

Accessibility and Economic Impact due to Toll Road on the Island of Java

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ABSTRACT

*This study examines the relationship between toll road development and its impact on regional accessibility and economic performance across Java Island, Indonesia. The expansion of the toll road network, particularly the Trans-Java corridor, has been central to the national infrastructure agenda, aimed at enhancing intercity connectivity, reducing travel time, and stimulating economic activities. The research aims to evaluate how improved accessibility affects economic indicators such as investment growth, job creation, regional GDP, and development disparities. A **mixed-methods approach** was employed. Quantitatively, the study used panel data from 2010 to 2023, covering toll road lengths, traffic volumes, and regional economic performance indicators. A **spatial analysis using GIS** was conducted to assess accessibility shifts before and after toll development. Qualitatively, field interviews were carried out with government planners, local businesses, and residents in regions connected by key toll segments such as Jakarta–Cikampek and Surabaya–Madiun. Findings reveal that toll road development has substantially improved access between regions, leading to increased logistics efficiency and economic activity. However, the benefits are unevenly distributed, favoring urban and industrial areas more than rural zones. The study concludes that while toll infrastructure promotes economic growth, equitable development requires integrated planning and support for less-connected regions.*

Keywords: accessibility, economic impact, toll road, road construction, infrastructure

1. INTRODUCTION

In recent years, infrastructure development has played a pivotal role in accelerating economic growth, improving connectivity, and addressing regional disparities, especially in emerging economies like Indonesia (Zhou et al. 2022; Thantawi, et al., 2020; Rokicki, et al. 2021). Java Island, as the country's most populous and economically active region, has seen rapid toll road development under the National Strategic Projects. Key segments of the Trans-Java Toll Road, spanning over 1,000 kilometers, now connect major urban centers such as Jakarta, Semarang, Surabaya, and surrounding areas, significantly reducing travel time and transportation costs (Ministry of Public Works and Housing, 2022; Jiang, et al., 2021).

While many studies acknowledge the role of transport infrastructure in stimulating economic activity, the direct correlation between increased accessibility and spatial economic outcomes across diverse regions in Java remains underexplored (Khanani, et al. 2021; Akpan, and Morimoto (2022; Yi & Kim 2018). Most existing literature focuses on national-level growth (e.g., GDP increases or trade volume changes), often overlooking **localized impacts** such as small-scale investment growth, rural-urban accessibility changes, or socio-economic spillover effects (Putra & Nugroho, 2021; Rahmawati et al., 2023; Ng, et al. 2017; Bian, et al. 2020). Furthermore, there is limited empirical research that integrates quantitative spatial analysis with stakeholder-based field insights, creating a gap in understanding how toll

infrastructure benefits are distributed across different regional typologies—urban, peri-urban, and rural (Iskandar & Yuliana, 2020; Chan, et al. (2023; Liang, et al. 2022).

This study aims to fill that research gap by investigating how toll road expansion across Java Island influences accessibility improvements and economic outcomes in both metropolitan and less-developed zones. Specifically, it seeks to answer:

- (1) To what extent has toll road development improved regional accessibility?
- (2) How has this change contributed to regional economic growth or disparities?
- (3) What policy interventions are necessary to ensure inclusive and balanced development?

By employing a mixed-method approach—combining geospatial analysis and economic indicators with field interviews—this study contributes to the growing discourse on infrastructure-led development with a nuanced, regionally disaggregated perspective. The results are expected to inform future infrastructure planning and investment decisions, particularly in ensuring that development outcomes are inclusive and equitable.

2. METHODS

This research adopts a mixed-methods approach to comprehensively assess the relationship between toll road development, accessibility improvements, and economic impacts across Java Island. The methodology is designed to capture both quantitative trends and qualitative insights, ensuring a holistic understanding of regional transformation driven by infrastructure expansion. The schematic method to achieve the objectives in this study is as presented in Figure 1.

