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Analysis of the Impact of Infrastructure Development on Inclusive Economic Growth in Indonesia

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Abstract

Infrastructure development is an important factor in supporting inclusive economic growth because it can improve people's access to economic activities and basic public services. This study aims to analyze the effect of infrastructure development on inclusive economic growth in Indonesia. Infrastructure development is represented by provincial road length, sanitation access, electricity access, clean water access, and internet access, while inclusive economic growth is measured using the Inclusive Growth Index (IGI). This study uses panel data from 34 provinces in Indonesia during the 2016–2024 period. The data were analyzed using panel data regression with the Random Effect Model (REM), which was selected based on the Chow and Hausman tests using EViews 12. The results show that provincial road length has a significant negative effect on inclusive economic growth. Sanitation access has a positive but insignificant effect, while electricity access has a significant negative effect. Clean water access has a negative but insignificant effect. Meanwhile, internet access has a positive and significant effect on inclusive economic growth. Simultaneously, all infrastructure variables have a significant effect on inclusive economic growth in Indonesia. These findings indicate that infrastructure development does not always have a positive impact on inclusive economic growth. Therefore, infrastructure development needs to be improved through better distribution and utilization so that its benefits can be more widely enjoyed by the community and support more inclusive economic growth.

Keywords: Inclusive Economic Growth; Infrastructure Development; Inclusive Growth Index; Panel Data; Indonesia.

INTRODUCTION

Economic development is generally pursued to improve people's welfare through higher economic activity, greater employment opportunities, and a more equitable distribution of development outcomes. However, economic progress cannot be assessed

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solely from the increase in economic output. High economic growth may coexist with poverty, unemployment, and income inequality when the benefits of development are not distributed evenly across different groups and regions. Therefore, the quality of economic growth has become increasingly important, particularly in ensuring that the benefits of development can be accessed and enjoyed by a broader segment of society (Harsono et al., 2024).

One of the approaches that has emerged in response to this challenge is inclusive economic growth. Inclusive growth extends beyond conventional economic growth because it considers not only increases in income and output but also the distribution of economic opportunities and improvements in social welfare. The World Bank (2018) emphasizes that inclusive growth should contribute to poverty reduction while strengthening economic security across society. Similarly, the Organisation for Economic Co-operation and Development (OECD, 2014) defines inclusive growth as economic growth that creates opportunities for all segments of society and distributes the benefits of prosperity more equitably across economic and social dimensions. Ranieri & Ramos (2013) further explain that inclusive growth is closely related to the concept of pro-poor growth, but has a broader scope because it also emphasizes equal access, opportunities, and participation in the development process.

The importance of inclusive growth is particularly relevant for developing countries such as Indonesia, where economic development is accompanied by differences in socioeconomic conditions and access to basic services across regions. Economic growth that is concentrated in particular areas or groups may not automatically translate into improvements in welfare for the wider population. Klasen (2010) argues that high inequality can reduce the effectiveness of economic growth in improving people's welfare. In this context, inclusive development requires policies that not only encourage economic expansion but also address disparities in access to economic and social opportunities. Thus, reducing poverty, unemployment, and income inequality while expanding access to essential services represents an important part of achieving more inclusive economic development.

To assess the quality of economic growth more comprehensively, the Inclusive Growth Index (IGI) can be used as an indicator that incorporates both economic and social dimensions of development. Unlike conventional measures that focus primarily on economic output, the IGI provides a broader perspective by considering distribution, economic opportunities, and social welfare. Sukowati (2019) demonstrates that the Inclusive Growth Index can be used to assess the quality of economic growth by simultaneously considering economic and social aspects. In the present study, the IGI is therefore used to measure inclusive economic growth across Indonesian provinces.

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Development of infrastructure is considered one of the important instruments for promoting inclusive economic growth. Adequate infrastructure can improve regional connectivity, reduce transaction and distribution costs, increase productivity, and expand people's access to economic opportunities and basic services. Infrastructure development can also support access to education, health services, information, and markets, thereby creating conditions that allow a wider range of people to participate in economic activities. In this perspective, infrastructure is not merely a physical asset but also an important foundation for reducing regional disparities and expanding opportunities for communities.

