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Infrastructure Development Policy and Economic Development Inequality Among Regions in Indonesia

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ABSTRACT: The Nine Priority Programmes (Nawacita) is a Jokowi administration programme that aims to improve infrastructure development to connect peripheral areas. This study aims to determine the relationship of infrastructure to income inequality between regions in Indonesia during the Jokowi administration. This research uses secondary data sourced from the Central Bureau of Statistics, the Ministry of Public Works and Housing, and the State Electricity Company in 2015-2022. The analytical tool used is Panel Data. The results of this study show that sanitation infrastructure only has a negative and significant effect in Western Indonesia, telecommunications infrastructure has a positive and significant effect in Central Indonesia, and electricity infrastructure has a significant negative effect in Eastern Indonesia.

KEYWORDS: Infrastructure, Income Inequality, Western Indonesia, Central Indonesia, Eastern Indonesia.

INTRODUCTION

Infrastructure availability is considered a major factor in economic development. The relationship between infrastructure development and economic development has been the focus of several empirical works in the evidence literature which show that infrastructure development can increase productivity and economic growth (David, 2019; Kadyraliev et al., 2022; Magazzino & Mele, 2021; Pradhan et al., 2016; Zhang & Cheng, 2023). However, it is still not correct to state that economic growth due to infrastructure development will lead to a reduction in inequality. From a theoretical point of view, the availability of infrastructure affects social impacts such as improved environmental conditions and energy use, better education and health, easier access to goods and services, and social equality and inclusion.

Research on the relationship between infrastructure and income inequality is still limited. According to research conducted by Makmuri (2017), infrastructure proxied by road quantity and telecommunications quantity has a positive effect on income inequality in Indonesia. The quantity of roads and telecommunications is considered more by households with high and middle income groups. On the other hand, according to research conducted by Nugraha et al. (2020), infrastructure proxied by access to clean water, access to electricity, and roads has an effect on increasing economic growth. Thus, the availability of infrastructure has an indirect impact on reducing income inequality between regions in Indonesia.

Addressing inequality within and between countries is one of the requirements in achieving the 2030 Sustainable Development Goals (SDGs). The Joko "Jokowi" Widodo administration has a program called Nawacita (Nine priority programs) which aims to increase infrastructure development to connect peripheral areas with growth centers and encourage connectivity between islands in Indonesia (Kominfo, 2016). The Jokowi-era government is stated to have a strategy that focuses on infrastructure development and attracting infrastructure investment to achieve the goals of reducing inequality and poverty, and promoting growth (Warburton, 2016).

Jokowi's strategy in increasing infrastructure development can be shown through an increase in the amount of budget in the infrastructure sector, which in 2014 amounted to Rp. 154.1 trillion and in 2022 amounted to Rp. 365.8 trillion. Indonesia is administratively divided into three regions: Western Indonesia, Central Indonesia, and Eastern Indonesia. The increased infrastructure budget is used to fund various projects organized by the Committee for the Acceleration of Priority Infrastructure Delivery (KPPIP) formed by Jokowi including roads and bridges, oil and gas, electricity, ports, water and sanitation, urban transportation, railways, and information technology. Infrastructure development in the three regions of Indonesia has differences where Western Indonesia has more adequate infrastructure than Central and Eastern Indonesia. This is the impact of the infrastructure development policy that focuses on Java Island (Kaswanto & Utami, 2016).

Research conducted by (Medeiros et al., 2019) analyzed the role of infrastructure development in reducing income inequality in Brazil. The results showed that at the level of quality and average access to infrastructure, the higher the availability of infrastructure, the smaller the regional income gap, except for the electricity sector which has an effect on increasing income

inequality. This research contradicts the research conducted by (Chotia & Rao, 2017). According to this study, infrastructure development and economic growth have an effect on reducing poverty in countries in BRICS (Brazil, Russia, India, China, and South Africa). However, it causes an increase in income inequality between villages and cities in these countries.

This paper analyzes the relationship between infrastructure and income inequality between regions in Indonesia during the Jokowi administration. This research focuses on the Jokowi administration because of the continuity in Jokowi's program for infrastructure development to increase economic growth and reduce inequality. However, based on the research that has been conducted, there are still ambiguous results.

METHOD

There are two main problems in this research, namely the identification of infrastructure as a whole and between regions. Therefore, several previous studies were evaluated. This study uses secondary data sourced from the Central Bureau of Statistics, the Ministry of Public Works and Housing, and the State Electricity Company for 2015-2022. The year 2015 was chosen as the beginning of the research year because in that year President Jokowi had served as President for one year and considered North Kalimantan Province which experienced regional expansion. Meanwhile, the research focus in this study is to divide Indonesia into three regions, namely Western Indonesia, Central Indonesia, and Eastern Indonesia based on time zones.