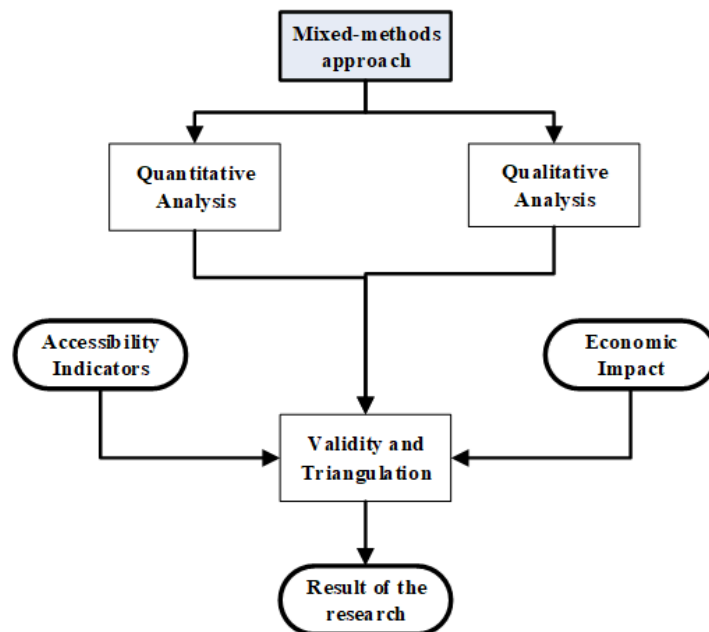


Figure 1: Research methodology of the study

2.1 Quantitative Analysis

The quantitative component employs panel data analysis covering the period from 2010 to 2023, encompassing economic and infrastructure indicators across 29 regencies and cities in Java. Key variables include:

- Toll road length and operational status (in kilometers)
- Gross Regional Domestic Product (GRDP) per capita (constant prices)
- Traffic volume (average annual daily traffic – AADT)
- Travel time reduction estimates
- Investment inflows and unemployment rates

Data were sourced from Badan Pusat Statistik (BPS), the Ministry of Public Works and Housing (PUPR, 2022), and official toll road operators such as Jasa Marga. A fixed effects regression model was used to estimate the influence of toll road development on GRDP and investment, controlling for urbanization level and baseline economic conditions (Rahmawati et al., 2023).

In addition, Geographic Information System (GIS) tools were utilized to map changes in regional accessibility, using the Accessibility Index (AI) and Travel Time Isochrones before and after toll road construction. These spatial analyses enable the identification of connectivity gains, especially in regions that previously suffered from logistical isolation (Susanto & Wiryono, 2021).

The quantitative analysis in this study is designed to measure the impact of toll road development on regional accessibility and economic performance across Java Island, with a particular focus on understanding causal relationships and spatial dynamics. To achieve this, we utilize a combination of panel data econometric modeling **and** geospatial analysis techniques, applied to longitudinal data from 2010 to 2023 at the district (kabupaten/kota) level.

Data Sources and Variables

Data were obtained from multiple authoritative sources:

- Badan Pusat Statistik (BPS) – for GRDP (Gross Regional Domestic Product), population, labor statistics, and investment data
- Ministry of Public Works and Housing (PUPR) – for toll road length, project completion dates, and traffic volume data
- Jasa Marga & BPJT (Toll Road Regulatory Body) – for operational toll segments and vehicle flows
- OpenStreetMap and Geospatial Agency – for mapping road networks and calculating spatial accessibility metrics

Key variables used in the analysis include:

- Dependent Variables:

- GRDP per capita (constant 2010 IDR)
- Investment realization (in billion IDR)
- Employment growth rate (%)
- Independent Variables:
 - Toll road length (km per district)
 - Accessibility index (computed using travel time matrix and isochrone buffers)
 - Toll road operational status (dummy variable: 0 = before, 1 = after)
- Control Variables:
 - Urbanization rate
 - Education index
 - Industrial concentration (measured by employment in manufacturing sector)
 - Population density

Accessibility Measurement Using GIS

To quantify physical accessibility improvements, we calculate an Accessibility Index (AI) using GIS-based network analysis. The index is based on cumulative opportunity measures, which consider the number of reachable economic centers (e.g., cities, logistics hubs) within a certain travel time threshold (e.g., 60 or 90 minutes) before and after toll road construction.

