

Preferences and Trip Attraction of Inclusive Public Transport for Vulnerable Groups to Support Equitable Urban Mobility

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ABSTRACT: Inclusive public transportation is essential for promoting equitable mobility, particularly among vulnerable groups whose travel opportunities are often constrained by limited accessibility, safety concerns, socioeconomic conditions, and restricted access to private vehicles. This study investigates the relationships among accessibility, perceived safety, collaborative governance, public transportation preference and intention, and trip attraction among vulnerable users in Majene Regency, Indonesia. A quantitative cross-sectional survey was conducted involving 212 respondents, and the hypothesized relationships were examined using partial least squares structural equation modeling (PLS-SEM). Five latent constructs were evaluated: Accessibility (AC), Perceived Safety (PS), Collaborative Governance (CG), Preference and Intention (PU), and Trip Attraction (TA). The study addresses the need for an integrated understanding of how infrastructure accessibility, safety perceptions, and institutional coordination are associated with transportation preferences and potential travel demand among vulnerable populations. Its primary contribution lies in integrating these five dimensions within a single empirical framework. The results demonstrate that accessibility is positively associated with perceived safety ($\beta = 0.545$, $p < 0.001$), while collaborative governance exhibits significant positive associations with preference and intention ($\beta = 0.755$, $p < 0.001$) and trip attraction ($\beta = 0.683$, $p < 0.001$). Conversely, perceived safety is not significantly associated with preference and intention ($\beta = 0.085$, $p = 0.076$), and the indirect association between accessibility and preference and intention through perceived safety is also not statistically significant ($\beta = 0.067$, $p = 0.096$). The model explains 29.7% of the variance in perceived safety, 60.1% in preference and intention, and 46.7% in trip attraction. These findings highlight the importance of integrating physical accessibility improvements with collaborative governance involving local authorities, transportation operators, public institutions, communities, and vulnerable users to support more inclusive and responsive public transportation planning.

KEYWORDS: Inclusive public transport; vulnerable groups; accessibility; perceived safety; collaborative governance; PLS-SEM; equitable mobility

1. Introduction

Public transportation plays an essential role in providing equitable mobility opportunities, particularly for individuals with limited access to private vehicles and vulnerable groups whose travel needs are influenced by physical, socioeconomic, demographic, and household conditions [1–5]. Inclusive public transportation extends beyond the provision of transportation services to ensuring that infrastructure, vehicles, passenger information, safety measures, and decision-making processes accommodate the diverse needs of users. However, achieving inclusive mobility remains challenging, particularly in regional areas where transportation services, infrastructure accessibility, and institutional coordination may be insufficient to address the specific requirements of vulnerable populations.

Vulnerable transportation users may include children, older adults, persons with disabilities, women, pregnant or breastfeeding women, caregivers traveling with dependents, low-income individuals, and people without access to private vehicles. These groups may experience interconnected mobility barriers that restrict their ability to access essential services and participate in socioeconomic activities. Physical obstacles, including inadequate pedestrian facilities, inaccessible boarding areas, and unsuitable vehicle designs, can limit transportation accessibility. Similarly, unsafe waiting environments, insufficient route coverage, and unreliable services may discourage public transportation use, particularly among individuals with mobility limitations or additional caregiving responsibilities [2–8]. These challenges demonstrate that transportation exclusion is multidimensional and cannot be adequately addressed through infrastructure improvements alone.

Previous studies have emphasized the importance of accessibility, perceived safety, and user-oriented transportation planning in promoting inclusive mobility [1–5]. Accessibility determines the extent to which passengers can reach, board, and use transportation services, whereas perceived safety reflects users' confidence in the security and conditions of their travel environment. Both dimensions may influence transportation preferences and willingness to use public transportation, particularly among vulnerable populations. However, improvements in accessibility and safety also depend on effective institutional arrangements and coordinated decision-making. Public transportation systems involve multiple stakeholders, including local governments, transportation operators, educational institutions, healthcare providers, security authorities, community organizations, and service users. Collaborative governance can therefore facilitate the coordination of transportation policies, infrastructure development, service provision, and stakeholder participation to better address the needs of vulnerable users [9–16].

Majene Regency, Indonesia, provides a relevant setting for investigating inclusive public transportation in a regional, non-metropolitan context. Mobility within the regency involves travel between residential areas and essential activity centers, including schools, universities, markets, government offices, healthcare facilities, and other public services. Access to these destinations is particularly important for individuals who cannot consistently rely on private vehicles. Although some residents have access to motorcycles or cars, others experience mobility limitations associated with financial constraints, physical conditions, age, or household responsibilities. Consequently, the accessibility, safety, and reliability of public

transportation services may influence their ability to participate in educational, economic, healthcare, and community activities.

