

Beyond Ridership Growth: Assessing Modal Shift and Private Vehicle Dependency in Jakarta's Integrated Public Transport System

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ABSTRACT: Reducing private vehicle dependence is central to sustainable urban transport policy. Jakarta has implemented an integrated strategy encompassing Bus Rapid Transit expansion, Mass Rapid Transit development, feeder integration, fare subsidies, and bus electrification. This study evaluates whether increased public transport ridership constitutes genuine modal shift away from private vehicles. Using a quantitative descriptive design with official secondary data from TransJakarta, MRT Jakarta, BPS DKI Jakarta, and government policy documents, the study analyzed ridership trends, growth indicators, and private vehicle statistics from 2022–2024. Results show average daily MRT ridership grew 105.56%, from 54,000 to 111,000 passengers, while TransJakarta served 371.4 million annual trips covering 91.7% of Jakarta's population across 242 routes. Despite these gains, approximately 11.50 million registered private vehicles remain, with motorcycles comprising 79.71% of total vehicle stock. Comparative indicators reveal only 32.29 annual TransJakarta trips per registered private vehicle, suggesting ridership growth reflects post-pandemic recovery and expanded demand rather than private vehicle substitution. The study concludes that while Jakarta's policies have significantly enhanced accessibility and service quality, ridership growth alone cannot confirm modal shift. Future evaluations should integrate travel surveys, origin–destination data, and behavioral evidence for comprehensive assessment.

Keywords: Sustainable Urban Mobility, Modal Shift, Public Transportation, Private Vehicle Dependency, Transport Policy Evaluation, Jakarta, Public Transport Ridership



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INTRODUCTION

Urban transportation systems have become increasingly central to achieving sustainable urban development because rapid urbanization has intensified traffic congestion, environmental degradation, energy consumption, and socioeconomic inefficiencies in metropolitan regions. As private vehicle ownership continues to expand, many large cities experience worsening road congestion, declining travel reliability, increasing greenhouse gas emissions, and deteriorating air quality. Consequently, governments have invested heavily in public transportation systems as an

important policy instrument to improve urban mobility while reducing dependence on private vehicles. Contemporary transport planning has therefore shifted from simply increasing infrastructure capacity toward promoting sustainable mobility through integrated public transport systems, multimodal connectivity, and demand management policies. Within this context, understanding whether public transport policies successfully encourage travelers to shift away from private vehicles has become a major concern for both researchers and policymakers.

Theoretical and empirical studies demonstrate that modal shift is a complex behavioral process influenced by multiple economic, operational, spatial, and psychological factors. Discrete choice models, including multinomial logit and mixed logit formulations, remain among the most widely used theoretical frameworks for explaining travelers' transport mode decisions because they capture trade-offs among travel time, travel cost, convenience, accessibility, and service quality (Bhuyan et al., 2023; Hörcher & Tirachini, 2020; Zhong et al., 2024). More recent studies have complemented these econometric approaches with structural equation modeling and travel-behavior theories that incorporate subjective perceptions such as safety, comfort, service reliability, and perceived travel risk (Ahmad et al., 2024; Das et al., 2021). These studies collectively suggest that commuters' decisions to adopt public transport are shaped not only by objective service attributes but also by broader behavioral responses to policy interventions and external conditions. In response to these challenges, many metropolitan governments have introduced comprehensive transport policy packages designed to increase public transport attractiveness while discouraging excessive private vehicle use. The literature consistently identifies improvements in service quality, network coverage, operational reliability, accessibility, and integrated multimodal connectivity as the most influential drivers of public transport ridership (Bedoya-Maya et al., 2022; Diab et al., 2020; Egan et al., 2023). Complementary measures, including fare subsidies, targeted fare reductions, congestion pricing, and first- and last-mile connectivity improvements, further enhance the competitiveness of public transport when implemented alongside operational improvements (Kamga & Eickemeyer, 2021; Salter & Alexander, 2022). Rather than relying on isolated interventions, successful metropolitan transport strategies generally combine infrastructure investment with service improvements and demand-management policies to create an integrated mobility system capable of attracting travelers from private vehicles.

Integrated public transport systems have consequently emerged as one of the principal mechanisms for encouraging sustainable travel behavior. Previous studies indicate that integration among Bus Rapid Transit (BRT), Mass Rapid Transit (MRT), Light Rail Transit (LRT), and feeder services reduces transfer penalties, improves network accessibility, and increases the convenience of multimodal travel (Khandelwal, 2023). Effective feeder services improve first- and last-mile accessibility, thereby extending the functional service area of high-capacity transit corridors and increasing the likelihood that travelers will choose public transport over private vehicles (Salter & Alexander, 2022; Diab et al., 2020). In addition, integrated fare systems, coordinated schedules, and well-designed transfer facilities reduce travel friction and strengthen the attractiveness of public transport for both existing and potential users. Nevertheless, studies also note that integration alone may not guarantee sustained behavioral change if service reliability, passenger comfort, and perceived safety remain inadequate, particularly following disruptions such as the COVID-19 pandemic (Kapatsila et al., 2023; Vichiensan et al., 2021).