Indonesia's infrastructure development, however, continues to face differences in availability and access among provinces. The issue is not only whether infrastructure exists, but also whether its benefits are distributed sufficiently and can be utilized productively by society. The final results of this study show that the average Inclusive Growth Index across 34 Indonesian provinces increased from 4.27 in 2016 to 5.14 in 2024. Despite this improvement, the 2024 average remained within the 4–7 range, which is categorized as fairly inclusive based on the IGI interpretation adopted in this study (Mckinley, 2010). This indicates that improvements in inclusive economic growth have occurred, but there is still considerable room to strengthen the inclusiveness of development in Indonesia.

Infrastructure dimensions relevant to inclusive development include transportation infrastructure, sanitation, electricity, access to clean drinking water, and digital connectivity. Road infrastructure, for example, can facilitate mobility between regions and improve the movement of people and goods. Sanitation and clean water are closely associated with living conditions and human welfare, while electricity provides essential support for household activities and economic production. Meanwhile, internet access has become increasingly important as digital technology expands access to information, markets, communication, and economic opportunities. The combination of these infrastructure dimensions provides a broader perspective for examining how infrastructure development may contribute to inclusive economic growth.

Previous studies have provided evidence concerning the relationship between infrastructure and inclusive growth, although their findings and research settings differ. Prabowo et al. (2022), for example, examine factors associated with inclusive growth in Indonesia, while Liao dan Yuliatiningtyas (2025) highlight the role of digital infrastructure in supporting inclusive growth through increased productivity, wider market access, lower transaction costs, improved public services, and the creation of employment opportunities. Vistarani (2023) also examines the relationship between infrastructure development and inclusive economic growth in Sumatra and Kalimantan. These studies suggest that infrastructure has an important role in supporting more inclusive

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development, but differences in indicators, geographical coverage, and research periods may produce different empirical results.

Despite the growing literature, an empirical gap remains concerning the simultaneous role of different types of infrastructure in determining inclusive economic growth across all Indonesian provinces. Previous studies have generally focused on particular infrastructure dimensions, specific geographical areas, or different measures of inclusive growth. This study addresses this gap by examining five infrastructure indicators—road infrastructure, adequate sanitation, electricity, access to clean drinking water, and internet access—and relating them to inclusive economic growth measured by the Inclusive Growth Index. The analysis covers 34 provinces in Indonesia over the 2016–2024 period, providing a broader provincial-level perspective on the relationship between infrastructure development and inclusive growth.

The contribution of this study lies in integrating physical, basic-service, and digital infrastructure indicators within a single empirical framework to examine inclusive economic growth in Indonesia. Rather than measuring development only through conventional economic growth indicators, this study uses the Inclusive Growth Index to capture the broader quality of development. By examining the effects of road infrastructure, sanitation, electricity, clean drinking water, and internet access simultaneously, the study seeks to identify which infrastructure dimensions are associated with inclusive economic growth and whether their contributions differ across dimensions.

Based on these considerations, this study aims to analyze the effect of infrastructure development on inclusive economic growth in Indonesia during the 2016–2024 period. Specifically, it examines the effects of road infrastructure, sanitation, electricity, access to clean drinking water, and internet access on the Inclusive Growth Index across 34 provinces in Indonesia. The findings are expected to provide empirical evidence for policymakers in designing infrastructure policies that not only expand physical infrastructure but also strengthen the equitable distribution of economic opportunities and welfare across Indonesian regions.

LITERATURE REVIEW

Inclusive Economic Growth

Inclusive economic growth refers to a pattern of economic development in which the benefits of economic progress are broadly shared across different groups of society. Unlike conventional economic growth, which tends to emphasize increases in production and income, inclusive growth also considers whether people have equal opportunities to participate in economic activities and benefit from development. The World Bank (2018) emphasizes that inclusive growth should contribute to poverty reduction and strengthen

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economic security for society as a whole. Similarly, the OECD (2014) highlights the importance of creating economic opportunities and ensuring that the benefits of prosperity are distributed more equitably.

The concept of inclusive growth is closely associated with poverty reduction and inequality. Ranieri & Ramos (2013) explain that inclusive growth has similarities with pro-poor growth because both approaches emphasize improving the welfare of disadvantaged groups. Nevertheless, inclusive growth has a broader perspective because it also incorporates access to opportunities, participation in economic activities, and the distribution of development benefits. Klasen (2010) further argues that high inequality can reduce the effectiveness of economic growth in improving welfare. Consequently, economic development needs to be accompanied by policies that expand access to economic and social opportunities.