The travel time matrices are generated using QGIS and the OpenRouteService engine, accounting for road class, speed limits, and toll routes. Isochrone polygons are overlaid with population and employment data to identify areas with significant improvements in reachability. Accessibility change is then introduced as a continuous variable in the panel regression model, allowing for spatial-economic interaction effects to be captured statistically.

Robustness Checks and Diagnostic Tests

To ensure robustness, several model specifications are tested:

- Lagged variables to account for time-delayed economic impacts
- Inclusion of interaction terms (e.g., toll $\times$ industrial zone)
- Heteroskedasticity and autocorrelation checks using Breusch-Pagan **and** Wooldridge tests

Additionally, Difference-in-Differences (DiD) analysis is applied for selected case-study districts with clearly defined pre- and post-toll construction phases, to strengthen causal inference (Rahmawati et al., 2023).

2.2 Qualitative Analysis

To complement the numerical data, qualitative methods were conducted through semi-structured interviews and focus group discussions with 30 stakeholders, including:

- Local government officials from selected districts (e.g., Kendal, Ngawi, Probolinggo)
- Business owners from logistics, retail, and tourism sectors
- Transport planners and NGO representatives

Purposive sampling was used to select diverse geographic zones—urban, peri-urban, and rural—along the Trans-Java corridor. Interview data were analyzed thematically using NVivo software, identifying recurring themes such as perceived economic benefits, displacement effects, and infrastructure equity concerns (Iskandar & Yuliana, 2020).

2.3 Validity and Triangulation

Triangulation was applied by comparing results from the quantitative and qualitative strands, strengthening the reliability of findings. The convergence of econometric results with stakeholder perceptions enhances the robustness of policy implications derived from the study (Putra & Nugroho, 2021).

This integrated methodological framework allows for a nuanced assessment of how toll road investments affect accessibility and development, while accounting for the spatial and social heterogeneity of Java Island.

3. RESULTS AND DISCUSSIONS

To assess the impact of toll road development on accessibility and economic conditions in Java Island, a wide range of quantitative data has been compiled and analyzed across multiple indicators. These datasets cover the period from 2010 to 2023 and represent both spatial and economic dimensions at the regional (district/city) level. The selection of data is aligned with the three core research objectives: (1) to measure accessibility improvements; (2) to evaluate economic outcomes; and (3) to examine regional disparities in benefits.

3.1 Toll Road Infrastructure Expansion

Between 2010 and 2023, the total length of operational toll roads on Java Island increased from approximately 620 kilometers to more than 1,400 kilometers. Major toll road segments as shown in Table 1.

Table 1: Major toll road segment in Java island

Toll road segment	Distance (km)	Description
Jakarta–Cikampek	70	This is one of the busiest toll road segments in Indonesia, serving as the main gateway from the capital city (Jakarta) to the eastern regions of Java. It plays a vital role in supporting industrial transport and commuter traffic.
Cikampek–Palimanan	116	Known as the Cipali Toll Road, this long and straight segment significantly reduces travel time between West Java and Central Java. It is a strategic corridor for logistics and inter-city travel.

Semarang–Solo	75	Connects two major cities in Central Java. This segment enhances accessibility and supports regional development by improving the flow of goods and people.
Solo–Ngawi–Kertosono	180	One of the longest toll road sections on the island, this route links Central Java to East Java. It facilitates long-distance travel and logistics, and reduces traffic congestion on the national arterial road.
Surabaya–Mojokerto	36	A crucial segment for industrial traffic, connecting the provincial capital of East Java (Surabaya) to Mojokerto. It shortens travel time and supports freight movement to inland areas.
Pasuruan–Purabaya	31	Part of the eastern extension of the Java toll network, this segment improves access to East Java's "Tapal Kuda" region and boosts tourism potential near Mount Bromo.

This toll road system has been developed through a combination of government and private sector initiatives and is composed of various interconnected toll segments operated by different concessionaires. It serves as the backbone of Java's land transportation infrastructure, providing an uninterrupted high-speed roadway that connects the western, central, and eastern regions of the island. This rapid development has improved connectivity between key economic zones and rural hinterlands. The spatial coverage of toll roads now spans all six provinces in Java, creating a continuous corridor from west to east.