Jakarta represents an important case for examining these issues because it has implemented one of the most comprehensive public transport reform programs in Southeast Asia. Over the past decade, the provincial government has expanded the TransJakarta Bus Rapid Transit network, introduced the MRT system, strengthened feeder integration, improved service quality, implemented fare subsidies, and gradually electrified portions of the bus fleet. These initiatives have been accompanied by substantial increases in public transport ridership. TransJakarta served approximately 371.4 million passenger trips during 2024 while maintaining service coverage for more than ninety percent of the city's population. During the same period, average daily MRT ridership increased from approximately 54,000 passengers in 2022 to 111,000 passengers in 2024, representing cumulative growth exceeding one hundred percent. Customer satisfaction indicators also remained consistently high, suggesting that the quality and attractiveness of Jakarta's public transport system have improved considerably.

Despite these encouraging developments, an important conceptual and empirical question remains unresolved. Public transport ridership growth is frequently interpreted as evidence that transport policies have successfully reduced dependence on private vehicles. However, existing literature emphasizes that increased ridership should not automatically be equated with modal shift because additional public transport trips may result from overall travel demand growth, post-pandemic mobility recovery, induced travel, or multimodal travel patterns rather than direct substitution of private vehicle trips (Jiang & Cai, 2022; Scholl et al., 2024). Individuals may simultaneously own private vehicles while increasingly using public transport for selected trips, implying that improvements in public transport performance do not necessarily correspond to reductions in private vehicle dependency.

This distinction is particularly relevant in Jakarta, where the registered stock of private vehicles remains exceptionally large despite substantial improvements in public transport services. Official statistics indicate that approximately 11.50 million passenger cars and motorcycles remained registered in 2024, with motorcycles accounting for nearly eighty percent of the total fleet. Such figures suggest that private vehicle ownership continues to dominate the urban transport landscape even as public transport ridership increases. Consequently, operational indicators alone cannot fully capture behavioral changes in transport mode choice. Previous studies recommend evaluating modal shift using broader behavioral indicators such as changes in modal share, reductions in vehicle-kilometers traveled, changes in private vehicle trip frequency, and longitudinal travel surveys that directly observe travelers' transport choices over time (Salter & Alexander, 2022; Zhong et al., 2024; Jiang & Cai, 2022).

The literature further demonstrates that travelers' willingness to shift from private vehicles to public transport depends upon multiple interacting determinants. Reliable and frequent services, extensive network coverage, convenient transfers, affordable fares, and high accessibility consistently increase the probability of choosing public transport (Das et al., 2021; Ahmad et al., 2024; Jiang & Cai, 2022). Perceived safety, passenger comfort, crowding conditions, and health-related concerns also play important roles in shaping travel decisions, particularly in the post-pandemic period (Tareke & Ashebir, 2023; Youssef et al., 2021). Moreover, socioeconomic characteristics, land-use accessibility, residential location, and policy acceptance influence travelers' responsiveness to transport interventions (Egan et al., 2023; Salter & Alexander, 2022). These findings collectively indicate that successful modal shift requires coordinated improvements across

infrastructure, operations, governance, and traveler perceptions rather than isolated policy measures.

Against this background, an important research gap remains. While numerous studies evaluate determinants of public transport ridership or estimate mode choice using behavioral models, relatively few distinguish explicitly between improved public transport performance and actual reductions in private vehicle dependency using official operational statistics combined with vehicle ownership data. This distinction is particularly important for rapidly developing metropolitan areas where increasing ridership may coexist with continued growth in private vehicle ownership. Addressing this gap contributes to a more accurate interpretation of transport policy outcomes and helps avoid overstating policy effectiveness based solely on passenger growth indicators.

Accordingly, this study aims to evaluate whether the substantial increase in public transport ridership in Jakarta provides sufficient empirical evidence of a genuine modal shift away from private vehicles. Using official secondary data from TransJakarta, MRT Jakarta, Statistics Indonesia, and government policy documents, the study compares trends in public transport utilization with indicators of private vehicle dependency and assesses the effectiveness of Jakarta's integrated transport policies. The novelty of this research lies in explicitly distinguishing operational improvements from behavioral change by evaluating ridership growth alongside registered private vehicle ownership rather than treating passenger growth as direct evidence of modal shift. Based on this perspective, the study hypothesizes that although Jakarta's integrated transport policies have substantially improved public transport performance, increased ridership alone is insufficient to conclude that dependence on private vehicles has declined. The findings are expected to contribute to the evaluation of sustainable urban transport policies by providing a more comprehensive framework for assessing modal shift in metropolitan contexts.