Ali & Son (2007) conceptualize inclusive growth through the distribution of opportunities, emphasizing that economic growth becomes more inclusive when improvements in average opportunities are accompanied by greater equality in access to those opportunities. This perspective implies that infrastructure development can contribute to inclusive growth when it allows a wider proportion of the population to participate in economic and social activities. In this study, inclusive economic growth is measured using the Inclusive Growth Index (IGI). The index provides a broader assessment of development by incorporating economic and social dimensions rather than relying solely on conventional economic growth indicators. Sukowati (2019) demonstrates that the IGI can be used to assess the quality of economic growth by simultaneously considering economic performance and social welfare. Mckinley (2010) also developed inclusive growth criteria and indicators to assess whether economic development is accompanied by improvements in opportunity and welfare.

Table 1. Dimensions and Indicators of Inclusive Growth Based on Mckinley (2010)

No	IGI Interpretation	IGI score
1	Not Inclusive	1 - 3
2	quite inclusive	4 - 7
3	very inclusive	8 - 10

Source: Adapted from Mckinley (2010)

Mckinley (2010) explains that inclusive growth involves not only increasing economic output but also expanding opportunities and ensuring that the benefits of growth can be accessed by a broad part of the population. The dimensions and indicators presented by McKinley provide a conceptual basis for assessing whether economic

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development generates broader opportunities and improves people's access to essential services. In this study, the concept of inclusive growth is represented by the Inclusive Growth Index (IGI), which is used to evaluate the development of inclusive economic growth across Indonesian provinces.

Infrastructure and Inclusive Economic Growth

Infrastructure represents an important foundation for economic development because it facilitates the movement of people, goods, services, information, and economic resources. Adequate infrastructure can reduce transaction costs, increase productivity, improve connectivity between regions, and expand access to markets and basic services. Todaro and Smith (2011) argue that infrastructure development can support economic productivity by improving the efficiency of economic activities.

From an inclusive growth perspective, the contribution of infrastructure extends beyond its effect on aggregate economic output. Infrastructure can improve people's access to economic opportunities and essential services, particularly when development is directed toward regions and groups that have historically experienced limited access. Therefore, infrastructure can become an instrument for reducing regional disparities and strengthening the inclusiveness of economic development.

The relationship between infrastructure and inclusive growth can be understood through several mechanisms. Transportation infrastructure can improve regional connectivity and facilitate the distribution of goods and labor. Electricity can support household welfare and productive activities. Sanitation and clean water can improve living conditions and health, which may strengthen human productivity over time. Meanwhile, internet infrastructure can expand access to information, digital markets, communication, education, and new employment opportunities.

Road Infrastructure and Inclusive Economic Growth

Road infrastructure facilitates the movement of people and goods between economic centers and peripheral areas. Better road connectivity can reduce transportation costs, shorten travel time, improve market access, and support the distribution of agricultural and industrial products. Through these mechanisms, road infrastructure is theoretically expected to contribute to broader participation in economic activities.

From the perspective of inclusive growth, road development can also reduce geographical barriers that prevent communities from accessing employment, education, health services, and markets. However, the effect of road infrastructure may depend on its quality, geographical distribution, and utilization. An increase in road length does not necessarily guarantee equal economic benefits when roads are concentrated in particular

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areas or when additional infrastructure is not sufficiently connected to productive economic activities.

Previous research has indicated that physical infrastructure can be associated with inclusive growth, although the magnitude and direction of the relationship may differ according to regional characteristics and the indicators used. This suggests that the impact of road infrastructure should be examined empirically rather than assumed to be uniformly positive.

Sanitation and Inclusive Economic Growth

Sanitation is an essential component of basic infrastructure because adequate sanitation contributes to a healthier living environment and reduces exposure to health risks. Improved sanitation can support human capital by reducing illness and enabling individuals to participate more consistently in education and economic activities. From an inclusive growth perspective, sanitation can contribute indirectly to economic welfare by improving the quality of life and productivity of households. However, its contribution to an aggregate measure of inclusive growth may not appear immediately because improvements in sanitation may require time before their effects on health, productivity, and economic participation become evident.

Differences in sanitation access between regions can also influence the inclusiveness of development. When sanitation services are concentrated in relatively developed areas, improvements in infrastructure may not generate equal benefits across provinces. Therefore, sanitation infrastructure needs to be considered not only in terms of its availability but also in terms of its distribution and quality.

