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Analysis of Performance and Feasibility of Investment Costs for Transjatim Bus Stops Case Study of Transit Point Purabaya Terminal

Devi Widitasari[1]*, Budi Witjaksana[2], Erni Puspanantasari Putri[3]
Civil Engineering Master's Study Program, Faculty of Engineering, Universitas 17 Agustus 1945 Surabaya, Indonesia
Corresponding Author: Devi Widitasari, widitasaridevi@gmail.com

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A B S T R A C T

The Trans Jatim Bus Transit Point Stop in Purabaya Terminal is currently experiencing a decline in service quality, indicated by overcapacity and the emergence of safety conflicts (hazards) due to intermodal transit activities within the terminal. The method used in this research is quantitative descriptive. The purpose of this study is to evaluate the feasibility of the Trans Jatim Transit Point stop facilities based on the Minimum Service Standards (SPM) established by the Regulation of the Minister of Transportation of the Republic of Indonesia Number 10 of 2012. And to analyze the cost feasibility for the improvement of stop facilities for service sustainability.

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INTRODUCTION

The determination of the location point for the Trans Jatim Transit Point stop within the Purabaya Terminal is supported by policies from the local government, namely the collaboration between the East Java Provincial Government and the central government, the Ministry of Transportation of the Republic of Indonesia, as the manager of the Type A Purabaya Terminal, has made this location a favorite stop and departure point for the community (SuryaMalang.com, July 9, 2025).

This is evident from the high traffic generation, especially during peak hours in the morning every day from 06:00 to 09:00 WIB, which is when workers leave for work, students and college students leave for school and lectures, as well as during peak hours in the afternoon from 16:00 to 19:00 WIB (Data from the East Java Provincial Transportation Office, 2025).

The Trans Jatim Transit Point at the Purabaya Terminal (Bungurasih) has become a vital hub connecting Corridor I (Surabaya – Gresik – Sidoarjo) and Corridor V (Mojokerto – Sidoarjo – Surabaya). The traffic generation is concentrated almost entirely on public activity at the southern border of Surabaya City, causing congestion during peak hours in the morning and afternoon, thus making the Trans Jatim Transit Point within the Purabaya Terminal a Transit Oriented Development that leads to high public interest in using public transportation.

This situation has led to several problems, as a number of prospective Trans Jatim passengers are queuing long at the Trans Jatim Transit Point stop within the Purabaya Terminal (SuryaMalang.com, July 9, 2025). The inadequate seating capacity and waiting area at the stop, especially during peak hours, result in crowded and disorderly queuing of passengers, and there are no special lanes or barriers between passengers getting on and off the Trans Jatim bus. According to Caymaz (2018), there is still very little research discussing the satisfaction of bus stop users.

In the development of a region, the transportation element becomes an important and inseparable part. Transportation has two main functions, namely as a means to support the movement of people and/or goods and as a means to control development in urban areas (Nazalaputra & Handayani, 2017). The government through SWP (Satuan Wilayah Pengembangan) designates certain cities or areas as economic centers (growth pole). The establishment of SWP aims to encourage equity, enhance economic growth, and efforts to boost the economy of the people, so that regional independence in financing can be realized. In November 2019, Presidential Regulation Number 80 of 2019 concerning the Acceleration of Economic Development in the Gresik, Bangkalan, Mojokerto, Surabaya, Sidoarjo, Lamongan area (Gerbangkertosusila/GKS), the Bromo, Tengger, Semeru area (BTS), and the Wilis Ring and Southern Cross area was officially enacted (Bureau of Communication and Public Information, KEMENHUB RI, 2020). The GKS area is the locomotive of the regional economy of East Java with industry as the leading sector (Spatial Planning of KSN Gerbangkertosusila, 2018). Based on development policies, zoning classifications have been divided in the GKS area, where the city of Surabaya is designated as

the center and other areas such as Sidoarjo, Gresik, Mojokerto, and Bangkalan as supporting areas of the central region (RTRW East Java, 2018). Surabaya is the economic center and the capital of East Java Province, which attracts workers, students, and tourists from outside the city of Surabaya, including the cities/districts of Gresik, Bangkalan, and Sidoarjo. According to data from the Central Statistics Agency (BPS) of East Java, the population in the three cities, namely Gresik, Surabaya, and Sidoarjo, reached 6,292,784 million people in 2021, an increase in 2022 to 6,323,288 million people, and 6,352,934 million people in 2023. Infrastructure development is one of the seven development agendas aimed at strengthening the economy and basic services. This is in line with the SDGs goal number 9 (nine), which is infrastructure, industry, and innovation (RPJMN Year 2021-2024). In support of this, the East Java provincial government has organized a mass transportation system, namely the inauguration of Bus Trans Jatim on August 19, 2022. Bus Trans Jatim is an agglomeration transport for.