Table 1 Three Regions in Indonesia by Time Zone

Region	Province
West Indonesia	Aceh, Sumatra Utara, Sumatra Barat, Riau, Kepulauan Riau, Jambi, Sumatra Selatan, Lampung, Bangka Belitung, Bengkulu, Jakarta, Banten, Jawa Barat, Jawa Tengah, Yogyakarta, Jawa Timur, Kalimantan Barat, Kalimantan Tengah
Central Indonesia	Kalimantan Utara, Kalimantan Timur, Kalimantan Selatan, Bali, NTB, NTT, Sulawesi Barat, Sulawesi Tengah, Sulawesi Selatan, Sulawesi Tenggara, Sulawesi Utara, Gorontalo
Eastern Indonesia	Maluku, Maluku Utara, Papua, Papua Barat

Source: Division of Indonesia based on time zones

There are several studies with different research methods to analyze the effect of infrastructure on income inequality. Bajar & Rajeev (2015) used several sectors as infrastructure proxies including road length, railways, electricity, and telecommunications to analyze the effect of infrastructure on income inequality. Makmuri (2017) analyzed the relationship between infrastructure and income inequality with road density, electricity, internet, and telecommunications as infrastructure proxies. Medeiros et al. (2019) used roads, electricity, telecommunications, clean water, and sanitation sectors as infrastructure proxies and analyzed the relationship of infrastructure to income inequality.

Nugraha et al. (2020) analyzed infrastructure and income inequality by using several variables as proxies, namely clean water, electricity, and road density. Chotia & Rao, (2017) used several variables as proxies for infrastructure, namely clean water and sanitation, electricity, telecommunications and transportation. (Chanieabate et al., 2023) used several variables such as roads and number of health centers as proxies of infrastructure and analyzed the relationship to income inequality.

In this study, the variables that researchers used were the gini ratio, national road length, electricity distribution, percentage of households using cellular phones, percentage of households with access to proper sanitation, high school net enrollment rate (APM), average years of schooling, Gender Development Index, number of poor people, and fiscal capacity index. The APM SMA, average years of schooling, Gender Development Index, number of poor people, and fiscal capacity index are control variables.

Analysis Tool

This study uses the analysis method, namely panel data. The panel data equation is as follows (Gujarati N. Damodar et al., 2012):

$$Giniit = \alpha 0 + \alpha 1 lnJalanit + \alpha 2 lnListrikit + \alpha 3 HPit + \alpha 4 Sanitasiit + \alpha 5 APMit + \alpha 6 RLSit + \alpha 7 IPGit + \alpha 8 lnPOVit + \alpha 9 Fiskalit + \varepsilon it$$

Notes:

Gini	= Gini Ratio
Road	= National road length (Km)
Electricity	= Electricity distributed (Kwh)
Cellular phone	= Households using cellular phone (%)
Sanitation	= Households that have access to proper sanitation (%)
APM	= Net Enrollment Rate at senior high school level (%)
RLS	= Average Years of Schooling (Years)

IPKG	= Gender Development Index (Index)
POV	= Number of poor people (Thousand)
Fiscal	= Fiscal Capacity Index
Ln	= Natural logarithm of the number
i	= Province (i: 1,2, ...,34)
t	= Year (t: 2015, 2016, ...,2022)

According to research (Yan & Mohd, 2023) that analyzes the causes of income inequality in China by analyzing the trend of income inequality in the western, central, northeastern, and eastern regions of China, this research tries to investigate infrastructure linkages in the Indonesian region.

RESULTS AND DISCUSSION

Descriptive Statistics

The following are the results of descriptive statistics of the variables used. The average value of the gini ratio has an average of 0.352. The length of national roads in 34 provinces in Indonesia has an average value of 1,417.62 km. Electricity distributed in provinces in Indonesia has an average of 6,991.69 Kwh. Households using cellular phones in Indonesian provinces have an average of 89.64 percent. Households that have access to proper sanitation in 34 provinces have an average of 72.29 percent. The overall net enrollment rate (APM) of the provinces has an average of 61.84 percent. The average years of schooling (RLS) has an average of 8.441 years. The Gender Development Index (GDI) in 34 provinces in Indonesia has an average value of 90.25 percent. The number of poor people (Pov) in Indonesia has an average of 789.20 thousand people. The Fiscal Capacity Index in Indonesia has an average value of 1.11.