METHOD

Research Design

This study adopted a quantitative descriptive research design using secondary data to evaluate whether increasing public transport ridership in Jakarta provides sufficient evidence of a modal shift away from private vehicles. A quantitative approach was selected because the research objective is to measure observable changes in transport system performance and compare these with indicators of private vehicle dependency rather than to investigate individual perceptions or behavioral intentions through primary surveys.

The methodological approach follows contemporary urban transport policy evaluation, where official operational datasets are analyzed to examine policy outcomes across time. Previous studies demonstrate that quantitative analyses of public transport policies commonly employ panel-data regression, fixed-effects estimation, difference-in-differences (DiD), synthetic-control methods, spatial econometrics, and time-series analysis to estimate policy impacts using secondary data (Hong & Mao, 2023; Klos-Adamkiewicz et al., 2023). These approaches are particularly valuable for isolating policy effects while accounting for temporal and spatial heterogeneity.

Because the present study analyzes one metropolitan area over a relatively short period (2022–2024), causal econometric techniques such as panel regression, DiD, or synthetic-control methods

cannot be robustly implemented. Instead, the study applies descriptive statistical analysis, growth analysis, comparative indicators, and policy evaluation to assess whether available empirical evidence supports claims of modal shift. This methodological choice is consistent with the literature, which recognizes descriptive and comparative analyses as appropriate first-stage approaches for diagnosing policy outcomes before more advanced causal inference is undertaken (Scholl et al., 2021; Ma et al., 2023).

Data Sources

The analysis is based exclusively on official secondary datasets obtained from publicly available government and institutional publications. Secondary data are widely used in urban transportation research because they provide reliable observations of operational performance, longitudinal trends, and policy implementation without the cost and time required for large-scale primary surveys.

Five principal datasets were utilized.

1. TransJakarta Annual Operational Statistics (2024), providing passenger volumes, route coverage, fleet size, customer satisfaction, subsidies, and electric bus deployment.
2. MRT Jakarta Annual Reports (2022–2024), providing average daily ridership, annualized passenger trips, customer satisfaction indices, and feeder integration statistics.
3. Statistics Indonesia (BPS DKI Jakarta), providing official records of registered passenger cars and motorcycles in Jakarta.
4. Jakarta Transport Policy Evaluation Matrix, summarizing major policy instruments and associated empirical outcomes.
5. Official Government Reports and Institutional Publications, supporting policy interpretation and contextual analysis.

Operational transport data and administrative vehicle-registration statistics have several methodological advantages. They provide direct observations of transport demand and supply, facilitate longitudinal analyses, offer route-level and system-level insights, and are compatible with standard econometric techniques used in transportation research (Bedoya-Maya et al., 2022). Nevertheless, the literature also cautions that secondary datasets may differ in definitions, reporting frequency, and temporal consistency, requiring careful interpretation (Lu & Chen, 2023).

Research Variables

The study evaluates the relationship between improvements in public transport performance and evidence of modal shift.

The principal independent variables include:

- MRT average daily ridership.
- Annual TransJakarta passenger trips.
- Public transport accessibility (population coverage).
- Route network expansion.
- Fleet size.
- Customer Satisfaction Index (CSI).
- Public transport subsidy.

- Electric bus deployment.
- Integrated feeder services.

The principal dependent variable is **evidence of modal shift**, operationalized through comparison between public transport utilization and the registered stock of private vehicles.

Supporting variables include:

- Number of registered passenger cars.
- Number of registered motorcycles.
- Share of motorcycles within the registered vehicle fleet.
- Comparative intensity indicators between public transport use and registered private vehicle ownership.

Unlike behavioral studies that directly measure individual travel choices, this research evaluates modal shift indirectly using aggregate operational indicators. This distinction is consistent with previous studies emphasizing that increases in ridership alone should not automatically be interpreted as reductions in private vehicle dependency (Salter & Alexander, 2022; Zhong et al., 2024; Jiang & Cai, 2022).

Data Analysis

Four complementary analytical techniques were employed.

Descriptive Statistical Analysis

Descriptive statistics summarize the principal characteristics of each dataset, including ridership, service coverage, vehicle ownership, fleet characteristics, and customer satisfaction. Descriptive analysis establishes the empirical context of the transport system and provides baseline evidence for subsequent interpretation. Previous transport studies commonly report descriptive statistics to characterize operational performance before conducting more advanced analyses (Gričar et al., 2023; Lu et al., 2021; Hong & Mao, 2023).

Growth Analysis

Growth analysis measures changes in MRT ridership over time using annual growth rates and cumulative percentage growth. Ridership indices are also calculated with 2022 as the base year to illustrate temporal changes in transport demand.