Electricity Infrastructure and Inclusive Economic Growth

Electricity is an essential infrastructure that supports both household and productive economic activities. Reliable electricity access can facilitate business operations, industrial production, trade, services, communication, and household activities. Therefore, broader electricity access is theoretically expected to increase productivity and expand opportunities for economic participation. Electricity infrastructure can also support improvements in living standards by enabling households to access various services and technologies. Harsono et al. (2024) examined the contribution of infrastructure to inclusive economic growth in Indonesia and found that electricity infrastructure may have a significant relationship with inclusive growth. However, the economic effect of electricity infrastructure may depend not only on coverage but also on reliability, service quality, distribution, and its utilization for productive activities.

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Clean Drinking Water Infrastructure and Inclusive Economic Growth

Access to clean drinking water is an important component of basic infrastructure and public welfare. Adequate access to clean water can improve health conditions, reduce the risk of waterborne diseases, and support a healthier and more productive population. Through these mechanisms, clean drinking water infrastructure can contribute to human capital and, indirectly, economic productivity.

The relationship between water infrastructure and economic growth may nevertheless vary across regions and development conditions. Luthfi et al. (2024) reported that public infrastructure, including water-related infrastructure, may have different relationships with economic growth across the Sumbagsel region. Malik and Sugiharti (2025) also showed that the determinants of economic growth can vary across regions. Therefore, an increase in access to clean drinking water does not necessarily produce an immediate effect on an aggregate measure of inclusive economic growth.

Internet Infrastructure and Inclusive Economic Growth

Internet infrastructure has become increasingly important in supporting economic activities in the digital economy. Internet access can reduce information barriers, improve communication, expand market access, facilitate digital financial services, and create new opportunities for businesses and workers. In particular, internet connectivity can help micro, small, and medium-sized enterprises reach broader markets and participate in digital economic activities.

Liao & Yuliatiningtyas (2025) emphasize that digital infrastructure can increase productivity, expand UMKM market access, reduce transaction costs, create employment opportunities, and improve welfare. Therefore, wider and more equitable internet access is theoretically expected to support inclusive economic growth by allowing more individuals and businesses to participate in economic activities and benefit from digital transformation.

RESEARCH METHODS

Research Design and Data

This study uses a quantitative approach with an explanatory design to examine the relationship between infrastructure development and inclusive economic growth in Indonesia. The unit of analysis consists of 34 provinces in Indonesia during the 2016–2024 period, resulting in a province-year panel dataset. The study relies on secondary data obtained from official publications of Statistics Indonesia (Badan Pusat Statistik/BPS). Data collection was conducted using documentation by compiling the statistical information required for the analysis from the relevant BPS publications.

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Measurement of Inclusive Economic Growth

Inclusive economic growth is represented by the Inclusive Growth Index (IGI). Since the index was not directly available as a ready-to-use dataset, it was constructed based on the indicators used in the study. The construction of the IGI involved several stages. First, indicators with different measurement units were normalized using the Min–Max method to place the values on a comparable scale. For indicators with a negative interpretation, the normalized values were reversed so that a higher value consistently indicated a better condition. The normalized indicators were then averaged and multiplied by 10 to produce an index with a scale of 1–10. This procedure follows the approach developed by Mckinley (2010) and its application by Sukowati (2019). The IGI classification used in this study consists of three categories: 1–3 indicates a not inclusive condition, 4–7 indicates a fairly inclusive condition, and 8–10 indicates a highly inclusive condition. Thus, a higher IGI value reflects a more inclusive pattern of economic growth and a broader distribution of development benefits.

Operational Definition of Variables

The dependent variable in this study is inclusive economic growth, measured by the Inclusive Growth Index (IGI) on a 1–10 scale. The independent variables consist of five infrastructure indicators. Road infrastructure is measured by the length of provincial roads in kilometers and is transformed into its natural logarithm. Sanitation is measured by the percentage of households with access to proper sanitation. Electricity is measured by the percentage of households using electricity as their main source of lighting. Clean drinking water is measured by the percentage of households with access to clean drinking-water sources. Internet infrastructure is measured by the percentage of households accessing the internet.

The five infrastructure indicators represent different aspects of infrastructure development. Road infrastructure represents physical connectivity, sanitation and clean drinking water represent basic services, electricity represents energy access, and internet access represents digital infrastructure. These indicators are therefore used to examine whether different forms of infrastructure development are associated with inclusive economic growth across Indonesian provinces.