Reducing traffic congestion, air pollution, and the risk of accidents in the Gerbangkertosusila area (Gresik, Bangkalan, Mojokerto, Surabaya, Sidoarjo, Lamongan) by combining various activity centers (Kasiani & Widiyarta, 2023). Since the inauguration until 2025, the daily average load factor of Corridor I and V reached 105% to 125%. Based on the statistics of Transjatim passengers from January to March 2025, the highest number of passengers is Corridor I with the route Terminal Porong (Sidoarjo Regency) – Terminal Purabaya (Surabaya City) – Terminal Bunder (Gresik Regency) with a route length of 75 km and a fleet of 33 medium bus units passing through 18 (eighteen) stops, while Corridor V covers the route Sidoarjo-Surabaya – Bangkalan, with a fleet of 15 units and passing through 31 (thirty-one) stops, with a travel distance of approximately 59 km. (East Java Provincial Transportation Agency, 2025). From the data on the number of Transjatim Corridor I and V stops, the Trans Jatim Transit Point Stop in Terminal Purabaya is the most strategic and crucial stopping location. This is because the location of the Trans Jatim Transit Point Stop in Terminal Purabaya is at the southern boundary of Surabaya City, where this stop serves as a transfer center for passengers between different public transport modes, namely the Tranjatim Bus Corridor I and V as the only route from the buffer Regency and City that has direct access to Surabaya City, Intercity Transportation Within the Province, Intercity Transportation Between Provinces, Suroboyo Bus R1 (Terminal Purabaya – Tanjung Perak), and Suroboyo Bus Roda 4 (Terminal Purabaya – UNAIR Campus C) which are mode options heading to the city center of Surabaya and strategic areas such as office and educational areas. The supporting facilities for the implementation of the mass transportation system are infrastructure facilities in the form of stops. As stated in the Minister of Transportation Regulation Number 12 of 2012 Article 1 Paragraphs (8 and 9) and Number 27 of 2025 that every mass transportation service must provide a stopping place for public motor vehicles to pick up and drop off passengers, commonly known as a Stop, where this place must be equipped with supporting facilities for the stop in the form of pedestrian facilities leading to the stop

location in the form of sidewalks, crossings marked by road markings and/or traffic signs, bridges.

Crossings and/or tunnels. The organization of road-based mass transportation must meet the Minimum Service Standards that must consider various aspects, namely Security, Safety, Comfort, Affordability, Equality, and Orderliness as stipulated in the Regulation of the Minister of Transportation of the Republic of Indonesia Number 10 of 2012, which has been updated regarding several aspects of the Minimum Service Standards for Road-Based Mass Transportation, namely the Regulation of the Minister of Transportation of the Republic of Indonesia Number 27 of 2015.

Meanwhile, regarding the facilities for public passenger vehicle stops, the determination of the distance between stops, the calculation of bus bays, layout, the determination of the type of stop (there are 10 types), the design standards for stops (including: capacity, bus bays, minimum size design, and effective area of the stop) should have been adjusted to the needs of Trans Jatim passengers and the Technical Guidelines for the Engineering of Public Passenger Vehicle Stops of the Ministry of Transportation of the Republic of Indonesia in 1996.

This research aims to conduct a quantitative descriptive analysis of the performance of the Trans Jatim Transit Point Stop in the Purabaya Terminal so that the percentage gap between the existing stop capacity and the current passenger capacity can be known, and to determine the suitability of the existing stop design with the Technical Guidelines for the Engineering of Public Passenger Vehicle Stops and the Minimum Service Standards for Road-Based Mass Transportation.