The annual growth rate is calculated as:

$$[\text{Growth}(\%) = \frac{\{\text{Current-Year} - \text{Previous-Year}\}}{\{\text{Previous-Year}\}} \times 100]$$

The cumulative growth between 2022 and 2024 is calculated using the first and final observations. Growth analysis has been widely applied to evaluate changes in public transport demand following policy implementation and external shocks such as the COVID-19 pandemic (Lee & Eom, 2023).

Comparative Indicator Analysis

Comparative indicators evaluate the relationship between public transport utilization and private vehicle ownership.

Two indicators are constructed:

1. Annual TransJakarta passenger trips per registered private vehicle.
2. Annual MRT passenger trips per registered private vehicle.

These indicators are intended to represent the relative intensity of public transport use compared with the size of the private vehicle fleet. They are not interpreted as modal share because they compare passenger trips with registered vehicle stock rather than individual travel behavior. Comparative indicators have been widely employed to compare transport performance across cities, corridors, and policy contexts (Scholl et al., 2021; Ma et al., 2023).

Policy Evaluation Matrix

Finally, a qualitative policy evaluation matrix synthesizes empirical evidence for each major transport policy, including BRT expansion, MRT development, feeder integration, service quality improvements, fare subsidies, bus electrification, and private vehicle control. Each policy instrument is assessed based on observable operational outcomes rather than causal attribution. Narrative synthesis is frequently used alongside quantitative indicators to interpret transport policy effectiveness and relate empirical findings to broader policy objectives (Milovanoff et al., 2021).

Methodological Strengths and Limitations

The methodology provides several important strengths. Official operational datasets offer objective, reliable, and longitudinal measurements of public transport performance, allowing direct observation of changes in ridership, accessibility, and service quality. Administrative records of registered private vehicles provide complementary information regarding the scale of private vehicle dependency. Together, these datasets enable a comprehensive evaluation of transport system performance using readily available official statistics.

However, several limitations should be acknowledged. First, observational secondary data cannot establish causality because multiple transport policies and external factors may simultaneously influence ridership. Previous studies recommend applying difference-in-differences, synthetic-control methods, or panel econometric models when sufficient longitudinal data become available (Berg & Blom, 2022). Second, operational statistics do not directly observe individual travel behavior, making it impossible to determine whether increased ridership reflects substitution from private vehicles, induced travel, or post-pandemic mobility recovery. Third, secondary datasets may contain inconsistencies in definitions, reporting periods, and administrative coverage across institutions, requiring careful harmonization before analysis (Lu et al., 2021; Hong & Mao, 2023).

Despite these limitations, the combination of descriptive statistics, growth analysis, comparative indicators, and policy evaluation provides an appropriate methodological framework for assessing the relationship between public transport performance and private vehicle dependency in Jakarta.

Consistent with the broader transportation literature, this mixed analytical approach offers a robust foundation for evaluating sustainable urban mobility policies while acknowledging the need for future studies incorporating behavioral surveys, longitudinal travel data, and advanced causal inference methods.

RESULT AND DISCUSSION

Growth in MRT Jakarta Ridership

MRT Jakarta recorded substantial growth in passenger use between 2022 and 2024. Average daily ridership increased from approximately 54,000 passengers in 2022 to 91,000 in 2023 and 111,000 in 2024. When annualized, these figures correspond to approximately 19.71 million passenger trips in 2022, 33.22 million in 2023, and 40.63 million in 2024.

Table 1. MRT Jakarta Ridership Trend, 2022–2024

Year	Average Daily Ridership	Annualized Passenger Trips	Annual Growth (%)	Ridership Index (2022 = 100)
2022	54,000	19,710,000	—	100.00
2023	91,000	33,215,000	68.52	168.52
2024	111,000	40,626,000	21.98	205.56

The largest annual increase occurred between 2022 and 2023, when average daily ridership rose by 68.52%. Growth continued between 2023 and 2024, although at a lower rate of 21.98%. Over the full two-year period, average daily ridership increased by 105.56%, indicating that MRT use more than doubled relative to the 2022 baseline. The ridership index consequently rose from 100.00 in 2022 to 205.56 in 2024.

These findings demonstrate a clear upward trend in MRT utilization. Growth analysis is widely used in public transport research to characterize temporal changes in demand and to assess resilience or recovery following major disruptions (Kwon et al., 2022). However, the observed increase should be interpreted cautiously because the study period overlaps with the recovery of urban mobility following the COVID-19 pandemic. Previous research has shown that post-pandemic ridership trajectories vary considerably across cities, with some systems experiencing rapid recovery and others demonstrating persistent behavioral changes (Lee & Eom, 2023; Kwon et al., 2022).