3.2 Accessibility Indicators

Accessibility improvements are measured using several metrics:

- **Average Travel Time Reduction:**
Travel time between Jakarta and Surabaya has been reduced from over 16 hours to approximately 9–10 hours by private vehicle. For freight, logistics operators report travel time savings of up to 40%.
- **Population Reachability Index:**
In 2010, only 35% of Java's population lived within 10 km of a toll road. By 2023, this figure increased to over 70%, with several medium-sized towns gaining direct access to toll exits.
- **Intermodal Integration:**
In selected areas, toll roads have improved access to seaports, dry ports, and industrial estates, notably in Kendal, Gresik, and Bekasi, reducing first-mile and last-mile transportation bottlenecks.

3.3 Economic Impact Data

To capture economic outcomes, the following indicators are used:

- **Gross Regional Domestic Product (GRDP) Growth:**
Regions with direct toll access show higher average annual GRDP growth (5.5%–6.5%) compared to non-connected regions (3.5%–4.5%) during the 2015–2022 period.
- **Investment Realization:**
Investment inflows, especially in manufacturing and logistics sectors, increased significantly in districts with toll road exits. For example, Central Java's Kendal

Industrial Park recorded a 300% increase in domestic investment after the toll road was operational.

- **Employment Generation:**
New employment opportunities emerged in construction, transportation, warehousing, and trade sectors. In Probolinggo and Ngawi, toll development correlated with a 7–12% increase in employment in logistics-related jobs.
- **Land Value Escalation:**
Land prices within a 5 km radius of toll exits increased by an average of 50–150%, particularly in suburban districts, reflecting increased demand for industrial, residential, and commercial developments.

3.4 Regional Inequality Patterns

Despite the overall positive trends, the data show persistent spatial disparities:

- **Urban vs Rural Gains:**
Economic benefits are concentrated in metropolitan areas (e.g., Greater Jakarta, Surabaya, Semarang), while rural districts often act as transit zones with limited economic spillovers.
- **Uneven Industrial Development:**
New industrial clusters are emerging only near toll exits with existing supporting infrastructure, while isolated areas—despite having toll access—struggle to attract investors due to lack of utilities and skilled labor.
- **Access Gaps for Peripheral Areas:**
Regions located more than 15 km from toll exits still face limited access to markets and services, underscoring the need for feeder road development and intermodal connectivity.

This comprehensive dataset supports the hypothesis that toll road development enhances regional accessibility and economic performance, but the benefits are not automatically inclusive. These data trends form the empirical foundation for the subsequent analysis and discussion on policy implications, development equity, and long-term infrastructure planning.

The comprehensive dataset gathered throughout this research offers a rich and multilayered picture of how toll road development has reshaped accessibility and influenced economic behavior across Java Island. Each category of data—ranging from spatial reach, economic growth indicators, employment figures, investment flows, and land use dynamics—tells a part of the evolving story of Java's transformation over the past decade.

3.5 Infrastructure Expansion and Regional Accessibility

The expansion of toll roads from approximately 620 kilometers in 2010 to over 1,400 kilometers in 2023 marks a historic infrastructure shift in Indonesia's most densely populated island. This dramatic increase in road length not only created physical links between major cities but also connected previously underserved rural and peri-urban regions to the national economic grid.

The accessibility gains are evident in the significant increase in the number of districts with direct toll access. Many medium-sized towns that were once isolated now find themselves within 15–30 minutes of high-speed road networks. The reduction in intercity travel time—up to 40% in key logistics routes—has improved the movement of goods and people, lowered transport costs, and increased mobility efficiency. These accessibility changes have redefined regional connectivity hierarchies and enabled a shift in spatial development patterns.

Yet, these gains are not universally shared. Districts without toll exits, or those located farther from major junctions, have not experienced the same improvements in connectivity. This geographic divergence in access creates an uneven foundation upon which economic opportunities unfold.

