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Social Consequences of Public Transport Accessibility Gaps for Vulnerable Groups in Indonesian Medium-Sized Cities: A Multiple-Case Study

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ABSTRACT: Public transport accessibility is essential for equitable urban mobility, particularly in medium-sized Indonesian cities experiencing rapid suburban growth that outpaces transport development, creating accessibility gaps between urban centers and peripheries. This study examines the social consequences of these gaps for vulnerable groups in three cities: Malang, Mataram, and Palu. Using a qualitative multiple-case study design, data were collected in January 2025 through field observations, document analysis, and semi-structured interviews with ten purposively selected participants, including transport users, peripheral commuters, students, older adults, operators, drivers, officials, and an academic, analyzed thematically through open, axial, and selective coding. Findings reveal consistent disparities: urban centers have denser networks, higher frequency, shorter waits, and better first/last-mile connectivity, while peripheral areas face limited routes, unreliable service, longer walking distances, and poor pedestrian infrastructure. These gaps increase travel costs, delay access to employment, education, and healthcare, reduce mobility, and heighten dependence on private motorcycles, ride-hailing, and family support—most affecting older adults, persons with disabilities, students, low-income households, and peripheral residents. Inequality is reinforced by rapid suburbanization, limited funding, low route viability, and weak transport–land-use integration. The study concludes that improving accessibility requires reliable frequency, strong first/last-mile connections, accessible pedestrian infrastructure, and integrated planning, supported by policies prioritizing peripheral routes, feeder services, subsidies, and coordinated governance to reduce social exclusion.

Keywords: Public Transport Accessibility, Transport Equity, Social Exclusion, Vulnerable Groups, Medium-Sized Cities, Thematic Analysis, Indonesia

INTRODUCTION

Public transport accessibility is widely recognized as a fundamental component of sustainable urban development because it determines the extent to which residents can participate in

economic, educational, healthcare, and social activities. Accessibility extends beyond the physical availability of transport services and encompasses the interaction between transport networks, land-use patterns, governance, affordability, and users' mobility needs. As cities continue to expand spatially, maintaining equitable accessibility becomes increasingly challenging, particularly in medium-sized cities where transport investments often lag behind urban growth. Consequently, disparities in accessibility have emerged as an important concern for urban planners and policymakers seeking to achieve socially inclusive and environmentally sustainable cities.

The determinants of public transport accessibility are multidimensional. Spatial structure and urban form strongly influence the effectiveness of transport provision because settlement density, urban corridors, and peri-urban expansion determine both travel demand and operational feasibility. Medium-sized cities frequently experience fragmented urban growth characterized by expanding suburban settlements, satellite communities, and dispersed residential development, making conventional fixed-route public transport increasingly difficult to provide efficiently (Singru, 2015). Accessibility is also shaped by network coverage, service design, multimodal integration, land-use patterns, institutional capacity, governance, and affordability. The interaction among these factors determines whether residents can conveniently access employment, education, healthcare, and other essential urban opportunities (Simon, 2008).

An extensive body of literature demonstrates that public transport accessibility is closely associated with social inclusion and transport equity. Reliable and affordable public transport enables individuals to participate in labor markets, educational institutions, healthcare systems, and social activities regardless of income or private vehicle ownership. Conversely, inadequate accessibility contributes to transport disadvantage and reinforces broader forms of social exclusion. Regional studies indicate that investments in public transport, particularly when integrated with feeder services and multimodal networks, can substantially improve mobility opportunities for lower-income and peri-urban populations. However, transport investments that prioritize high-capacity corridors without preserving neighborhood connectivity or integrating intermediate transport services may unintentionally reduce accessibility for populations that rely on flexible and affordable transport modes. Consequently, transport equity requires consideration not only of aggregate mobility improvements but also of the distribution of accessibility benefits across different population groups.

Urban sprawl presents an additional challenge for transport accessibility, particularly in developing countries. Rapid suburbanization often produces low-density settlements that increase travel distances, reduce passenger concentrations, and undermine the operational viability of fixed-route public transport. As peri-urban development accelerates, transport infrastructure frequently fails to expand at the same pace, creating areas with limited or nonexistent public transport services (Singru, 2015; Simon, 2008; "Harnessing Uzbekistan's Potential of Urbanization", 2021). Regional assessments further demonstrate that infrastructure investments in many developing countries have not kept pace with the expansion of secondary cities and suburban areas, leaving residents increasingly dependent on private vehicles or informal transport. These patterns indicate that transport planning cannot be separated from urban spatial planning if equitable accessibility is to be achieved.