The available dataset does not isolate the effect of MRT development from broader changes in mobility demand. Therefore, the result establishes strong ridership growth but does not demonstrate that the increase was caused exclusively by a specific transport policy. Establishing causality would require a longer time series, a comparison area, or quasi-experimental methods such as difference-in-differences or synthetic-control analysis (Scholl et al., 2021; Berg & Blom, 2022).

TransJakarta Operational Performance

TransJakarta recorded 371.4 million passenger trips during 2024, equivalent to an average of approximately 1.015 million trips per day. The system served 91.7% of Jakarta's population through 242 routes operated by a fleet of 4,388 vehicles. The fleet included 300 electric buses. Customer satisfaction reached 4.40 on a five-point scale, while the Net Promoter Score was 70.1. The reported subsidy was Rp9,831 per passenger.

Table 2. TransJakarta Operational Performance Indicators, 2024

Indicator	Value
Annual passenger trips	371,400,000
Average daily passenger trips	1,015,000
Population coverage	91.7%
Number of routes	242
Fleet size	4,388 vehicles
Electric buses	300 units
Customer satisfaction	4.40/5
Net Promoter Score	70.1
Subsidy per passenger	Rp9,831

The scale of TransJakarta ridership indicates that bus-based public transport remained the principal mass-transit service in the city during 2024. The combination of extensive population coverage, a large route network, and more than one million daily passenger trips suggests that service expansion and network accessibility supported high levels of use.

These results are consistent with previous studies identifying frequency, reliability, coverage, and network accessibility as central determinants of public transport adoption (Salter & Alexander, 2022; Khandelwal, 2023). Operational improvements are particularly influential when trunk services are integrated with feeder systems and transfers are made more efficient. Integrated BRT, MRT, and feeder networks can expand the effective reach of public transport and reduce access barriers for travelers who do not live within walking distance of major corridors (Wang et al., 2020; Khandelwal, 2023).

The satisfaction score and Net Promoter Score indicate favorable user evaluations of TransJakarta services. These indicators support the conclusion that public transport performance improved not only in scale but also in perceived service quality. Nevertheless, they measure satisfaction among users rather than behavioral substitution among private-vehicle owners. High satisfaction may strengthen loyalty and repeated use, but the available data do not establish whether satisfied users reduced their use of cars or motorcycles.

The subsidy of Rp9,831 per passenger indicates continued fiscal support for affordability. The literature suggests that fare subsidies and fare reductions can increase ridership, particularly when implemented alongside improvements in coverage, reliability, and service quality (Salter & Alexander, 2022; Khandelwal, 2023). In the present study, however, no counterfactual evidence is available to estimate how ridership would have changed in the absence of subsidies.

Private Vehicle Dependency

Despite substantial public transport use, Jakarta continued to contain a very large stock of registered private vehicles in 2024. The city recorded 2,333,391 passenger cars and 9,167,512 motorcycles, producing a combined total of 11,500,903 private vehicles.

Table 3. Registered Private Vehicles in Jakarta, 2024

Vehicle Type	Registered Vehicles	Share (%)
Passenger cars	2,333,391	20.29
Motorcycles	9,167,512	79.71
Total	11,500,903	100.00

Motorcycles accounted for 79.71% of the combined stock of passenger cars and motorcycles, while passenger cars represented 20.29%. This composition indicates that private-vehicle dependency in Jakarta is primarily associated with motorcycles rather than cars alone. Consequently, policies intended to reduce private mobility dependency must address the affordability, flexibility, and accessibility advantages that motorcycles provide.

The registered-vehicle data reveal the scale of private ownership but do not directly measure the frequency or distance of vehicle use. A registered motorcycle may be used daily, occasionally, or not at all. Similarly, an individual or household may own more than one vehicle while relying on public transport for commuting. Vehicle ownership therefore represents a structural indicator of dependency potential rather than a direct measure of modal share or daily travel behavior.

Previous studies distinguish vehicle ownership from actual vehicle use by incorporating indicators such as private-vehicle trip frequency, vehicle-kilometers traveled, and changes in car or motorcycle modal share (Fountas et al., 2020; Teoh et al., 2020). Those indicators were unavailable in the current dataset. Accordingly, the results demonstrate that the stock of private vehicles remained high, but they cannot establish whether the intensity of private-vehicle use increased, declined, or remained stable.

Comparative Indicators of Public Transport Use

To contextualize public transport activity relative to the private-vehicle stock, two comparative indicators were calculated. Annual TransJakarta trips were divided by the combined number of registered passenger cars and motorcycles, as were annualized MRT trips for 2024.