Table 2 Descriptive Statistics

ariabel Gini	**N** 272	**Minimum**	**Maximum**	**Average**	**Standard Deviation**
		0,247	0,459	0,352	0,0390
Jalan	272	0	5868,25	1417,62	769,67
Listrik	272	180,59	56226,11	6991,69	11939,31
HP	272	47,27	98,4	89,64	7,613
Sanitasi	272	23,9	97,12	72,29	14,301
APM	272	43,22	74,82	61,84	6,092
RLS	272	5,99	11,31	8,441	0,971
IPG	272	78,52	95,04	90,25	3,346
Pov	272	40,31	4782,545	789,20	1113,75
Fiskal	272	0,103	11,473	1,11	1,524

Source: Data processed, Stata 2024

To analyze the impact of infrastructure on income inequality, three research models are used: Pooled Least Square (PLS), Fixed Effect Model (FEM), and Random Effect Model (REM). Furthermore, the best model is selected using Chow Test and Hausman Test. Based on the two tests, the significance value <0.05 was obtained so that the fixed effect was selected.

Regression Results of Inter-Regional Income Inequality with Fixed Effect Model

This study focuses on the effect of infrastructure development on income inequality between regions in Indonesia and suggests the application of appropriate policies. To determine the relationship between regions, panel data regression with fixed effect model is used.

Table 3 Inter-regional Regression Analysis

		West Indonesia	Central Indonesia	East Indonesia
Constanta	Coefisien	0.2385518	-0.3743456	-0.9227063
	T-stat	0.77	-0.84	-0.93
	Prob	0.442	0.404	0.364
lJalan	Coefisien	0.0034859	-0.0003997	-0.0076806
	T-stat	0.77	-0.09	-0.34
	Prob	0.442	0.930	0.738
lListrik	Coefisien	0.0000591	0.0262744	-0.0529164***
	T-stat	0.01	1.28	-2.34
	Prob	0.992	0.204	0.030
HP	Coefisien	0.0004614	0.0027248***	0.0002058
	T-stat	0.54	2.70	0.16

	Prob	0.588	0.009	0.871
	Coefisien	-0.0004959**	-0.000201	0.0013037
Sanitasi	T-stat	-2.50	-0.64	0.93
	Prob	0.014	0.527	0.362
	Coefisien	0.0040789*	-.0024422	.000226
APM	T-stat	1.83	-0.77	0.04
	Prob	0.070	0.446	0.971
	Coefisien	-0.0256246**	-.0335365***	-.0324841
RLS	T-stat	-2.38	-2.74	-1.00
	Prob	0.019	0.008	0.331
	Coefisien	-0.0003224	.0074517	.0053959
IPG	T-stat	-0.07	1.57	0.42
	Prob	0.941	0.120	0.680
	Coefisien	0.0113587	.0145109	.2422168**
lPov	T-stat	0.55	0.48	2.60
	Prob	0.587	0.663	0.018
	Coefisien	-0.0011389	-.0112958***	.005081
Fiskal	T-stat	-0.74	-3.79	1.47
	Prob	0.460	0.000	0.158

Source: Data processed, Stata 2024

Based on the regression results using the Fixed Effect Method between regions in Indonesia, it shows that the Western Indonesia region has a probability value of the F-statistic test result of 0.77 > 0.05. Therefore, the independent variables (road length, distributed electricity, households using cellular phones, and households having access to proper sanitation) do not simultaneously affect income inequality.

The Central Indonesia region has an F-statistic probability value of -0.84 > 0.05. Therefore, statistically the independent variables (road length, distributed electricity, households using cellular phones, and households having access to proper sanitation) simultaneously have no effect on income inequality.

In Eastern Indonesia, the probability value of the F-statistic test result is -0.93 > 0.05. Therefore, statistically, the independent variables (road length, distributed electricity, households using mobile phones, and households having access to proper sanitation) simultaneously have no effect on income inequality.

Analysis of the Relationship between Infrastructure and Regional Income Inequality

Relationship between National Road Length and Income Inequality

Based on the regression results with FEM between regions in Table 6, the Western Indonesia Region has a coefficient value of 0.2385518 and a significance value of 0.442. Therefore, partially, road length does not have a significant effect on income inequality in the Western Indonesia region in 2015-2022.

The Central Indonesia region has a coefficient value of -0.0003997 and a significance value of 0.930. Based on the significance value, it shows that partially road length does not have a significant effect on income inequality in the Central Indonesia region in 2015-2022.

Eastern Indonesia has a coefficient value of -.0076806 and a significance value of 0.738. Based on the significance value, it shows that partially road length also has no significant effect on income inequality in Eastern Indonesia region in 2015-2022.

Relationship between distributed electricity and income inequality

Based on the regression results in Table 6, in Western Indonesia, electricity infrastructure has a coefficient value of 0.0000591 with a significance value of 0.992. Partially distributed electricity has no significant effect on income inequality in 2015-2022.

In the Central Indonesia region, distributed electricity has a coefficient value of 0.0262744 with a significance value of 0.204 so that partially the amount of electricity distributed in Central Indonesia has no significant effect on income inequality in 2015-2022.