Second, to test the feasibility of the stop costs using financial indicators (NPV, IRR, and BCR) with a discount rate of 12.66%. The results of this study are expected to provide strong and measurable policy recommendations for the East Java Provincial Government in planning sustainable, safe, comfortable, secure, and efficient transportation infrastructure investments.

Based on the background presented, several research questions can be formulated as follows:

1. How is the performance feasibility of the Transjatim Bus Stops Corridor I and Corridor V at the Transit Point Stop in the Purabaya Terminal in accordance with the Technical Guidelines for the Engineering of Public Passenger Vehicle Stops and the Minimum Service Standards for Mass Transportation using the Importance Performance Analysis (IPA) method?
2. How is the cost feasibility analysis of the investment in the development of the Transjatim Bus Stop Corridor I and Corridor V at the Transit Point Stop in Purabaya Terminal?

Research Objectives

The objectives to be achieved based on the formulation of the problems above are:1. To analyze the feasibility of the performance of the Transjatim Bus Stop Corridor I and Corridor V at the Transit Point Stop in Purabaya Terminal in accordance with the Technical Guidelines for the Engineering of Passenger

Vehicle Stopping Places and the Minimum Service Standards for Mass Transportation using the Importance Performance Analysis (IPA) method;2. To analyze the cost feasibility of the investment in the development of the Transjatim Bus Stop Corridor I and Corridor V at the Transit Point Stop in Purabaya Terminal.

Research Benefits

This research is expected to provide dual contributions, both theoretically and practically, for various related parties:1. For Myself (Researcher): This research serves as a means of applying the discipline of Transportation Civil Engineering, particularly in evaluating public infrastructure projects, in order to produce expertise and academic competence at the Master's level in the evaluation and planning of public transportation infrastructure, namely by comparing the existing conditions of the stop, the detailed engineering design of the stop, the Minimum Service Standards for Road-Based Mass Transportation, and the Technical Guidelines for the Engineering of Passenger Vehicle Stopping Places;2. For the Local Environment/Community (Stop Users): The results of this analysis can serve as a basis for the Government/Managers to make improvements to the design and addition of facilities at the Trans Jatim Transit Point Stop within Purabaya Terminal (for example, the addition of waiting room capacity and protection from rain), thus increasing the comfort and safety of users. Encouraging the creation of a clear separation between the waiting area and pedestrian paths, thereby enhancing safety and restoring the function of sidewalks for the general public.

For the Government and Private Sector (TransJatim Organizers)

Providing valid Net Present Value (NPV), Benefit Cost Ratio (BCR), and Internal Rate of Return (IRR) data as a scientific basis for the East Java Provincial Government in evaluating the cost feasibility and performance of the Transit Point TransJatim facility investment. Providing strategic recommendations regarding effective budget allocation for the improvement and development of stop facilities in other corridors, as input in the formulation of technical policies (Standard Operating Procedures/SOP) for the arrangement and management of interactions between public transportation (TransJatim) and online transportation (online motorcycle taxis) in the stop area, in order to reduce conflicts and delays.

For the Campus Community (Transportation Science Development)

Demonstrating the active role and real contribution of UNTAG Surabaya in solving infrastructure and transportation problems faced by the Local Government, thereby enhancing the campus's reputation in the eyes of the public and stakeholders. The results of this analysis can serve as baseline data for other researchers and students at UNTAG Surabaya who are interested in conducting further research related to operational efficiency or user satisfaction with TransJatim services.

THEORETICAL REVIEW

Evaluating the performance and investment cost feasibility of bus stop infrastructure, such as the Transjatim Bus Stops at the Transit Point Purabaya Terminal, requires an integrated assessment of operational effectiveness, user satisfaction, and economic viability. The literature on public transportation infrastructure highlights that performance analysis often includes metrics such as passenger flow, service reliability, accessibility, safety, and comfort—factors that influence ridership levels and overall system efficiency. Studies emphasize the use of both qualitative and quantitative data, including surveys, observational counts, and service performance indicators, to capture the multifaceted nature of bus stop functionality. In parallel, investment cost feasibility is commonly examined through economic appraisal techniques such as cost–benefit analysis (CBA), net present value (NPV), and internal rate of return (IRR), which compare the projected benefits—like reduced travel times, improved connectivity, and increased economic activity—against upfront capital and operating costs. Research further suggests that incorporating life-cycle cost analysis and sensitivity testing enhances the robustness of feasibility assessments by accounting for uncertainties in demand forecasts and operating conditions. Additionally, studies on transit-oriented development indicate that well-designed bus stop facilities can stimulate local development and improve social inclusion, reinforcing their broader value beyond direct financial returns. Taken together, the literature supports a comprehensive framework that combines performance evaluation with rigorous investment appraisal to inform strategic decision-making for bus stop infrastructure improvements.