The consequences of accessibility inequality are not experienced equally across society. Previous studies consistently identify residents of peri-urban areas, informal settlements, and low-income households as among the groups most vulnerable to inadequate public transport provision. Because these populations often depend on affordable public transport for daily mobility, deficiencies in route coverage, service frequency, or affordability directly affect access to employment, education, healthcare, and other essential services. The literature also highlights the particular mobility needs of older adults, persons with disabilities, women, and other mobility-constrained groups, emphasizing that equitable transport planning should address not only average users but also populations with greater accessibility challenges ("100 Climate Actions from Cities in Asia and the Pacific", 2021). These findings reinforce the importance of adopting a socially inclusive perspective when evaluating transport accessibility.

Another critical dimension of accessibility concerns first-mile and last-mile connectivity. Even where high-capacity public transport services exist, poor connections between residential areas and transport corridors may substantially reduce effective accessibility. Walkable streets, safe pedestrian infrastructure, bicycle facilities, feeder services, and coordinated multimodal systems are therefore essential components of successful public transport networks. Regional evidence suggests that intermediate transport modes and paratransit operators continue to play an important role in providing fine-grained neighborhood accessibility, particularly within peripheral areas where conventional public transport services remain limited ("Tourism Sector Assessment, Strategy, and Road Map for Cambodia, Lao People's Democratic Republic, Myanmar, and Viet Nam (2016–2018)", 2017; "100 Climate Actions from Cities in Asia and the Pacific", 2021). In many expanding suburban areas, however, inadequate feeder services, poor pedestrian infrastructure, and the absence of integrated transport planning create service deserts that require residents to rely on private vehicles or expensive informal transport options ("Tajikistan National Urban Assessment", 2024; Simon, 2008).

Despite growing international attention to transport accessibility, empirical evidence focusing specifically on medium-sized cities remains comparatively limited. Regional studies acknowledge that medium-sized and secondary cities accommodate a substantial proportion of Asia's urban population and serve as important service centers for surrounding regions, yet these cities often possess weaker institutional capacity, limited financial resources, and less developed transport infrastructure than metropolitan areas (Singru, 2015; "Together We Deliver: 50 Stories of ADB's Partnerships in Asia and the Pacific", 2017). Existing evidence from Southeast Asia illustrates that policy choices regarding transport governance, service provision, and integration with informal transport substantially influence accessibility outcomes outside major metropolitan regions ("100 Climate Actions from Cities in Asia and the Pacific", 2021). Nevertheless, systematic comparative studies examining public transport accessibility in Indonesian medium-sized cities remain scarce, particularly those employing qualitative approaches to capture the lived experiences of diverse user groups. Previous regional assessments have therefore emphasized the need for place-based investigations capable of informing scalable and context-sensitive transport policies (Simon, 2008; "Harnessing Uzbekistan's Potential of Urbanization", 2021).

Against this background, the present study investigates the social consequences of public transport accessibility gaps between urban centers and peripheral areas in three Indonesian medium-sized cities: Malang, Mataram, and Palu. Using a qualitative multiple-case study approach, the research explores how accessibility disparities influence employment, education, healthcare access, and everyday mobility among vulnerable populations while identifying the institutional and spatial factors contributing to these inequalities. The novelty of this study lies in its comparative examination of multiple Indonesian medium-sized cities using rich qualitative evidence from transport users, operators, government officials, and academics. By integrating perspectives on accessibility, social exclusion, and transport governance, the study contributes empirical evidence to the growing literature on transport equity and provides policy recommendations for developing more inclusive, equitable, and integrated public transport systems in medium-sized cities.

METHOD

Research Design

This study employed a qualitative multiple-case study design to examine the social consequences of public transport accessibility gaps for vulnerable groups in Indonesian medium-sized cities. A multiple-case approach was selected because it enables an in-depth exploration of complex social phenomena across different urban contexts while facilitating cross-case comparison. Qualitative case studies are particularly appropriate for investigating transport accessibility because they capture the lived experiences, perceptions, and adaptive behaviors of diverse stakeholders that cannot be adequately represented through quantitative accessibility indicators alone (Biddell et al., 2022; He et al., 2024; Sudeshika et al., 2021).

The research focused on three Indonesian medium-sized cities Malang, Mataram, and Palu which represent different geographical regions and public transport conditions. Examining multiple cities improves analytical robustness by identifying recurring patterns and context-specific differences in accessibility and social exclusion. The multiple-case design also supports the development of transferable explanations regarding transport equity in medium-sized cities while remaining sensitive to local institutional and spatial contexts (Cole & Rioufreyt, 2020; McRell et al., 2020).