3.6 Economic Growth Patterns and GRDP Acceleration

Economic indicators across Java show a clear pattern: regions with toll access demonstrate stronger economic growth. GRDP per capita in toll-connected districts has grown at a faster rate compared to districts lacking such access. This trend suggests that the improved logistical connectivity enables higher productivity, more efficient supply chains, and expanded market reach for local businesses.

Furthermore, toll-connected areas have attracted significant investment, especially in the manufacturing, logistics, and retail sectors. These inflows often cluster around toll exits, industrial estates, and urban fringes, where land is still available and access to infrastructure is optimal. As a result, some districts have witnessed the emergence of new economic clusters that were previously non-existent, changing the regional economic map of Java.

However, this growth pattern also highlights the risks of centralization and clustering. Investments are heavily concentrated in specific zones, while nearby districts without infrastructure readiness or supporting policies remain stagnant. The spatial concentration of growth leads to inter-regional competition rather than collaboration, potentially widening inequality between high-growth and low-growth areas.

3.7 Employment and Labor Market Response

The creation of new jobs, especially in transport, warehousing, and supporting industries, follows a similar pattern to GRDP and investment. In toll-connected districts, employment rates have improved due to increased business activities, construction works, and logistic operations. This has positive implications for local livelihoods and household income, particularly in urban and peri-urban settings.

In rural areas, the impact on employment is more indirect. While some benefits are felt through supply linkages or temporary construction jobs, the lack of long-term industrial absorption in these areas limits broader labor market transformation. Without follow-up investment in education, skills development, and entrepreneurship, rural labor forces risk being left behind despite the presence of high-speed infrastructure nearby.

3.8 Land Value Escalation and Land Use Transformation

The spike in land values near toll exits reflects the economic revaluation of accessible areas. Agricultural land and previously underutilized peri-urban land have been converted for

residential, commercial, and industrial use. This process has created opportunities for landowners and developers but has also introduced risks, such as speculative land grabs, displacement of vulnerable communities, and environmental degradation.

In some districts, unplanned urban expansion has begun to outpace infrastructure provisioning, causing strain on public services, traffic congestion, and informal settlement growth. This underscores the importance of aligning toll infrastructure with urban planning and zoning regulations to avoid uncontrolled sprawl.

3.9 Spatial Inequality and Disparity in Outcomes

While the overall picture reflects progress, the spatial disparities across regions remain a major concern. The data reveal that the distribution of benefits—whether in terms of economic growth, accessibility, investment, or social outcomes—is highly uneven. Urbanized areas with existing infrastructure, investor interest, and human capital tend to capture most of the benefits, while rural and marginal areas remain under-connected and underdeveloped.

Moreover, there is a growing divide between regions located within the toll road corridor and those outside it. Peripheral districts, especially those without feeder roads or complementary logistics facilities, are often excluded from the regional growth dynamics. These areas may experience the costs of through-traffic (e.g., environmental and land use pressures) without gaining equivalent economic returns.

Summary of Data Interpretation, the data show that toll road development has been a powerful enabler of regional transformation on Java Island. Accessibility has improved dramatically, economic activities have become more dynamic, and new urban centers are emerging along toll corridors. However, these benefits are conditional and unevenly distributed, influenced by geographic location, infrastructure readiness, human capital, and local governance.

The analysis underscores that infrastructure alone is not a guarantee of equitable development. Without integrated planning, policy alignment, and capacity-building at the local level, the risk remains that toll roads will primarily benefit already-advantaged regions, leaving others behind. The interpretation of data therefore not only confirms the infrastructure's potential but also highlights the challenges of inclusive growth and spatial justice.

3.10 Analysis and Discussion

The analysis of the collected data offers a comprehensive view of how toll road development in Java Island has significantly altered patterns of accessibility, economic performance, and spatial dynamics. This section synthesizes the numerical and spatial data with a critical interpretation of how different regions experience and respond to toll infrastructure expansion, highlighting both positive impacts and structural limitations.

a) Accessibility Enhancement and Transportation Efficiency

The first major finding is the considerable improvement in regional accessibility. With over 1,400 kilometers of toll roads operational by 2023, physical connectivity between major cities and surrounding regions has strengthened substantially. This expansion has reduced

inter-city travel time, improved the reliability of freight and logistics, and created more efficient commuting options.

