Electricity and Gas Supply	2.67	1	2.70	1
Water Supply, Waste Management, Waste Disposal, and Recycling	1.54	11	1.40	11
Construction	1.82	4	1.11	15
Wholesale and Retail Trade; Repair of Motor Vehicles and Motorcycles	1.43	14	1.69	8
Transportation and Warehousing	1.79	5	1.82	7
Accommodation and Food Services	1.84	3	1.20	13
Information and Communication	1.58	10	1.99	6
Financial and Insurance Services	1.33	16	2.14	4
Real Estate	1.38	15	1.43	10
Business Services	1.65	9	2.37	2
Public Administration, Defence and Compulsory Social Security	1.78	7	1.12	14
Education Services	1.45	13	1.09	16
Health and Social Services	1.93	2	1.07	17
Other Services	1.70	8	1.27	12
Average	**1.67**		**1.67**	

Source: Indonesia's 17 Sector Input-Output Table (2020), 2025 (processed)

To assess the strength of the relationship between one sector and another, tests are conducted on the total backward and forward linkage coefficients using the sector linkage coefficient values. In this study, the interdependence of a sector can be said to be high or low and can be compared and used as a reference with the average interdependence value of all existing sectors. In this analysis, the average interdependence coefficient value is 1.67 for backward and forward interdependence.

The Infrastructure sector with the highest total backward and forward interdependence values is the Electricity and Gas Supply sector, which is part of the Infrastructure sector. With a backward coefficient of 2.67, the Electricity and Gas Supply sector illustrates that if there is an increase in final demand of Rp 1 million for the related sector, then the direct and indirect interdependence requires inputs from other sectors (Agriculture; Mining; Manufacturing; Construction; Trade, Hotels & Restaurants; Transportation & Communication; Finance, Rentals & Business Services; Other Services) and the sector itself by Rp 2.67 million. Then, with a forward coefficient of 2.70, it indicates that if there is an increase in final demand of Rp 1 million, the output of the related sector will also increase the output of other sectors by Rp 2.70 million, which is allocated directly and indirectly to other sectors (Manufacturing; Transportation and Warehousing; Information & Communication; Business Services/Real Estate) and the sector itself.

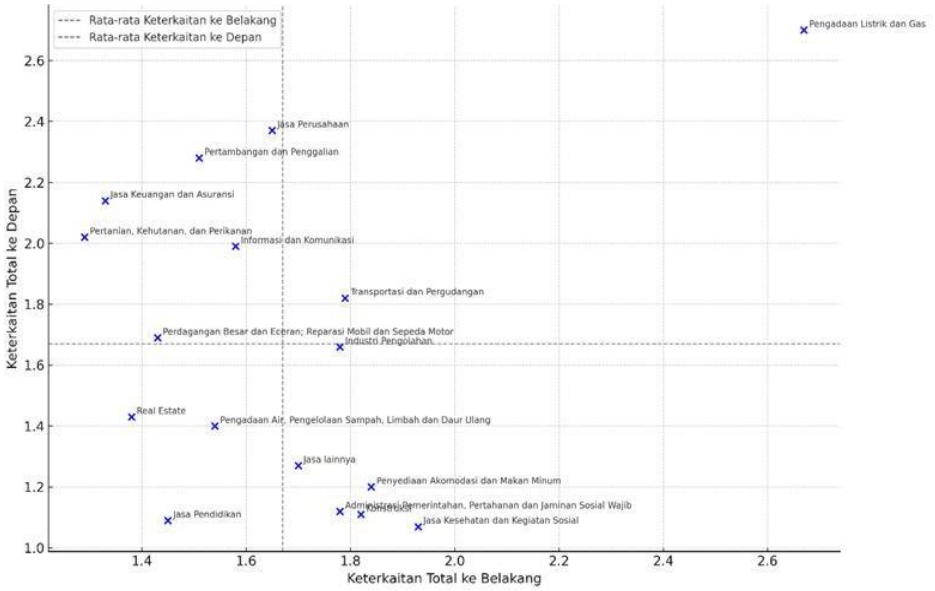

Figure 1. Scatter Plot of Backward dan Forward Linkage Total of Indonesian Sectors in 2020

This phenomenon reflects that not all infrastructure sectors have a strong driving force on economic activity in general, especially in times of crisis. The Construction sector is affected by delays in physical projects due to restrictions on various activities, thereby reducing input demand from other sectors. Meanwhile, the Water Supply and Waste Management sector, which provides basic public services with inelastic demand, has relatively low interconnectivity with other sectors.