METHODOLOGY

Research Limitations and Scope

This research limits its focus to testing the causality between the quality of stop infrastructure and mode integration on user satisfaction at a critical point in the TransJatim Bus transportation system in Corridor I and Corridor V.

Location and Infrastructure Limitations

This research is exclusively located at the Transit Point Stop at Purabaya Terminal. This location was chosen due to its crucial function as the starting and ending point of the TransJatim Corridor I and Corridor V routes and as a major mode integration hub at the southern border of Surabaya City. The survey time is limited to weekdays and focused on peak hours (for example, morning 06:00-08:00 and afternoon 16:00-18:00 WIB because the main issues occur during those times). The infrastructure objects analyzed include the waiting room capacity and passenger boarding/alighting access, the existing physical condition of the Transit Point Stop at Purabaya Terminal, including cost components.

RESULTS AND DISCUSSION

The research study area is the Trans Jatim Bus Transit Point, located within the Purabaya (Bungurasih) Type A Terminal. Administratively, Purabaya Terminal is located in Waru District, Sidoarjo Regency, but functionally, it serves as the main gateway and transit hub for people traveling to and from Surabaya.

This makes Purabaya Terminal the second busiest transportation hub in Indonesia after Jakarta.

Geographically, Purabaya Terminal is located on Jalan Bungurasih Timur, Sidoarjo Regency, precisely on the southern border of Surabaya City, adjacent to the Waru Roundabout, which serves as the meeting point for national routes, exits and entries for toll roads (Surabaya-Gempol Toll Road, Waru-Juanda Toll Road), and the entrance to Surabaya City and Sidoarjo Regency (Wikipedia Purabaya Terminal, 2024). Purabaya Terminal has 34 routes and 627 fleet units serving a variety of inter-city destinations within the province (East Java Class II Land Transportation Management Center, 2025) and serves as a transit hub for city buses and intercity transportation from various regencies/cities throughout East Java.

There are two corridors passing through the Purabaya Terminal Transit Point Bus Stop: Corridor I, Regular and Luxury, and Corridor V. The total fleet of Trans Jatim Corridor I buses currently consists of 140 buses, with 136 operating and 4 in reserve.

Corridor I has a route from and to the Porong Terminal in Sidoarjo Regency to the Bunder Terminal in Gresik Regency, which passes through the TransJatim Transit Point bus stop at the Purabaya Terminal. Departure times for TransJatim Corridor I from the Porong Terminal in Sidoarjo Regency are 5:00 AM to 7:00 PM WIB and from the Bunder Terminal in Gresik Regency are 5:00 AM to 7:00 PM WIB. A round trip (1 trip) between Sidoarjo and Gresik. TransJatim Corridor I passes through 35 bus stops, as shown in the TransJatim route map.

The demographic profile of TransJatim Corridor I and Corridor V passengers using Transit Point Bus Stops strongly demonstrates the characteristics of young professional commuters. Of the 110 respondents, the gender composition was dominated by males at 60% (66 people), while females accounted for 40%. The age profile shows that the majority of passengers are in the young, productive age category, with the 26-35 age group making up the absolute majority at 54% (59 people), followed by the 18-25 age group at 19% (21 people).

In total, the 18-35 age group constituted 73%. The occupational characteristics of these passengers align closely with this productive age group. The majority of passengers work in the formal sector, dominated by civil servants (PNS/ASN) at 43% (47 people) and private sector employees at 31% (34 people). This high percentage of workers is reflected in their monthly net income, with those earning over 4.5 million rupiah per month dominating (54%), with the highest income group (>5.5 million rupiah per month) accounting for the largest share, at 37% (41 people). This indicates that TransJatim services at this crucial bus stop attract professionals and the upper-middle class.