Study Areas

The study was conducted in three purposively selected Indonesian medium-sized cities: Malang, Mataram, and Palu. Each city continues to operate public transport services while experiencing rapid peripheral urban expansion. They were selected because they possess: (1) operational public transport systems, (2) expanding suburban or peripheral development, (3) available transport and spatial planning documents, and (4) observable differences in service quality between urban centers and peripheral areas.

Within each city, one urban-center district and one peripheral district were selected to facilitate spatial comparison:

City	Urban Center	Peripheral Area
Malang	Klojen	Kedungkandang
Mataram	Cakranegara	Sandubaya
Palu	Palu Timur	Mantikulore

Selecting contrasting urban and peripheral locations enabled examination of how differences in transport provision shape everyday accessibility and social inclusion.

Participant Selection

Purposive sampling was employed to recruit participants possessing direct knowledge and experience of public transport accessibility. This sampling strategy is widely recommended for qualitative case studies because it prioritizes information-rich participants capable of providing detailed insights into the phenomenon under investigation (McRell et al., 2020).

Ten participants represented a broad range of perspectives:

Code	Participant
I1–I2	Public transport users (urban center)
I3–I4	Peripheral residents and commuters
I5	University student
I6	Older adult
I7	Public transport driver
I8	Public transport operator
I9	Local Transport Agency representative
I10	Transport academic

Including users, operators, policymakers, and academic experts enabled triangulation of perspectives and strengthened the comprehensiveness of the findings.

Data Collection

Data collection was conducted throughout January 2025.

Period	Activity
Week I	Field observation and document review
Weeks II–III	Semi-structured interviews
Week IV	Data verification and preliminary analysis

Three complementary techniques were employed:

Field observation documented transport infrastructure, route coverage, stop accessibility, pedestrian conditions, and first-mile/last-mile connectivity.

Document analysis reviewed transport master plans, spatial planning documents, and local government reports to contextualize interview findings.

Semi-structured interviews served as the primary data source. This interview format provides flexibility for probing participants' experiences while maintaining consistency across cases, making it particularly suitable for comparative transport accessibility research (Biddell et al., 2022; He et al., 2024). The interview guide covered ten themes, including accessibility, transport barriers, service frequency, differences between urban centers and peripheral areas, social impacts, adaptation strategies, vulnerable populations, institutional causes, government roles, and policy recommendations.

Standardized interview questions were applied across all participants while allowing follow-up questions to capture city-specific and participant-specific experiences. This balance between consistency and flexibility is recommended for comparative qualitative studies because it supports both cross-case comparison and contextual understanding (Cole & Rioufreyt, 2020; Sudeshika et al., 2021).

Data Analysis

Interview recordings were transcribed verbatim prior to analysis. Data were analyzed using thematic analysis because it provides a flexible and systematic approach for identifying recurring patterns within qualitative data while accommodating both inductive and deductive reasoning (Brooks et al., 2018).

The analytical procedure followed four iterative stages.

First, transcripts were read repeatedly to achieve data familiarization and develop an initial understanding of participants' experiences.

Second, open coding was conducted to identify meaningful concepts related to transport accessibility, barriers, adaptation strategies, institutional issues, and social consequences. Open coding generated numerous initial codes without imposing predetermined categories(Al-Nuaimi et al., 2020; Lim, 2024).

Third, axial coding grouped related codes into broader analytical categories by identifying relationships among concepts. Categories such as accessibility barriers, vulnerable groups, institutional constraints, and adaptation strategies emerged during this stage (Schmid & Winkler, 2023).

Fourth, selective coding integrated these categories into overarching themes that explained the relationships between public transport accessibility, social exclusion, and transport equity. This stage produced the final thematic framework used to interpret the findings (McRell et al., 2020; Lim, 2024).

The coding process was iterative, allowing themes to be refined as additional comparisons were made across participants and study sites. This approach is consistent with recommended qualitative practice, which emphasizes continual movement between empirical evidence and conceptual interpretation during theme development (Ghadi et al., 2022).

Trustworthiness and Research Rigor

Several procedures were implemented to enhance the trustworthiness of the analysis. First, methodological triangulation combined interviews, field observations, and document analysis to corroborate findings across multiple sources. Second, cross-case comparison enabled recurring themes to be examined across the three cities while identifying context-specific variations. Third, an explicit coding trail was maintained throughout the analytical process to document coding decisions, category development, and theme refinement. Such transparent documentation is widely recommended for improving credibility, dependability, and confirmability in qualitative research (Albasha et al., 2025).