Panel Data Regression

The relationship between infrastructure development and inclusive economic growth is estimated using panel-data regression. Panel data combine cross-sectional observations across provinces with observations over time. Three panel-data models were considered: the Common Effect Model (CEM), Fixed Effect Model (FEM), and

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Random Effect Model (REM). The general regression specification is formulated as follows:

$$IGI_{it} = \alpha + \beta_1 LN_Jalan_{it} + \beta_2 Sanitation_{it} + \beta_3 Electricity_{it} + \beta_4 CleanWater_{it} + \beta_5 Internet_{it} + \varepsilon_{it}$$

Where IGI represents inclusive economic growth, LN_Jalan represents the natural logarithm of provincial road length, Sanitation represents household access to proper sanitation, Electricity represents household electricity use as the main lighting source, CleanWater represents household access to clean drinking-water sources, Internet represents household internet access, α is the constant, β_1–β_5 are the regression coefficients, and ε represents the error term.

The natural logarithmic transformation is applied specifically to the provincial road variable to reduce differences in scale across provinces and obtain a more appropriate estimation. Model selection is conducted through the Chow test and Hausman test. The Chow test is used to determine whether the Common Effect Model or Fixed Effect Model is more appropriate, while the Hausman test is used to determine whether the Fixed Effect Model or Random Effect Model should be selected.

Hypothesis Testing

Hypothesis testing is conducted at a 5% significance level. The t-test is used to evaluate the partial effect of each infrastructure variable on inclusive economic growth, while the F-test is used to examine the joint effect of all infrastructure variables. The adjusted R-squared is used to indicate the proportion of variation in inclusive economic growth that can be explained by the infrastructure variables included in the model.

Based on the model selection results in the study, the Chow test produced a probability value of 0.0000, indicating that the Fixed Effect Model was preferred to the Common Effect Model. The subsequent Hausman test produced a probability value of 0.0876, which led to the selection of the Random Effect Model as the final estimation model. Therefore, the relationship between the five infrastructure indicators and inclusive economic growth was estimated using the Random Effect Model.

RESULTS AND DISCUSSION

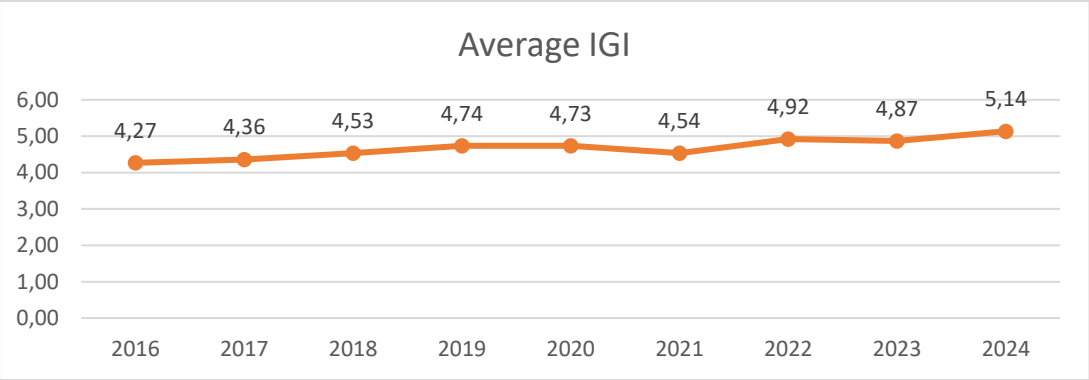
Development of Inclusive Economic Growth

The average Inclusive Growth Index (IGI) across 34 provinces increased from 4.27 in 2016 to 5.14 in 2024, although fluctuations occurred during the period. Based on the classification used in this study, the 2024 value remains in the fairly inclusive category (4–7). This indicates an improvement in inclusive economic growth, although development outcomes are not yet evenly distributed across provinces.

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Figure 1. Development of the Average Inclusive Growth Index (IGI) in Indonesia, 2016–2024



Source: BPS, processed by the author, 2026.

Panel Model Selection

The Chow test produced a probability of 0.0000, indicating that the Fixed Effect Model (FEM) was preferred to the Common Effect Model (CEM). However, the Hausman test produced a probability of 0.0876, which is greater than 0.05. Therefore, the Random Effect Model (REM) was selected as the final estimation model.

Random Effect Model Results

The REM estimation shows different effects among the five infrastructure indicators. The results are presented in Table 1.

Table 2. Random Effect Model Estimation Results

Variable	Coefficient	Probability
LN_Road	-0.035421	0.0040
Sanitation	0.000075	0.8697
Electricity	-0.002055	0.0026
Clean Drinking Water	-0.000523	0.2447
Internet	0.002093	0.0000

Source: EViews 12 output, processed by the author, 2026.