Data on trip purposes confirms the primary function of TransJatim at the Purabaya Bus Stop, namely as a daily commuter transportation mode. Work was the most dominant reason for travel, accounting for nearly half of all trips, at 48% (53 people). Other large percentages included visiting relatives (24%) and tourism/vacation (10%). Therefore, this demographic data consistently depicts the Purabaya Bus Stop as a daily commuter transit hub serving young, middle-

to upper-income male workers, primarily from the government and private sectors.

The measurement tool used in this study was a questionnaire. The questionnaire used in this study can be seen in Appendix 5. Data obtained from interviews with respondents was then further processed to obtain results that could be used to answer the research questions. Before conducting the service quality test, validity and reliability tests were conducted to determine whether the questions used in the questionnaire were valid and reliable.

Validity testing is used to determine or measure the accuracy of each statement item in the questionnaire. Statements deemed inaccurate must be replaced or removed. Validity test results are considered valid if the calculated r value is greater than the table r value. The table r value used in this study was 0.195, with an alpha value of 0.05 and an N of 110. Validity testing was conducted using IBM SPSS 23. The calculated r value can be determined by analyzing the data processing results, including the correlation between item scores and the total score, which can be seen in the SPSS output.

Reliability testing is needed to determine the stability or consistency of respondents in answering each question in the questionnaire. Furthermore, reliability testing is also used to determine the accuracy of the research measurement results. In this study, reliability testing was conducted using IBM SPSS 23. Data is considered reliable if the Cronbach's Alpha is greater than the reference alpha, which is 0.6.

Importance Performance Analysis (IPA) is used to map the relationship between the level of importance and the level of performance of each described attribute. Respondents' assessments, as seen in Appendix 1 regarding the level of importance and performance, will be averaged, analyzed, and presented in diagram form using a scatter plot in SPSS.

The suitability analysis is obtained from the assessment of the importance and performance levels, which can be used to determine the priority scale for improving performance factors. The suitability level (Tki) is the result of comparing the performance score (Xi) with the importance score (Yi).

- Security Aspects

  Based on Regulation of the Minister of Transportation of the Republic of Indonesia Number 10 of 2012 concerning minimum service standards for road-based mass transportation, the safety aspect of bus stop performance has four attributes. The Minimum Service Standards that must be met are:

  1. Lighting
  2. Security personnel
  3. Information about security disturbances
  4. CCTV installation

- Safety Aspects

  The minimum service standards for road-based mass transportation, in terms of bus stop safety performance, have two minimum service standard attributes that must be met:

  1. Availability of signs
  2. Availability of markings

- Convenience Aspect

  The minimum service standards for road-based mass transportation, including bus stop comfort performance, have 7 (seven) service standard attributes. The minimum service standards that must be met are:

  1. Lighting
  2. Availability of air conditioning, fans, and ventilation
  3. Sanitation facilities such as trash cans
  4. Standing space for passengers while waiting
  5. Facilities for boarding/alighting passengers: The bus stop floor height is the same as the bus floor height
  6. Toilet facilities
  7. Prayer room facilities

- Affordability Aspect

  The minimum service standards for road-based mass transportation, in terms of bus stop accessibility performance, have two minimum service standard attributes that must be met:

  1. Availability of integrated feeder route networks
  2. Affordable fares

- Equality Aspect

  The minimum service standards for road-based mass transportation, including bus stop performance, have two minimum service standard attributes that must be met:

  1. Special wheelchair space
  2. Special floor slope and texture

- Aspect of Order

  The minimum service standards for road-based mass transportation, including bus stop performance, have four service standard attributes. The minimum service standards that must be met are:

  1. Service information (bus stop name, route, map)
  2. Bus arrival time information
  3. Bus disruption information
  4. Payment system (ticket receipt)

This cost feasibility analysis aims to ensure that the initial investment for the construction of the Transjatim Bus transit point will provide greater and more sustainable returns throughout the project's economic life. The assessment methods used include Net Present Value (NPV), Benefit-Cost Ratio (BCR), and Internal Rate of Return (IRR), which are standard techniques in public project investment analysis based on the concept of the time value of money.

Based on data from the East Java Provincial Transportation Agency, the project's cash inflows (benefits) and cash outflows (costs), which include the initial investment in Year 0, namely 2022, will require the first launch of the Trans Jatim Corridor I public transportation service. The construction costs for the transit point bus stop will be.