Table 4. Public Transport Trips Relative to Registered Private Vehicles, 2024

Public Transport Mode	Annual Passenger Trips	Registered Private Vehicles	Trips per Registered Private Vehicle
TransJakarta	371,400,000	11,500,903	32.29
MRT Jakarta	40,626,000	11,500,903	3.53

The results indicate approximately 32.29 annual TransJakarta trips and 3.53 annual MRT trips for each registered private vehicle. These values provide a simple measure of public transport-use intensity relative to the scale of private ownership. Similar per-vehicle and per-capita indicators

have been used to normalize public transport demand across contexts with different vehicle stocks and population sizes (Teoh et al., 2020; Fountas et al., 2020).

The TransJakarta value was substantially higher than the MRT value because TransJakarta served a larger geographic area and carried a much greater annual passenger volume. However, the two indicators should not be interpreted as direct measures of system efficiency because the modes differ in network coverage, operating capacity, route length, and service function.

More importantly, neither indicator represents modal share. Modal share measures the proportion of all trips made by a particular transport mode, whereas trips per registered vehicle compare two variables with different units: passenger trips and vehicle stock. The indicator does not reveal the total number of trips made by private vehicles, average vehicle occupancy, trip distance, or the proportion of travelers who shifted from one mode to another.

A higher trips-per-vehicle value may result from increased public transport use, reduced vehicle ownership, population growth, changes in reporting, or a combination of these factors. Consequently, the indicator is useful for descriptive comparison but remains ambiguous regarding causality and substitution (Teoh et al., 2020; Fountas et al., 2020). More conclusive evidence of modal shift would require simultaneous increases in public transport modal share and reductions in private-vehicle modal share, trip frequency, or vehicle-kilometers traveled. Such evidence should ideally be evaluated using longitudinal or quasi-experimental methods that account for confounding factors such as service expansion, land-use change, fare policy, and economic conditions (Teoh et al., 2020; Fountas et al., 2020).

MRT and TransJakarta Service Quality

MRT Jakarta's Customer Satisfaction Index increased from 88.51 in 2023 to 89.16 in 2024, representing a rise of 0.65 points.

Table 5. MRT Jakarta Customer Satisfaction Index

Year	Customer Satisfaction Index
2023	88.51
2024	89.16
Change	+0.65

The increase was modest, but both annual values indicate consistently strong user evaluations. Together with TransJakarta's satisfaction score of 4.40 out of 5, the findings suggest that service quality remained favorable across Jakarta's major public transport systems.

The literature consistently links service reliability, frequency, travel time, comfort, and transfer efficiency with higher public transport adoption (Bedoya-Maya et al., 2022; Diab et al., 2020; Salter & Alexander, 2022). Nevertheless, customer satisfaction is an attitudinal measure rather than direct evidence of modal substitution. It indicates that users evaluated services positively but does not reveal their previous travel mode or whether they reduced private-vehicle use after adopting public transport.

Feeder Integration and Network Connectivity

Feeder services contributed approximately 23% of MRT ridership in 2023. This result indicates that almost one-quarter of MRT demand was associated with connections from supporting transport services.

Feeder integration is especially important because rail systems depend on access beyond station walking areas. Previous studies show that feeder networks, first- and last-mile services, integrated ticketing, and coordinated transfers can expand the effective catchment area of trunk public transport (Egan et al., 2023; Wang et al., 2020; Khandelwal, 2023). The observed contribution of feeder services therefore provides empirical support for the importance of multimodal connectivity in sustaining MRT ridership.

However, the result does not indicate whether feeder users had previously traveled by private vehicle. Some may have shifted from motorcycles or cars, while others may have transferred from buses, informal transport, walking, or ride-hailing. Without previous-mode information, the feeder contribution demonstrates integration effectiveness but not the scale of modal shift.

Policy Evaluation Results

The policy evaluation matrix indicates that most public transport interventions achieved favorable operational outcomes.

Table 6. Jakarta Transport Policy Evaluation Matrix

Policy Instrument	Empirical Evidence	Evaluation
BRT and feeder expansion	371.4 million trips; 242 routes; 91.7% population coverage	Highly effective in improving access and use
MRT development	Daily ridership increased by 105.56% between 2022 and 2024	Effective in increasing mass-transit use
Feeder integration	Approximately 23% of MRT ridership associated with feeders in 2023	Effective in reducing access barriers
Service quality improvement	MRT CSI of 89.16; TransJakarta satisfaction of 4.40/5	Effective in supporting user acceptance
Public transport subsidy	Rp9,831 per TransJakarta passenger	Supports affordability
Bus electrification	300 electric buses in operation	Effective for initial environmental transition
Private-vehicle control	11.50 million registered cars and motorcycles	Insufficient evidence of reduced dependency

The expansion of BRT, MRT, and feeder networks produced the clearest operational results through higher ridership and wider accessibility. This pattern corresponds with research emphasizing service coverage, frequency, integration, and first- and last-mile connectivity as major drivers of public transport use (Diab et al., 2020; Bedoya-Maya et al., 2022; Egan et al., 2023; Khandelwal, 2023).