The development of inclusive public transportation in Majene also presents institutional and operational challenges. Transportation accessibility cannot be improved solely by providing additional infrastructure because effective services require appropriate route coverage, reliable operations, accessible pedestrian connections, safe boarding facilities, and responsive passenger information systems. These components involve different stakeholders whose responsibilities and resources must be coordinated. Local governments, transportation operators, educational institutions, healthcare facilities, community representatives, security authorities, and vulnerable users may contribute to identifying mobility barriers and developing appropriate service improvements. Accordingly, collaborative governance represents a potentially important dimension of inclusive transportation planning, particularly in regional settings where institutional capacity and transportation resources may be limited.

Despite increasing attention to inclusive transportation, important research gaps remain regarding the relationships among accessibility, perceived safety, collaborative governance, transportation preferences, and trip attraction. Previous studies have examined physical accessibility, transportation safety, gender-responsive mobility, barriers experienced by vulnerable users, and transportation governance [5–22]. However, empirical evidence integrating these dimensions within a single structural framework remains limited, particularly in smaller regional Indonesian contexts. Existing research has not sufficiently clarified how accessibility is associated with perceived safety, whether perceived safety is associated with transportation preference and intention, and how collaborative governance relates to user preferences and trip attraction. Furthermore, the potential indirect relationship between accessibility and transportation preference through perceived safety requires additional empirical examination. Addressing these gaps is important for developing a more comprehensive understanding of inclusive mobility that considers physical transportation conditions, user perceptions, institutional coordination, and potential travel demand.

To address these gaps, the present study develops and evaluates an integrated conceptual framework comprising five latent constructs: Accessibility (AC), Perceived Safety (PS), Collaborative Governance (CG), Preference and Intention (PU), and Trip Attraction (TA). The study contributes to existing transportation research by examining these dimensions simultaneously rather than treating infrastructure accessibility, passenger safety, and governance as independent issues. Its principal novelty lies in applying an integrated structural model to vulnerable transportation users in Majene Regency, thereby providing empirical evidence from a regional Indonesian setting. The framework also distinguishes direct relationships from the proposed indirect association between accessibility and transportation preference through perceived safety. This approach provides a basis for identifying which dimensions are statistically associated with inclusive transportation preferences and potential trip attraction.

The conceptual framework is illustrated in Figure 1, which presents the five latent constructs and their hypothesized relationships. The framework proposes that accessibility is positively associated with perceived safety (H1), while collaborative governance is positively associated with preference and intention (H2) and trip attraction (H3). Perceived safety is hypothesized to have a positive association with preference and intention (H4), while accessibility is expected to have an indirect association with preference and intention through

perceived safety (H5). These relationships provide the theoretical foundation for the subsequent empirical analysis using partial least squares structural equation modeling (PLS-SEM).

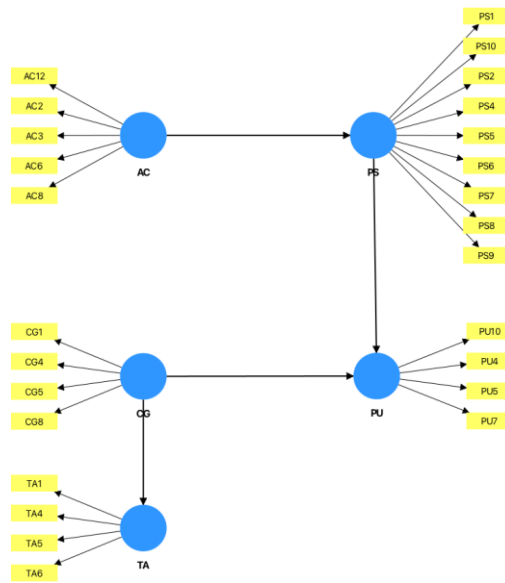


Figure 1. Conceptual Framework and Hypotheses.

Accordingly, this study aims to empirically examine the relationships among accessibility, perceived safety, collaborative governance, public transportation preference and intention, and trip attraction among vulnerable users in Majene Regency. Specifically, the study evaluates the association between accessibility and perceived safety, investigates the relationships between collaborative governance and both preference and intention and trip attraction, examines the relationship between perceived safety and preference and intention, and assesses the indirect association between accessibility and preference and intention through perceived safety. By applying PLS-SEM to cross-sectional survey data, the study seeks to identify statistically significant relationships that can inform inclusive public transportation planning and stakeholder coordination. The findings are intended to provide practical insights for improving transportation accessibility, service responsiveness, and institutional collaboration without implying causal relationships.