The analytical process also incorporated researcher reflexivity through continual reflection on coding decisions and interpretation. Maintaining an auditable analytic trail including code definitions, thematic memos, and iterative comparisons is considered good practice in thematic analysis and supports transparent reporting of qualitative findings (Mastrobattista et al., 2024). Although this study was conducted by a single research team, the use of structured coding procedures and consistent interview protocols enhanced analytical consistency across the three study sites.

Overall, the methodological approach combined qualitative multiple-case study design, semi-structured interviews, thematic analysis, and systematic coding procedures to produce a rigorous understanding of how public transport accessibility inequalities shape social exclusion among vulnerable populations in Indonesian medium-sized cities. By integrating established methodological guidance with context-specific fieldwork, the study provides a transparent and credible foundation for interpreting accessibility disparities and informing equitable transport policy.

RESULT AND DISCUSSION

Overview of the Findings

The analysis identified a consistent pattern of unequal public transport accessibility between urban centers and peripheral areas across the three medium-sized Indonesian cities examined in this study. Participants described accessibility not merely as the presence of public transport vehicles, but as the combined outcome of route availability, service frequency, waiting time, proximity to stops, service reliability, and first-mile and last-mile connectivity. These dimensions correspond with established public transport accessibility frameworks, which conceptualize accessibility as a multidimensional interaction between spatial coverage, temporal service provision, and the ability to reach relevant destinations within acceptable time and cost limits (Adhvaryu & Mudhol, 2021; Lyons & Choi, 2021; Schlossberg et al., 2013).

The thematic analysis generated six interrelated themes: spatial differences in route availability, unequal service frequency and waiting time, first-mile and last-mile barriers, social consequences of reduced accessibility, disproportionate impacts on vulnerable groups, and institutional causes of service inequality. Across the interviews, urban-center users generally reported easier access, more frequent services, and shorter walking distances to stops. By contrast, peripheral residents described limited route coverage, long and uncertain waiting times, weak pedestrian connections, and dependence on alternative transport modes.

Unequal Route Availability and Spatial Coverage

Route availability emerged as the most visible distinction between urban centers and peripheral areas. Urban-center participants reported that public transport routes were generally available near their homes and connected them to several daily destinations. Informant I1, a worker living in an urban-center area, explained:

"From my house to the stop, it takes about five minutes on foot. Vehicles also pass quite frequently."

This statement indicates that accessibility in central areas was supported by both stop proximity and route availability. Informant I2 similarly considered public transport relatively accessible, although the route did not provide a direct connection to the market:

"I still have to take a motorcycle taxi after getting off the minibus because the route does not reach the market. So, the access exists, but it is not fully connected."

The experience of I2 shows that physical route availability does not automatically guarantee complete accessibility. A route may be present but remain insufficient when it fails to connect users directly to important destinations. This finding reflects the distinction between basic service coverage and destination-based accessibility. Coverage-oriented approaches assess whether stops or routes are available, whereas broader accessibility measures evaluate whether users can reach employment, markets, education, healthcare, and other opportunities (Adhvaryu & Mudhol, 2021; Lyons & Choi, 2021).

Peripheral participants reported substantially poorer conditions. Informant I3 stated that no direct service connected the residential area to the primary workplace destination. Informant I4 similarly explained:

"There is no public minibus entering our residential complex. To reach the community health center, I have to order a motorcycle taxi or ask a family member to take me."

These accounts demonstrate that peripheral settlements contained areas effectively located outside the practical public transport service network. The problem was not limited to route inconvenience but involved the complete absence of services within residential areas. Consequently, residents had to make additional trips using private, informal, or app-based transport before accessing formal public transport or essential services.

Table 1. Comparison of Route Availability and Spatial Accessibility

Accessibility Dimension	**Urban Centers**	**Peripheral Areas**
Route availability	Relatively high	Limited
Proximity to stops	Generally near	Frequently distant
Direct connection to destinations	Partially available	Often unavailable
Spatial coverage	Concentrated and denser	Fragmented
First-mile access	Relatively manageable	Frequently difficult
Dependence on additional modes	Moderate	High

The findings indicate that route coverage was spatially concentrated in urban centers where passenger demand was higher. Peripheral areas, despite continuing residential expansion, remained weakly connected to the existing network. This unequal spatial distribution formed the foundation of the broader accessibility gap identified in the study.