The benefits of public infrastructure projects like this generally include direct benefits (revenue) and indirect benefits. The calculation, obtained from secondary data in this study, is the first-year benefit calculated from the number

of passengers after the initial launch of Corridor I in 2022, which is IDR 3,100,700,000.00. This indirect benefit was calculated based on the fare difference for students (Islamic boarding school students) of IDR 2,500 and general passengers of IDR 5,000. Operational and maintenance costs include annual employee wages and cleaning equipment of IDR 204,000,500. In 2025, an additional bus stop building on the north side will be built, amounting to IDR 36,220,000.

Based on calculations, the project's Internal Rate of Return (IRR) is 22%. This IRR far exceeds the assumed interest rate or discount rate, which was analyzed in the range of 8.00% to 25.00%. Because the IRR (22%) is greater than the highest interest rate tested, this project is considered financially attractive. Meanwhile, the project's Net Present Value (NPV) consistently shows positive results across the entire tested interest rate range (8.00% to 25.00%). At the discount rate At the lowest discount rate (8.00%), the NPV reached IDR 384.88 million, and even at the highest discount rate (25.00%), the NPV remained positive at IDR 72.71 million, indicating that the project consistently generated net added value. Consistent feasibility is also reinforced by the Benefit Cost Ratio (BCR), which consistently exceeded 1.00 across all interest rate scenarios. At an interest rate of 8.00%, the BCR reached 1.29, meaning that every rupiah of costs generated yielded a benefit of IDR 1.29. Even at an interest rate of 25.00%, the BCR remained at 1.10. With a BCR consistently above 1.00, a consistently positive NPV, and a high IRR (22%), it can be concluded that this transit point construction project is feasible and economically and financially profitable.

CONCLUSION

Based on the analysis of the performance and feasibility of the Transjatim Bus Transit Point Stops for Corridor I and Corridor V at Purabaya Terminal, the following conclusions can be drawn:

1. The Transit Point Stop at Purabaya Terminal is feasible and complies with the Technical Guidelines for Engineering Passenger Vehicle Stops and Minimum Service Standards for Mass Transportation. As analyzed using the Importance Performance Analysis (IPA) method to determine the deviation between existing facilities and current TransJatim user needs, five of the eighteen indicators fall into Quadrant III and are areas that require improvement.
2. The feasibility analysis of the investment costs for the Transit Point Bus Stop development for Corridor I and Corridor V indicates that the project is highly feasible. This is because the project's Internal Rate of Return (IRR) is greater than the highest interest rate tested (8% - 25%), the Net Present Value (NPV) consistently shows positive results across the entire interest rate range, and the Benefit Cost Ratio (BCR) is consistently greater than 1.00. It can be concluded that the transit point bus stop development project is feasible and economically and financially profitable.

RECOMMENDATION

Based on the feasibility analysis results and conclusions, the author can provide the following recommendations:

1. Regarding bus stop performance, particularly regarding modal integration, it is crucial to develop it, particularly the plan for intermodal fare integration. This is very positive for developing and replicating the integrated Transit Point bus stop model at other crucial points in the Transjatim network, thereby strengthening inter-corridor interconnections and overall operational efficiency.
2. The necessity of strengthening indirect benefits, this is to maintain a high benefit value (BCR > 1.00), it is necessary to carry out socialization programs and incentives to increase the number of ridership, so that indirect benefits (such as reduced congestion, time savings, and environmental improvements) that have been monetized in the analysis can be achieved.
3. Conduct periodic sensitivity analysis on key cost and benefit components, especially if there is an increase in construction material prices or drastic changes in passenger number projections, to prepare operational risk mitigation strategies and maintain project feasibility in the long term.

FURTHER STUDY

Future research is recommended to further examine the operational performance and user satisfaction of TransJatim Transit Point Stops by incorporating longitudinal data to assess changes over time after facility improvements are implemented. Additional studies could focus on evaluating the effectiveness of upgrading the indicators identified in Quadrant III of the Importance Performance Analysis in improving service quality and passenger experience. Moreover, expanding the analysis to include other corridors or terminals within the TransJatim network would provide comparative insights into system-wide performance and investment feasibility. Integrating environmental and social impact assessments may also enrich future evaluations, supporting more sustainable and comprehensive planning of mass transportation infrastructure.

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