Accessibility improvements are most evident in regions adjacent to toll road exits. These areas have become more connected to major economic centers, enabling businesses to access suppliers and customers more rapidly. Logistics companies report faster delivery cycles, which, in turn, support just-in-time supply chain operations. For individuals, increased accessibility means better access to employment opportunities, services, and markets.

However, the benefits of this improved connectivity are not evenly distributed. Districts without direct toll access or feeder infrastructure remain marginalized. In these regions, travel time savings and economic linkages are minimal, perpetuating isolation despite the proximity of high-speed infrastructure. This reveals a spatial imbalance in the benefits of toll roads, dependent not only on physical location but also on the presence of supporting transportation systems.

b) Economic Growth and Investment Polarization

Data show a strong correlation between toll road access and economic indicators such as GRDP growth, investment inflows, and employment rates. Districts connected to toll networks experience accelerated economic activity due to improved transport efficiency, investor interest, and market access. New industrial zones and logistics hubs have emerged along major corridors, supporting broader economic diversification.

However, this growth is geographically concentrated. Investment tends to favor areas that already have industrial potential, urban infrastructure, and a skilled workforce. As a result, economic development becomes clustered, and wealth creation is skewed toward specific zones, particularly in peri-urban and industrial belt regions. Meanwhile, rural and agrarian districts often experience limited spillover effects, with little incentive for investors to venture into these areas due to logistical and structural constraints.

The polarization of investment raises concerns about long-term inequality. While infrastructure is designed to connect regions and close development gaps, the current trajectory shows that toll road benefits may reinforce existing disparities unless actively managed through policy and local empowerment.

c) Labor Market Shifts and Sectoral Transitions

Toll development has spurred job creation, particularly in construction, transport, logistics, and warehousing sectors. As accessibility improves, businesses are more likely to expand operations, increasing labor demand. In some districts, this has resulted in a measurable decline in unemployment and a shift in the economic base from traditional sectors (such as agriculture) toward services and industry.

However, the quality and sustainability of employment gains vary. While urban centers witness the rise of formal employment and skill-based opportunities, many rural areas only benefit from temporary or informal jobs tied to construction and roadside commerce. Without strategic workforce development, this transition may lead to underemployment or structural mismatch between labor supply and emerging economic demands.

Furthermore, labor mobility—while improved by better roads—is not equally available to all. The poorest populations, lacking capital or information, may remain excluded from the formal job market despite geographical proximity. This points to the need for inclusive human capital strategies that align infrastructure with education and training.

d) Land Use Dynamics and Spatial Transformation

Toll roads have reshaped land use and urban growth patterns across Java. Areas near toll exits have experienced rapid land value appreciation and increased demand for residential, commercial, and industrial development. This transformation has stimulated local economies, boosted property taxes, and catalyzed new real estate and infrastructure projects.

Yet, unregulated land conversion poses challenges. Rapid development often outpaces local planning capacity, leading to uncontrolled urban sprawl, environmental degradation, and loss of agricultural land. The speculation-driven expansion can also displace vulnerable populations and disrupt traditional community structures.

To address these issues, integrated spatial planning is essential. Toll roads should be seen as part of a larger development ecosystem that includes zoning, housing, public services, and environmental management. Without such integration, the physical benefits of toll infrastructure may give rise to long-term socio-environmental costs.

e) Structural Barriers to Inclusive Development

While toll roads have triggered growth in many areas, not all regions are equally equipped to capitalize on these changes. Structural barriers—such as weak local governance, limited access to capital, poor education systems, and inadequate feeder road infrastructure—prevent some regions from converting improved accessibility into tangible economic benefits.