Service Frequency, Waiting Time, and Reliability

Service frequency was the second major component differentiating urban centers from peripheral areas. Participants in urban-center locations generally described services as relatively frequent, although congestion and high passenger demand could reduce comfort and increase waiting during peak periods. Informant I1 observed that vehicles operated throughout much of the day, but morning services were often crowded:

"The problem usually occurs in the morning because there are many passengers, so sometimes I have to wait for the next vehicle."

This suggests that even in better-served central areas, effective accessibility could decline during periods of overcrowding. Dynamic accessibility studies similarly show that service availability may vary according to time of day, capacity, schedule performance, and passenger loading (Li et al., 2020).

Peripheral residents reported more severe service-frequency problems. Informant I3 described waiting for almost forty minutes in the morning:

"Sometimes in the morning I wait almost forty minutes before a vehicle arrives. In the end, I more often ride my own motorcycle so that I am not late for work."

Informant I5, a university student, emphasized uncertainty rather than waiting duration alone:

"The most difficult thing is not knowing when the vehicle will arrive. Sometimes I have waited for a long time, but no minibus passes."

These findings show that accessibility was influenced not only by nominal service frequency but also by schedule reliability and predictability. Long headways increase expected waiting time, while irregular operations make travel planning difficult. Service-frequency research identifies headway as a central dimension of public transport quality because shorter and more consistent intervals reduce waiting and improve the perceived usability of a system (Schlossberg et al., 2013). Similarly, on-time performance and reliability affect transport equity when service irregularity is concentrated in disadvantaged areas (Palm et al., 2020).

Table 2. Service Frequency and Waiting-Time Conditions

Indicator	Urban Centers	Peripheral Areas
Service frequency	Relatively frequent	Infrequent
Waiting time	Generally shorter	Frequently prolonged
Schedule certainty	Moderate	Low
Peak-hour conditions	Crowding and congestion	Vehicle scarcity
Service reliability	Relatively better	Unpredictable
Main user response	Wait for the next vehicle	Shift to another mode

The contrast indicates two different types of service problem. Central users mainly experienced congestion and crowding, whereas peripheral users experienced scarcity, irregularity, and uncertain arrival times. These conditions had direct implications for work attendance, educational participation, and users' willingness to rely on public transport.

First-Mile and Last-Mile Accessibility Barriers

First-mile and last-mile connectivity emerged as a critical determinant of practical accessibility. Several participants noted that reaching a stop was difficult because of long walking distances, poor road conditions, or unsafe pedestrian infrastructure. Informant I6, an older adult, explained:

"I actually want to use public transport, but the walk to the stop is quite far. The pavement is also uneven, so I am afraid of falling."

This experience demonstrates that a service may technically exist but remain inaccessible to users whose physical mobility is constrained. Informant I4 also described poor road access and the absence of vehicles entering the residential area. In such cases, the first stage of the journey became a barrier before the formal public transport trip had even begun.

The literature treats first-mile and last-mile connectivity as essential to converting network coverage into effective accessibility. Walkable routes, feeder services, safe crossings, and coordinated transfers determine whether users can reach and leave major transport corridors (Adhvaryu & Mudhol, 2021). Public Transport Accessibility Level and related indicators similarly combine stop access, walking distance, frequency, and spatial context rather than treating route presence as sufficient.

Table 3. First-Mile and Last-Mile Barriers

Barrier	Supporting Informants	Practical Consequence
Long walking distance	I2, I6	Greater physical burden
No service within residential area	I3, I4	Need for additional transport
Poor road or pedestrian condition	I4, I6	Safety and mobility risks
Incomplete destination connection	I2	Additional transfer required
Limited feeder services	I3, I4, I6	Dependence on motorcycles or family
Uncertain transfer availability	I2, I5	Longer and less predictable trips

The findings indicate that peripheral accessibility gaps were produced through both network-level deficiencies and neighborhood-level access barriers. For older adults and mobility-limited users, pedestrian conditions were especially important. For workers and students, incomplete connections increased travel time and reduced schedule reliability.

Social Consequences of Accessibility Gaps

The accessibility gap produced several social consequences related to employment, education, healthcare, travel expenditure, and everyday mobility. Informant I3 reported that long waiting times created a risk of arriving late at work and encouraged reliance on a private motorcycle. Informant I5 experienced delays in reaching university because of uncertain schedules. These accounts indicate that poor service reliability affected participation in time-sensitive activities.

Healthcare access was particularly problematic for peripheral residents. Informant I4 depended on ride-hailing services or family assistance to reach a community health center, while I6 reported difficulty traveling to a hospital because of the long and unsafe walk to the stop. These findings suggest that transport barriers may reduce not only convenience but also access to essential services.