In Eastern Indonesia, the distributed electricity variable has a coefficient value of -0.0529164 with a significance value of 0.030 so that partially the amount of electricity distributed has a negative and significant effect on income inequality in 20152022.

Relationship between Households using cellular phones and Income Inequality

Based on the regression results in Table 6, it shows that in the Western Indonesia region, the cellular telephone variable has a coefficient value of 0.0004614 with a significance value of 0.588 so that partially the cellular telephone variable has no significant effect on income inequality in 2015-2022.

In Central Indonesia, the cellular telephone variable has a coefficient value of 0.0027248 with a significance value of 0.009 so that partially the cellular telephone variable has a positive and significant effect on income inequality in 2015-2022.
In Eastern Indonesia, the cellular telephone variable has a coefficient value of 0.0002058 with a significance value of 0.871, so partially the cellular telephone variable has no significant effect on income inequality in 2015-2022.
Relationship between Households with Access to Proper Sanitation and Income Inequality
Based on the regression results in Table 6, the availability of proper sanitation variable in the Western Indonesia region has a coefficient value of -0.0004959 with a significance value of 0.014 so that partially the availability of proper sanitation has a negative and significant effect on income inequality in 2015-2022.
The Central Indonesia region has a coefficient value of -0.000201 with a significance value of 0.527 so that partially the availability of proper sanitation does not have a significant effect on income inequality in 2015-2022.
Eastern Indonesia has a coefficient value of 0.0013037 with a significance value of 0.362, so partially the availability of proper sanitation does not have a significant effect on income inequality in 2015-2022.

ANALYSIS

Infrastructure availability and income inequality have a causal relationship. Income inequality prevents the poor from accessing infrastructure services and inadequate infrastructure can increase income inequality (Makmuri, 2017). Data analysis shows that different regions in Indonesia have different infrastructure conditions.

The Effect of Road Infrastructure on Interregional Income Inequality
Road infrastructure is one of the facilities used to improve the economy in Indonesia. Therefore, improving road infrastructure has an impact on increasing economic growth and reducing income inequality in Indonesia. In this study, road infrastructure has no effect on income inequality in western, central and eastern Indonesia. This is in line with research conducted by (Makmuri, 2017). The existence of road infrastructure is considered to affect income inequality indirectly, there are several transmissions from road infrastructure and income inequality, one of which is through physical capital accumulation and economic growth (Nugraha et al., 2020). With the existence of road infrastructure, it is considered to reduce income inequality through easy access to education and health services, market expansion, and an increase in living standards which have an effect on reducing income inequality (Hooper et al., 2018).

The Effect of Electricity Infrastructure on Inter-Regional Income Inequality

Electricity infrastructure has a negative and significant effect on income inequality in Eastern Indonesia but has no effect on Western and Central Indonesia. According to www.radarsorong.id, the percentage of installed capacity in 2021 in Eastern Indonesia, namely Maluku and Papua, reached 36 percent. This figure is still quite low when compared to Western Indonesia which has reached more than 50 percent. The results of this study are in line with research conducted by (Makmuri, 2017) which states that the quantity of electricity can be used for low-income households and small businesses owned to increase productivity so that it affects the increase in income and employment for the poor.

Effect of Telecommunication Infrastructure on Inter-Regional Income Inequality

Telecommunication infrastructure has a positive and significant effect on income inequality in Central Indonesia but no effect in Western and Eastern Indonesia. Therefore, an increase in telecommunications has an impact on increasing income inequality. Telecommunication has a biased nature where the impact of telecommunication is both positive and negative. The positive impact of telecommunications is that it increases skilled labor compared to unskilled labor for some people. Thus, people who do not have skills will be displaced.

The Effect of Sanitation Infrastructure on Inter-Regional Income Inequality
Sanitation infrastructure has a negative and significant effect on income inequality in Western Indonesia but no effect in Central and Eastern Indonesia. This result is consistent with research conducted by (Medeiros et al., 2019) which explains that the greater the percentage of waterborne diseases in a city, the smaller the negative effect on inequality. This is because the benefits of water and sewage provision are higher in areas with adequate treatment conditions. Since the poor are more vulnerable to hazardous water and sewage treatment situations, expanding this sector with higher quality can ensure more suitable health conditions for low-income people.

CONCLUSION

The role of infrastructure in reducing income inequality is ambiguous. This study found differences in the availability of infrastructure in Western, Central and Eastern Indonesia. In Western Indonesia, sanitation infrastructure has a significant effect in reducing income inequality. Central Indonesia has different results where the increase in telecommunication infrastructure affects the increase in income inequality. While in Eastern Indonesia, electricity infrastructure has a significant effect in reducing income

inequality. The implication of this study is that different types of infrastructure are needed between regions in Indonesia to reduce income inequality.

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