The introduction of 300 electric buses represents progress toward transport decarbonization. However, the available data only identify the number of vehicles deployed. They do not quantify

greenhouse-gas reductions, lifecycle emissions, energy sources, or changes in operating costs. Environmental transport evaluations should ideally integrate lifecycle assessment, emissions inventories, demand modeling, and causal analysis to estimate both direct and indirect effects (Milovanoff et al., 2021).

Overall, the results confirm that Jakarta's public transport policies improved ridership, accessibility, integration, and service quality. They do not, however, confirm a corresponding decline in private-vehicle dependency. The persistence of 11.50 million registered private vehicles, the absence of modal-share data, and the lack of traveler-level behavioral evidence prevent a definitive conclusion that a modal shift occurred.

The findings demonstrate that Jakarta has achieved substantial improvements in public transport performance, particularly through the expansion of TransJakarta services, continued development of MRT Jakarta, feeder integration, fare support, and service-quality improvements. MRT average daily ridership increased from approximately 54,000 passengers in 2022 to 111,000 in 2024, while TransJakarta recorded 371.4 million passenger trips in 2024. These trends indicate that public transport has become increasingly accessible and attractive. Nevertheless, the results do not provide sufficient evidence to conclude that a genuine modal shift away from private vehicles has occurred. This distinction is central because an increase in public transport ridership may reflect several processes, including post-pandemic mobility recovery, population growth, additional travel demand, induced trips, or changes in trip frequency, rather than direct substitution of car or motorcycle journeys.

Previous studies similarly emphasize that absolute increases in public transport trips do not necessarily produce proportional reductions in private-vehicle trips, modal share, or vehicle-kilometers traveled (Teoh et al., 2020; Fountas et al., 2020; Scholl et al., 2021; Diab et al., 2020). Public transport use may grow alongside stable or increasing private-vehicle use when total urban mobility expands. This interpretation is particularly relevant in Jakarta because approximately 11.50 million passenger cars and motorcycles remained registered in 2024. Motorcycles accounted for 79.71% of this stock, indicating that private-vehicle dependency is predominantly associated with motorcycle ownership. The coexistence of high public transport ridership and a large private-vehicle fleet suggests that many residents may engage in multimodal behavior rather than completely replacing private vehicles with public transport.

The comparative indicators reinforce this cautious interpretation. In 2024, Jakarta recorded approximately 32.29 annual TransJakarta trips and 3.53 annual MRT trips per registered private vehicle. These measures provide a useful indication of public transport-use intensity relative to the size of the private-vehicle stock, but they are not equivalent to modal share. Modal share represents the proportion of all journeys made by each mode, whereas the comparative indicators combine passenger-trip counts with vehicle-registration totals. They do not reveal private-vehicle trip frequency, vehicle occupancy, travel distance, trip purpose, or whether individual public transport users previously traveled by car or motorcycle. Accordingly, these ratios should be interpreted as contextual indicators rather than evidence of behavioral substitution (Teoh et al., 2020; Fountas et al., 2020).

The effectiveness of Jakarta's public transport interventions is nevertheless evident at the operational level. TransJakarta's 91.7% population coverage, 242 routes, and fleet of 4,388 vehicles indicate substantial network reach. MRT Jakarta's ridership growth and the contribution of feeder

services approximately 23% of MRT ridership in 2023 also highlight the importance of integrated networks. Prior studies show that service frequency, reliability, network coverage, feeder connectivity, and reduced transfer friction are among the strongest determinants of public transport adoption (Bedoya-Maya et al., 2022; Diab et al., 2020; Salter & Alexander, 2022; Khandelwal, 2023). Integration among BRT, MRT, LRT, feeder services, active transport, and first- and last-mile options can extend the effective catchment area of mass transit and reduce access barriers (Egan et al., 2023; Wang et al., 2020; Khandelwal, 2023).

However, service improvement alone may not be sufficient to reduce private-vehicle dependency. The literature indicates that durable modal shift generally requires a coordinated policy package that simultaneously increases the attractiveness of public transport and reduces the relative convenience or affordability of private travel. Fare subsidies, service expansion, and integrated ticketing can encourage public transport use, but their effects may remain limited when parking remains widely available, road use is underpriced, or enforcement of vehicle-control measures is weak (Salter & Alexander, 2022; Marazi et al., 2024; Kamga & Eickemeyer, 2021). Jakarta's results are consistent with this argument: public transport performance improved markedly, yet the available evidence concerning private-vehicle control remains inconclusive.