Travel costs also increased when residents were required to combine public transport with ride-hailing or private vehicles. Informant I2 had to pay for an additional motorcycle-taxi trip after leaving the public minibus, while I3 used a private motorcycle to avoid delays. Although these alternatives improved mobility, they transferred additional costs to households.

Table 4. Social Consequences Identified in the Interviews

Social Domain	Main Consequence	Supporting Informants
Employment	Late arrival and reduced reliability	I2, I3
Education	Delayed arrival at university	I5
Healthcare	Difficulty reaching clinics and hospitals	I4, I6
Household expenditure	Increased transport costs	I2, I3, I4
Daily mobility	Reduced flexibility and dependence	I6, I9
Public-service access	Unequal access between areas	I9, I10

Informant I9 characterized the broader consequence as reduced community mobility, while I10 linked the transport gap to inequality in access to public services. These statements show that public transport accessibility was perceived as a social-equity issue rather than merely an operational transport problem.

Vulnerable Groups and Unequal Burdens

Participants consistently identified older adults, persons with disabilities, students, low-income households, and peripheral residents as the groups most affected by limited accessibility. Older adults faced long walking distances and unsafe pedestrian environments. Students were affected by uncertain schedules and delays. Low-income households were considered especially vulnerable because they had fewer affordable alternatives when services were unavailable.

Informant I6 explicitly identified older adults and persons with disabilities as groups requiring special attention. Informant I3 emphasized low-income communities, while I9 similarly referred to economically disadvantaged households. Informant I10 viewed all mobility-vulnerable groups as being exposed to the consequences of unequal transport planning.

Table 5. Vulnerable Groups and Primary Accessibility Challenges

Vulnerable Group	Primary Challenge
Older adults	Long walking distances and unsafe pedestrian access
Persons with disabilities	Inaccessible infrastructure and limited assistance
Students	Uncertain schedules and educational delays
Low-income households	Higher relative transport costs
Peripheral residents	Limited routes and service frequency
Caregivers and homemakers	Difficult access to health and family services

The results demonstrate that accessibility inequality generated differentiated burdens. Users with private motorcycles or sufficient income could partially overcome service deficiencies, whereas transport-dependent groups had fewer adaptation options.

Adaptation Strategies

Participants adopted several strategies when formal public transport was unavailable or unreliable. These included private motorcycle use, ride-hailing, walking, carpooling, family assistance, and route adjustment. Informant I3 relied on a motorcycle to avoid work delays, while I4 used ride-hailing or requested help from family members. Informant I5 shared vehicles with others, and I6 depended on family support.

These strategies reduced immediate mobility constraints but also revealed hidden inequalities. Ride-hailing and private vehicles required additional financial resources, while family assistance depended on social support and household availability. Therefore, adaptation did not eliminate accessibility inequality; instead, it shifted the burden from the transport system to individuals and households.

Institutional and Operational Causes

Drivers, operators, government representatives, and the academic informant provided institutional explanations for the observed accessibility gap. Informant I7 stated:

"If we travel into peripheral areas, there are often no passengers. The operating costs are not covered, so most drivers prefer to remain on central routes."

Informant I8 similarly explained that low occupancy made new peripheral routes financially difficult to operate. Informant I9 acknowledged that peripheral services remained inferior because of limited government budgets and substantial infrastructure needs. Informant I10 identified weak integration between urban growth and transport planning:

"The main problem is not only the number of vehicles, but the growth of peripheral areas that is not followed by transport planning."

These findings reveal a reinforcing cycle. Low-density peripheral development reduced passenger concentration, making routes less profitable. Low profitability discouraged operators from expanding services, while limited public funding prevented government from compensating for commercially weak but socially necessary routes.

Cross-Theme Synthesis

The findings demonstrate that public transport accessibility inequality was produced through the interaction of spatial, temporal, infrastructural, social, and institutional factors. Route scarcity, low frequency, long waiting times, and poor first-mile connectivity reduced practical access in peripheral areas. These conditions restricted access to employment, education, and healthcare and disproportionately affected groups with limited mobility resources.

The empirical pattern can be summarized as follows:

Peripheral urban growth → limited route coverage → low service frequency and unreliable waiting times → weak first-mile and last-mile connectivity → dependence on costly alternatives → unequal access to essential opportunities.

This chain of effects shows that accessibility cannot be evaluated through route presence alone. A multidimensional assessment incorporating coverage, frequency, waiting time, reliability, walking access, destination connectivity, and social distribution is necessary to identify how transport inequalities are experienced in medium-sized cities (Schlossberg et al., 2013; Li et al., 2020; Palm et al., 2020; Adhvaryu & Mudhol, 2021; Lyons & Choi, 2021).