Effects of Infrastructure on Inclusive Economic Growth

Road infrastructure has a coefficient of -0.035421 with a probability of 0.0040, indicating a negative and significant effect on inclusive economic growth. This result suggests that increasing road length does not automatically improve inclusive growth.

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Road expansion may not always be accompanied by improvements in quality, maintenance, connectivity, and equitable distribution across regions. Therefore, road development needs to focus not only on quantity but also on quality and accessibility.

Sanitation infrastructure has a positive coefficient of 0.000075 but is statistically insignificant, with a probability of 0.8697. Although improved sanitation can support health and productivity, its contribution to inclusive economic growth may not appear immediately. The result suggests that increased sanitation access during the study period was not sufficient to produce a significant direct effect on the IGI. Electricity infrastructure has a coefficient of -0.002055 and a probability of 0.0026, indicating a negative and significant effect. This finding suggests that greater electricity access does not necessarily translate into higher inclusive growth when improvements in coverage are not accompanied by reliability, quality, equitable distribution, and productive utilization. Thus, electricity infrastructure needs to support productive economic activities rather than only increase household coverage.

Clean drinking-water infrastructure has a coefficient of -0.000523 with a probability of 0.2447. The result is statistically insignificant, meaning that the negative coefficient cannot be interpreted as a significant negative effect. The benefits of clean water may operate gradually through improvements in health and human capital, while differences in service quality and distribution across regions may also affect its relationship with inclusive growth. Internet infrastructure has a coefficient of 0.002093 with a probability of 0.0000, indicating a positive and significant effect. Wider internet access can reduce information barriers, expand market access, improve communication, and create opportunities for digital entrepreneurship. This result supports the importance of digital infrastructure in expanding economic opportunities and strengthening inclusive growth.

Simultaneous Effect and Coefficient of Determination

The F-statistic is 53.48595 with a probability of 0.0000, indicating that road, sanitation, electricity, clean drinking water, and internet infrastructure jointly have a significant effect on inclusive economic growth. Although the individual effects differ, the five infrastructure indicators collectively contribute to explaining changes in the IGI.The model has an R-squared of 0.471300 and an Adjusted R-squared of 0.462489. Thus, approximately 46.25% of the variation in inclusive economic growth can be explained by the infrastructure variables included in the model, while the remaining 53.75% is related to other factors outside the model.

Overall, the findings show that infrastructure development cannot be evaluated solely based on the expansion of access. The quality, distribution, reliability, and productive utilization of infrastructure are also important. In particular, the positive significant effect of internet access indicates the growing role of digital connectivity in

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expanding economic opportunities, while the insignificant results for sanitation and clean water suggest that their benefits may require a longer period to influence inclusive growth.

CONCLUSION

This study examines the effect of infrastructure development on inclusive economic growth in Indonesia across 34 provinces during 2016–2024. The results show that the development of inclusive economic growth improved during the study period, as reflected by the increase in the average Inclusive Growth Index (IGI) from 4.27 in 2016 to 5.14 in 2024. However, the level of inclusiveness remained in the fairly inclusive category, indicating that improvements in economic growth have not been distributed evenly across provinces.

Based on the Random Effect Model estimation, road infrastructure and electricity infrastructure have a negative and significant effect on inclusive economic growth. These findings indicate that increasing infrastructure coverage alone does not necessarily improve inclusive growth, particularly when it is not accompanied by adequate quality, reliability, equitable distribution, and productive utilization. Meanwhile, sanitation and access to clean drinking water do not have a significant effect on inclusive economic growth during the study period. This suggests that the economic benefits of these basic services may not be immediately reflected in the inclusive growth index. In contrast, internet access has a positive and significant effect, indicating that wider digital connectivity can contribute to more inclusive economic opportunities by improving access to information, markets, communication, and digital economic activities.

Simultaneously, the five infrastructure variables have a significant effect on inclusive economic growth. The adjusted R-squared value of 0.462489 indicates that the model explains approximately 46.25% of the variation in inclusive economic growth, while the remaining variation is influenced by other factors outside the model.

Overall, the findings emphasize that infrastructure development should not be measured only by the expansion of physical access. Government policies should also focus on infrastructure quality, equitable distribution, reliability, maintenance, and its productive use by communities. Strengthening digital infrastructure is also important because internet access shows the clearest positive contribution to inclusive economic growth in this study.

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