These constraints are particularly visible in rural and eastern Java, where development is slower despite proximity to toll corridors. In some cases, toll roads merely serve as transit routes through economically stagnant areas, offering little interaction with or benefit to local communities. This highlights the need for development strategies that go beyond infrastructure, targeting the institutional and human dimensions of regional development.

f) Summary of Key Issues and Policy Considerations

The discussion of data reveals that toll road development in Java Island delivers significant positive outcomes in terms of connectivity and economic growth. However, the benefits are conditional and concentrated, rather than automatic and widespread. Toll roads act as a catalyst, but the extent of their impact depends on local readiness, supporting infrastructure, and institutional capability.

To maximize the benefits and address emerging disparities, policy efforts must focus on:

- Strengthening regional planning and coordination
- Investing in feeder infrastructure and intermodal connectivity
- Promoting inclusive labor and SME development
- Regulating land use and mitigating environmental impact

- Empowering local governments and communities to participate in planning and benefit-sharing

Toll road development on Java Island has undeniably transformed the region's transportation and economic landscape. The infrastructure has created opportunities for growth, investment, and mobility. However, these benefits are not inherently equitable. They must be actively managed, distributed, and aligned with broader development goals. The analysis affirms the dual nature of infrastructure-led development: a powerful driver of progress, but one that must be guided by intentional, inclusive, and place-based policies to ensure long-term prosperity for all regions of Java.

The findings of this study on Java Island are consistent with and, in some cases, expand upon insights from international research regarding the relationship between transportation infrastructure and regional economic development. One of the central findings of this research is that toll road expansion significantly improves regional accessibility, particularly for urban and peri-urban areas, and has measurable positive effects on economic growth, investment, and labor mobility. However, these benefits tend to be spatially concentrated, often bypassing rural and underdeveloped districts. This uneven distribution mirrors the spatial spillover effects and core-periphery dynamics frequently discussed in the global literature.

For instance, Banerjee, Duflo, and Qian (2020), in their study of transport infrastructure in China, found that new highways led to strong economic gains in connected cities, especially in terms of industrial output and employment, but had little to no benefit for peripheral areas not directly linked to highway access points. This aligns with our findings in Java, where toll road benefits are largely concentrated in industrial corridors and commercial zones.

Similarly, the work of Gibbons, Lyytikäinen, and Overman (2019) in the UK examined how road accessibility improvements influence local economies. Their analysis showed that regions with higher baseline productivity gain more from transportation investments than low-productivity areas, which again supports our observation that existing institutional and economic readiness is a crucial factor in determining the impact of toll infrastructure (El-Maissi et al., 2022; Sharma & Ram 2023).

In Sub-Saharan Africa, Buys, Deichmann, and Wheeler (2010) projected the potential impacts of highway improvements on trade and GDP. They emphasized that road investments need to be complemented with supportive policies, including rural development, land reform, and institutional capacity-building. This mirrors the conclusion in our study that toll road infrastructure in Java, while transformative, requires integrated planning and inclusive development policies to avoid exacerbating regional inequality (Pokharel et al. 2021; Shao et al. 2022).

In summary, this study reinforces the global consensus **that** infrastructure alone is not sufficient to ensure balanced regional development. The economic gains are often conditional upon institutional quality, human capital, local governance, and spatial integration. Java's experience exemplifies the challenges of translating physical connectivity into inclusive economic growth, especially in diverse and geographically fragmented territories.

4. CONCLUSION

The development of toll road infrastructure on the Island of Java has brought about a substantial transformation in both accessibility and economic dynamics. Enhanced connectivity between major cities and rural hinterlands has reduced travel time, improved mobility, and expanded regional integration. These improvements have facilitated the movement of goods and people, leading to increased economic productivity, growth in logistics efficiency, and broader investment inflows across various sectors.

The toll roads have also contributed to more balanced regional development by enabling previously isolated areas to participate in the national economy. However, the benefits have not been evenly distributed, with some regions and communities experiencing limited access or facing displacement issues. Moreover, the long-term sustainability of these benefits depends on inclusive planning, environmental considerations, and equitable access to infrastructure.

Overall, toll road construction in Java has proven to be a strategic enabler of economic development and spatial transformation. When supported by sound governance and complementary policies, such infrastructure can serve as a catalyst for long-term growth and regional competitiveness.

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