The findings demonstrate that public transport accessibility gaps in Indonesian medium-sized cities are produced through the interaction of spatial coverage, service frequency, waiting time, reliability, pedestrian access, and institutional capacity. Participants living in urban centers generally experienced closer stops, more frequent services, and denser route networks, whereas peripheral residents reported limited route availability, long and uncertain waiting times, poor first-mile and last-mile connectivity, and dependence on additional transport modes. This pattern confirms that accessibility cannot be understood solely as the physical presence of a route. Rather, it is a multidimensional condition shaped by where services operate, how frequently they run, whether arrival times are predictable, and whether users can safely reach stops and final destinations (Schlossberg et al., 2013; Adhvaryu & Mudhol, 2021; Gil, 2014; Lyons & Choi, 2021).

The urban–peripheral contrast found in Malang, Mataram, and Palu is consistent with the broader literature on spatially uneven transport provision. Medium-sized cities frequently experience dispersed growth, peri-urban expansion, and fragmented land-use development that increase trip distances and reduce the viability of conventional fixed-route services (Singru, 2015; Simon, 2008). In the present study, operators and drivers explained that peripheral routes were less attractive because passenger volumes were insufficient to cover operating costs. This creates a circular disadvantage: low-density development reduces demand concentration, limited demand discourages service expansion, and weak service encourages greater reliance on private vehicles. Over time, this process may reinforce both transport exclusion and automobile dependency.

The results also show that service frequency and waiting time are central to practical accessibility. Peripheral respondents described waiting periods of up to approximately forty minutes and uncertainty about whether vehicles would arrive at all. Such conditions affected work attendance,

educational participation, and confidence in public transport. Previous research similarly identifies frequency, headway, operating hours, and on-time performance as essential dimensions of service quality and accessibility (Palm et al., 2020). Dynamic accessibility research further demonstrates that access varies across the day because of congestion, overcrowding, schedule instability, and changing service levels (Ringsberg et al., 2023). Therefore, average route coverage may conceal significant temporal inequalities, particularly for users traveling during off-peak periods or from peripheral neighborhoods.

First-mile and last-mile barriers intensified these inequalities. Older participants reported that stops were too far away and that uneven pedestrian infrastructure increased the risk of falling. Other respondents had to use ride-hailing services or obtain assistance from family members before reaching a public transport route or essential destination. This finding supports multimodal accessibility frameworks that emphasize the importance of walking conditions, feeder services, transfer coordination, and neighborhood-scale connectivity (Gil, 2014; Adhvaryu & Mudhol, 2021). A route may appear accessible in a conventional network map while remaining effectively inaccessible to an older adult, a person with a disability, or a low-income household unable to afford an additional motorcycle-taxi trip. Consequently, spatial coverage should be interpreted together with pedestrian access, transfer requirements, and user capabilities.

The social consequences identified in the interviews extend beyond mobility inconvenience. Poor accessibility delayed workers and students, increased household transport expenditure, restricted healthcare access, and reduced participation in daily activities. These outcomes illustrate how transport disadvantage can generate or reinforce social exclusion. Public transport determines whether residents can reach employment, education, healthcare, markets, and social networks within acceptable time and financial limits. When access is unreliable or unaffordable, disadvantaged populations may lose opportunities even when those opportunities are geographically present. This relationship between mobility and social participation is consistent with research linking transport accessibility to employment access, life opportunities, and inclusion(Johnson et al., 2017; Siu, 2019; Stentzel et al., 2016).

The burdens were distributed unevenly. Older adults, persons with disabilities, students, low-income households, and peripheral residents were repeatedly identified as the most affected groups. These users commonly possess fewer mobility alternatives and are more sensitive to long walks, unreliable schedules, additional fares, and inaccessible infrastructure. The findings therefore support an equity-based interpretation of transport performance. A system may appear adequate when evaluated using citywide averages, yet still produce severe disadvantage for specific neighborhoods or social groups. Equity-oriented indicators are valuable because they reveal who benefits from service provision and who remains underserved (Lyons & Choi, 2021; Palm et al., 2020). In this context, transport equity requires more than equal distribution of routes; it requires differentiated interventions that respond to varying levels of need and vulnerability.