C. Analysis the Impact of Dispersion

Through Impact Spread Analysis, it is possible to determine how much influence a sector has on the input market mechanism or its position with the upstream sector. Then, through the Degree of Sensitivity, it is possible to explain the relationship between the sector in the output market mechanism and the downstream sector. Based on these two analyses, it is possible to determine the Key Sectors or Main Sectors of the Indonesian Economy.

Table 6. Diffusion Index, Degree of Sensitivity, and Determination of Key Sectors of the Indonesian Economy in 2020 Classification of 17 Sectors

Sector	**er of Dispersion Index (Pd)**	**ree of Sensitivty Indeks (dS)**	**Priority Ranking**
Agriculture, Forestry, and Fisheries	0.77299096	1.144790726	III
Mining and Quarrying	0.901533813	1.265919487	III
Manufacturing	1.064904205	2.28606253	I
Electricity and Gas Supply	1.592941082	1.385772685	I
Water Supply, Waste Management, Waste Disposal, and Recycling	0.921312118	0.628767657	IV
Construction	1.08547336	0.772607127	II
Wholesale and Retail Trade; Repair of Motor Vehicles and Motorcycles	0.856022754	1.208958399	III
Transportation and Warehousing	1.069954417	1.03501483	I
Accommodation and Food Services	1.096472771	0.734465861	II
Information and Communication	0.94588152	1.114677124	III
Financial and Insurance Services	0.792135635	0.996937669	IV

Real Estate	0.821403067	0.76506324	IV
Business Services	0.982661951	1.104216236	III
Public Administration, Defence and Compulsory Social Security	1.063369067	0.642098125	II
Education Services	0.864815841	0.632932168	IV
Health and Social Services	1.155567456	0.619860071	II
Other Services	1.012559984	0.661856064	II

Source: Indonesia's 17 Sector Input-Output Table (2020), 2025 (processed)

Two infrastructure sectors, namely Electricity and Gas Supply; Transportation and Warehousing, have high Diffusion Power and Sensitivity Degree coefficients, or greater than 1. If the values of these two indices are greater than one, it reflects that the sector has the ability to increase the productivity of both its upstream and downstream sectors simultaneously. Therefore, the Electricity and Gas Supply; Transportation and Warehousing sectors are priority sectors or key sectors based on the criteria for determining key sectors. In addition to these two infrastructure sectors, the Manufacturing Industry is also one of the key sectors in Indonesia's economy in 2020.

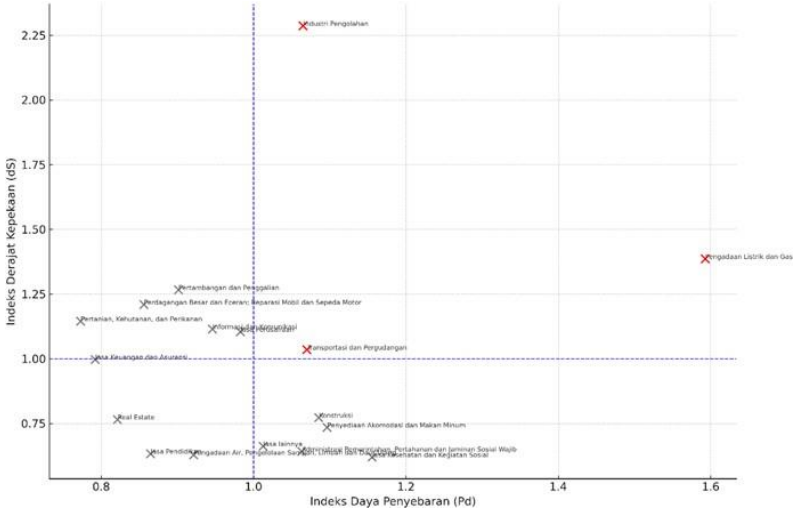

Figure 2. Quadrant Plot of Backward dan Forward Linkage Total of Indonesian Sectors in 2020

The mapping results show that the manufacturing, electricity and gas supply, and transportation and warehousing sectors occupy the upper right quadrant. These three sectors demonstrate above-average national performance in terms of diffusion power and sensitivity, making them key sectors in the economy. The manufacturing industry has the highest sensitivity index, indicating its role as a hub of interconnection in the production chain. According to research by (Nugroho , 2022), 'the sector that is included as a lever sector is the manufacturing sector (sector 3)... analysis of Forward linkages and Backward Linkage Indexes shows this sector has high value.'

D. Multiplier Effect Analysis

The multiplier analysis calculations measured include production sector output, household income, and labour. Each multiplier figure is divided into two parts, namely type I and type II. The difference between the two types of multipliers is related to whether or not consumption induction is included.