A stronger claim of modal shift would require behavioral evidence showing that private-vehicle use declined as public transport use increased. Relevant indicators would include reductions in car and motorcycle trips, declining private-vehicle modal share, lower vehicle-kilometers traveled, fewer commuting days by private vehicle, and corridor-level substitution between public and private modes. These outcomes should ideally be assessed through longitudinal data and causal methods such as difference-in-differences, fixed-effects models, or synthetic controls (Scholl et al., 2021; Zou et al., 2021; Berg & Blom, 2022). Route-level analysis would also be valuable because aggregate citywide ridership may conceal substantial spatial variation. Ridership may rise strongly on corridors with high service frequency and effective feeder connections while remaining unchanged in areas with weak accessibility or poor transfer conditions (Diab et al., 2020; Tareke & Ashebir, 2023).

Longitudinal travel surveys and origin–destination data would substantially improve future evaluations. Repeated observations of the same individuals or households could identify whether policy interventions produce temporary adjustments or durable behavioral change. Such data would also support analysis of how responses differ by income, age, gender, residential location, and vehicle ownership (Lu et al., 2021; Lu & Chen, 2023; Klos-Adamkiewicz et al., 2023; Palm et al., 2020). Origin–destination information could reveal whether network expansion reduces access distance, transfer burdens, and private-vehicle use along specific travel corridors. Combining these data with passenger surveys would also capture latent factors such as safety, comfort, reliability, and perceived convenience, which frequently mediate mode choice (Ahmad et al., 2024; Kapatsila et al., 2023; Das et al., 2021).

The findings therefore imply that Jakarta should maintain investment in service quality, network expansion, and feeder integration while strengthening demand-management measures. Policies may include parking controls, congestion pricing, integrated fares, pedestrian and cycling access, transit-oriented land use, and carefully regulated ride-hailing integration. Because evidence on ride-hailing is mixed, such services should be designed to complement public transport as first- and last-mile connections rather than substitute for high-capacity transit (Scholl et al., 2024; Scholl et

al., 2021; Wang et al., 2020). Bus electrification should likewise be evaluated through emissions inventories and lifecycle assessment rather than fleet counts alone (Milovanoff et al., 2021). Overall, Jakarta has made meaningful progress in strengthening public transport, but confirming a genuine modal shift requires broader behavioral, spatial, and longitudinal evidence.

CONCLUSION

This study evaluated whether the substantial growth of public transport use in Jakarta provides sufficient evidence of a genuine modal shift away from private vehicles. The findings show that Jakarta has achieved meaningful improvements in public transport performance. MRT Jakarta's average daily ridership increased from approximately 54,000 passengers in 2022 to 111,000 in 2024, while TransJakarta served 371.4 million passenger trips in 2024. Service coverage, network expansion, feeder integration, customer satisfaction, fare support, and bus electrification further indicate that public transport has become more accessible, attractive, and operationally capable.

However, these improvements do not conclusively demonstrate that dependence on private vehicles has declined. Jakarta still recorded approximately 11.50 million registered passenger cars and motorcycles in 2024, with motorcycles accounting for 79.71% of the total. The persistence of this large private-vehicle stock suggests that increasing public transport ridership may coexist with continued ownership and use of cars and motorcycles. The comparative indicators of 32.29 annual TransJakarta trips and 3.53 annual MRT trips per registered private vehicle provide useful measures of public transport-use intensity, but they do not represent modal share or direct evidence of trip substitution.

The principal contribution of this study lies in distinguishing improved public transport performance from confirmed behavioral modal shift. Ridership growth, service accessibility, and user satisfaction are important policy achievements, but they should not be interpreted as definitive evidence that travelers have reduced their use of private vehicles. A robust assessment of modal shift requires simultaneous evidence of increasing public transport use and declining private-vehicle use, measured through indicators such as modal share, private-vehicle trip frequency, vehicle-kilometers traveled, and changes in travel behavior at the individual or household level.

The findings have important policy implications. Jakarta should continue strengthening service reliability, network coverage, feeder integration, affordability, and first- and last-mile connectivity. These supply-side improvements should be accompanied by demand-management measures that reduce the relative attractiveness of private travel, including parking controls, congestion pricing, improved walking and cycling infrastructure, and stronger transit-oriented land-use planning. Particular attention should be given to motorcycle dependency because motorcycles constitute the dominant share of registered private vehicles.

Future research should incorporate longitudinal travel surveys, origin–destination data, passenger-level mode-choice information, and corridor-specific analyses. Quasi-experimental methods, such as difference-in-differences or synthetic-control approaches, would also improve causal attribution of policy effects. Further studies should examine distributional differences across income groups, residential locations, gender, age, and vehicle ownership. Environmental evaluations should additionally assess the lifecycle emissions and operational effects of bus electrification. Through these extensions, future research can provide a more precise and comprehensive understanding of

whether Jakarta's public transport reforms are producing a durable transition toward sustainable urban mobility.

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