Adaptation strategies further reveal the hidden social costs of inadequate public transport. Respondents used private motorcycles, ride-hailing services, carpooling, walking, and family assistance when formal services were unavailable. Although these strategies maintained short-term

mobility, they shifted responsibility and cost from the transport system to individuals and households. Users with sufficient income, vehicle ownership, or family support could partially compensate for service deficiencies, whereas more vulnerable residents had fewer options. Thus, adaptation should not be interpreted as evidence that accessibility problems have been resolved. Instead, it demonstrates how households absorb institutional failures through additional expenditure, time, risk, and dependence.

The findings also underscore the importance of integrating public transport planning with land-use planning. Informants identified rapid peripheral development and the lack of corresponding transport expansion as major causes of accessibility inequality. This observation aligns with literature emphasizing transit-oriented development and multimodal land-use integration as strategies for aligning settlement growth with high-quality transport services (Das, 2021; Dindar, 2025; Nibbs, 2024). However, the direct transfer of metropolitan transit-oriented development models to Indonesian medium-sized cities may be inappropriate without contextual adjustment. These cities often rely on smaller vehicles, paratransit, informal operators, and dispersed travel patterns. A more suitable approach may combine compact development around strategic corridors with flexible feeder systems, improved walking access, and integration of existing intermediate transport services.

Governance and institutional coordination are equally important. Government representatives acknowledged fiscal limitations, while operators emphasized low route profitability. These perspectives indicate that market mechanisms alone are unlikely to deliver equitable coverage in peripheral areas. Socially necessary routes may require targeted subsidies, public service obligations, operator incentives, or contractual arrangements tied to minimum frequency and reliability standards. Governance literature shows that fragmented responsibilities, weak coordination, and incompatible systems can reduce accessibility even where infrastructure exists (Medeiros, 2019; Schiebel et al., 2015)s. Although cross-border governance differs from municipal transport management, the underlying lesson remains relevant: accessibility depends on institutional coordination, interoperable services, and clear policy responsibility.

Overall, the study contributes to transport-equity research by showing how accessibility inequality is experienced in medium-sized Indonesian cities through interconnected spatial, temporal, economic, and institutional mechanisms. The findings suggest that equitable intervention should prioritize peripheral route expansion, predictable schedules, neighborhood feeder services, safer pedestrian infrastructure, operational support for low-profit routes, and integrated transport–land-use planning. Policy evaluation should disaggregate service performance by location, time of day, and population group rather than relying solely on systemwide averages. Such an approach would better identify hidden inequalities and support a transition toward inclusive mobility and sustainable urban development.

CONCLUSION

This study examined the social consequences of public transport accessibility gaps between urban centers and peripheral areas in three Indonesian medium-sized cities: Malang, Mataram, and Palu. The findings demonstrate that accessibility inequality is shaped by the combined effects of limited route coverage, low service frequency, long and uncertain waiting times, weak first-mile and last-mile connectivity, inadequate pedestrian infrastructure, and insufficient integration between transport and land-use planning. These disadvantages were consistently more severe in peripheral areas than in urban centers.

The consequences extended beyond transport inconvenience. Inadequate services increased travel costs, delayed access to employment and education, restricted healthcare access, reduced daily mobility, and intensified dependence on private motorcycles, ride-hailing services, informal transport, and family assistance. Older adults, persons with disabilities, students, low-income households, and residents of peripheral areas experienced the greatest burdens because they possessed fewer affordable and reliable mobility alternatives.

The study's principal contribution is its comparative qualitative evidence showing how spatial and operational transport inequalities translate into broader forms of social disadvantage in Indonesian medium-sized cities. It demonstrates that transport accessibility should be evaluated not only through the presence of routes or stops, but also through service reliability, destination connectivity, walking conditions, affordability, and the distribution of mobility opportunities across population groups.

The findings imply that market-based service provision alone is unlikely to achieve equitable accessibility in low-demand peripheral areas. Public policy should therefore support socially necessary routes through operational subsidies, operator incentives, minimum service standards, neighborhood feeder systems, accessible stops, and safer pedestrian connections. Transport planning should also be integrated with spatial development policies so that peripheral residential growth is accompanied by adequate mobility infrastructure and services.

Future research should expand the number of cities, participants, and stakeholder groups examined. Mixed-method studies could combine qualitative evidence with geographic information systems, travel-time analysis, service-frequency data, and household transport expenditure. Further studies should also investigate gendered mobility patterns, disability access, affordability, digital ride-hailing dependence, and the long-term effectiveness of feeder services and transport subsidies. Such research would strengthen the evidence base for developing more inclusive, equitable, and sustainable public transport systems in Indonesia and other comparable developing-country contexts.

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