Table 7. Multiplier Effect on Output, Income, and Employment in Indonesia in 2020 Classification of 17 Sectors

Sector	**Output**		**Income**		**Labour**	
	TYPE I	**TYPE II**	**TYPE I**	**TYPE II**	**TYPE I**	**TYPE II**
Agriculture, Forestry, and Fisheries	5.27	-24.67	0.10	-0.06	0.23	-0.14

Mining and Quarrying	7.40	-12.53	0.06	0.01	0.02	0.00
Manufacturing	11.37	-11.81	0.05	0.01	0.05	0.00
Electricity and Gas Supply	24.21	5.24	0.03	0.02	0.01	0.01
Water Supply, Waste Management, Waste Disposal, and Recycling	7.88	-11.80	0.06	0.01	0.13	0.02
Construction	11.87	-16.39	0.09	-0.01	0.05	0.00
Wholesale and Retail Trade; Repair of Motor Vehicles and Motorcycles	6.29	-25.97	0.11	-0.06	0.15	-0.08
Transportation and Warehousing	11.49	-14.53	0.08	0.00	0.08	0.00
Accommodation and Food Services	12.14	-19.60	0.10	-0.02	0.16	-0.03
Information and Communication	8.48	-15.58	0.07	0.00	0.02	0.00
Financial and Insurance Services	4.74	-24.33	0.09	-0.05	0.03	-0.01
Real Estate	5.45	-6.53	0.02	0.01	0.01	0.00
Business Services	9.37	-19.99	0.09	-0.02	0.04	-0.01
Public Administration, Defence and Compulsory Social Security	11.33	-37.90	0.20	-0.18	0.13	-0.12
Education Services	6.51	-47.39	0.21	-0.32	0.14	-0.22
Health and Social Services	13.57	-19.52	0.11	-0.02	0.07	-0.01
Other Services	10.10	-26.41	0.14	-0.07	0.28	-0.14

Source: Indonesia's 17 Sector Input-Output Table (2020), 2025 (processed)

The multiplier effect is important in measuring further economic impact. This effect is divided into two types: Type I, which includes direct and indirect impacts, and Type II, which adds the influence of household consumption. The results in the table show that electricity and gas procurement recorded the highest output multiplier in Type I at 24.21 and remained positive in Type II at 5.24. This indicates that the sector is not only capable of significantly boosting output but can also stimulate household economic activity through increased income.

On the other hand, the construction and transportation sectors have relatively large output multipliers in Type I (11.87 and 11.49, respectively), but fail to generate positive multipliers for income and employment in Type II, even showing negative values. This indicates that increased consumption in the infrastructure sector does not necessarily boost national output but instead declines sharply. This reflects the context of the COVID-19 crisis, where declining consumption and low profit expectations make the MEC small or even zero, consistent with Keynes' observation that during a recession, investment can become highly insensitive to low interest rates. In other words, despite the high potential for infrastructure investment, market uncertainty weakens its transmission through the real demand mechanism.

This phenomenon supports the Harrod–Domar perspective that efficient capital investment (low capital-output ratio) drives output growth. A large multiplier value indicates high capital productivity in the infrastructure sector, consistent with the Harrod–Domar assumption that growth (g) is determined by the savings and capital-output ratio. Within the Keynesian framework, these results are also consistent with Marginal Efficiency of Capital (MEC): the prospect of large returns on investment in the infrastructure sector (a reflection of high multipliers) encourages further investment decisions.

E. Investment Impact Analysis

Table 8. The Impact of Infrastructure Investment on Output Formation, Income Growth, and Employment Opportunities in Indonesia in 2020 Classification of 17 Sectors

Sector	Output		Income		Labour	
	Score (million Rp)	Percent	Score (million Rp)	Percent	Score (million Rp)	Percent
Agriculture, Forestry, and Fisheries	-403.201.856,69	-0.53	-118.421.018,25	1.07	-5.964.998,21	71.50
Mining and Quarrying	274.040.591,15	0.36	39.961.179,32	-0.36	240.591,28	-2.88
Manufacturing	-735.711.786,16	-0.97	-88.183.928,47	0.80	-1.581.031,63	18.95
Electricity and Gas Supply	910.591.077,18	1.20	40.315.096,62	-0.36	364.478,73	-4.37
Water Supply, Waste Management, Waste Disposal, and Recycling	-17.497.195,80	-0.02	-2.490.472,65	0.02	-122.605,37	1.47
Construction	953.275.442,09	1.26	176.119.872,51	-1.59	2.233.495,30	-26.77
Wholesale and Retail Trade; Repair of Motor Vehicles and Motorcycles	-342.974.377,02	-0.45	-104.446.964,75	0.94	-2.890.120,52	34.64
Transportation and Warehousing	1.261.731.439,41	1.67	209.546.414,69	-1.89	4.604.892,05	-55.19
Accommodation and Food Services	-354.398.412,59	-0.47	-76.881.188,37	0.70	-2.549.676,98	30.56
Information and Communication	-160.112.915,07	-0.21	-28.337.062,09	0.26	-133.113,06	1.60
Financial and Insurance Services	-104.809.771,56	-0.14	-28.962.940,80	0.26	-175.576,28	2.10
Real Estate	-252.125.670,41	-0.33	-17.576.518,74	0.16	-102.933,62	1.23
Business Services	37.845.808,19	0.05	8.476.354,49	-0.08	82.011,60	-0.98
Public Administration, Defence and Compulsory Social Security	-2.955.703,50	0.00	-1.308.831,57	0.01	-17.898,34	0.21
Education Services	-129.365.140,09	-0.17	-72.104.314,88	0.65	-1.021.551,07	12.24
Health and Social Services	-104.924.603,24	-0.14	-23.472.359,20	0.21	-307.066,32	3.68
Other Services	-73.312.235,01	-0.10	-22.852.288,34	0.21	-1.002.047,18	12.01
TOTAL	**756.094.690,86**	**100,0**	**-110.618.970,47**	**100,0**	**-8.343.149,61**	**100,00**

Source: Indonesia's 17 Sector Input-Output Table (2020), 2025 (processed)

The impact of investments amounting to Rp 2,899 trillion shows paradoxical results. On the one hand, national output increased by Rp 756.09 trillion, a result that is in line with the findings of Chandra Darma & Alla (2010), who found that investment growth in the electricity, gas, and water sectors had the greatest effect on total output growth. On the other han d, household income decreased by Rp 110.62 trillion, and there was a reduction of 8.3 million workers. The Agriculture, Trade, and Accommodation sectors were the most affected, each losing thousands of workers. Meanwhile, the construction sector, which received significant investment, only added approximately 2,235 jobs, a very small number compared to the number of jobs lost in other sectors.

In conclusion, infrastructure development is indeed important in long-term growth strategies, but its effectiveness heavily depends on the selection of sectors, locations, and implementation approaches. If development is focused solely on capital - intensive sectors without considering sectoral and socio-economic impacts, the results will be uneven. Therefore, the government needs to direct investments toward sectors that can drive output, increase income, and absorb a wide range of jobs to ensure that Indonesia's post-pandemic economic development grows in an inclusive, fair, and sustainable manner.

CONCLUSION

The Infrastructure Sector in the Indonesian Economy in 2020 reflects both growth and volatility in the Indonesian economy based on the results of this study. With this, several key findings of this study can be summarised as follows.

- **The Role of the Infrastructure Sector**

The infrastructure sector plays a supporting role in growth with high input requirements, particularly for the output of the manufacturing industry, as well as a strategic function in supporting cross-sectoral production activities. However, some sub-sectors of infrastructure still exhibit input-intensive consumption patterns with relatively 'closed' (self-contained) output supply, resulting in suboptimal transmission of benefits to non-infrastructure sectors.

- **Inter-Sector Linkages**

Infrastructure has very strong linkages with other sectors. Electricity & Gas Supply holds the strongest position with backward linkages of 2.67 and forward linkages of 2.70, underscoring its role as a connector between upstream and downstream sectors in the national economic structure. Transportation & Warehousing also show significant linkages (1.79 backward; 1.82 forward), effectively channelling economic effects. Conversely, Construction is strong on the input side (backward 1.82) but relatively weak in supplying outputs to other sectors (forward 1.11), indicating a role more as a cross - sector input user than an inter-sector supplier.

- **Key Sector**

Quadrant mapping (Diffusion Power Index/Pd and Sensitivity Degree/dS) places Electricity & Gas Supply and Transportation & Warehousing alongside Manufacturing in the key sector quadrant (performance above average in Pd and dS). Construction exceeds the average in Pd but falls below in dS, thus not fully meeting the simultaneous 'key sector' criteria, with its role more limited to one-way transmission.

- **Impact of Infrastructure Investment in 2020**

Investment in infrastructure resulted in significant increases in output, income, and employment. The 2020 Indonesian Input-Output Analysis shows that infrastructure investment of Rp 2,899 trillion increased total economic output by Rp 756.09 trillion, with the construction, transportation, and electricity and gas supply sectors as the main contributors. However, on the other hand, household income decreased by Rp 110.62 trillion and there was a reduction in employment of 8.3 million people. Thus, infrastructure investment effectively drives output growth but is not yet inclusive in terms of income distribution and employment absorption. Future investment planning needs to be directed towards strengthening labour - intensive sectors so that the impact is more equitable and sustainable.

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