2. Materials and Methods

2.1. Research Design.

This study employed a quantitative, cross-sectional survey design to investigate the relationships among accessibility, perceived safety, collaborative governance, public transportation preference and intention, and trip attraction among vulnerable transport users in Majene Regency, Indonesia. Primary data were collected using a structured questionnaire with a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). This approach enabled the quantitative assessment of respondents' perceptions and the statistical examination of the proposed relationships. The research framework comprised five latent constructs: Accessibility (AC), Perceived Safety (PS), Collaborative Governance (CG), Preference and Intention (PU), and Trip Attraction (TA). Accessibility and Collaborative Governance were specified as exogenous constructs, whereas Perceived Safety, Preference and Intention, and

Trip Attraction were treated as endogenous constructs. Perceived Safety was also proposed as a mediating construct in the relationship between Accessibility and Preference and Intention. The hypothesized relationships were evaluated using partial least squares structural equation modeling (PLS-SEM) with SmartPLS 4.

2.2. Questionnaire Development.

The questionnaire was developed by adapting and contextualizing measurement indicators from previous studies addressing inclusive transportation, accessibility, safety, collaborative governance, transportation preferences, and travel demand [5–22]. Rather than adopting an existing questionnaire without modification, the indicators were adjusted to reflect local transportation conditions and the mobility needs of users in Majene Regency. This approach was intended to maintain the conceptual relevance of established constructs while ensuring that the questionnaire was appropriate for the study context.

The adaptation process focused on the practical dimensions of inclusive transportation. Accessibility indicators addressed boarding and alighting facilities, pedestrian connections, waiting areas, and physical obstacles surrounding transportation stops. Perceived Safety indicators covered conditions inside vehicles, safety at waiting locations, travel during less busy periods, and transportation experiences involving children or other dependents. Collaborative Governance indicators examined coordination among local government agencies, transportation operators, public institutions, community representatives, security personnel, and service users. The questionnaire was reviewed for clarity and contextual relevance before distribution, and the final statements were written in accessible language to accommodate respondents with different educational backgrounds.

2.3. Respondents and Sampling Procedure.

A total of 212 valid questionnaire responses were included in the analysis. Respondents were recruited from community and institutional settings relevant to public transportation use in Majene Regency. The recruitment process targeted individuals who had experience using public transportation or whose daily mobility needs made public transportation a relevant travel option. Purposive sampling was employed because the study focused on individuals with mobility-related characteristics relevant to inclusive transportation rather than attempting to represent the entire population of Majene Regency. In this study, vulnerability was defined primarily in relation to mobility conditions rather than formal clinical or administrative classifications. Respondents were considered relevant to inclusive transportation research when their transportation needs or circumstances could increase their dependence on accessible, safe, and affordable mobility services. Accordingly, the sample included individuals with different socioeconomic backgrounds, educational levels, occupations, income categories, and vehicle ownership conditions. The demographic and mobility-related characteristics of the respondents are summarized in Table 1. The sample was predominantly composed of younger respondents, with 61.79% aged 19–28 years and 25.00% aged 29–38 years. Students represented the largest occupational group (53.30%), followed by civil servants, military personnel, and police officers (31.60%). Half of the respondents held bachelor's degrees, while 53.30% reported monthly incomes below IDR 1,500,000. These characteristics indicate that the sample included a substantial proportion of younger individuals

and respondents in lower income categories, whose transportation needs may be influenced by educational activities, employment, and financial circumstances.

Table 1. Demographic and Mobility-Related Characteristics of Respondents.

Variable	Category	n	%
Age	<18 years	7	3.3
	19–28 years	131	61.79
	29–38 years	53	25
	39–48 years	18	8.49
	>48 years	3	1.42
Education	Senior high school/vocational school	67	31.6
	Bachelor's degree	106	50
	Master's/doctoral degree	39	18.4
Occupation	Student	113	53.3
	Civil servant/military/police	67	31.6
	Private employee	14	6.6
	Entrepreneur/trader	7	3.3
	Informal worker	7	3.3
	Homemaker	4	1.9
Income	< IDR 1,500,000	113	53.3
	IDR 1,500,000–3,000,000	28	13.21
	IDR 3,000,001–5,000,000	36	16.98
	> IDR 5,000,000	35	16.51
Vehicle ownership	None	64	30.19
	Motorcycle	109	51.42
	Car	14	6.6
	Motorcycle and car	25	11.79

Vehicle ownership provided additional insight into respondents' mobility conditions. Approximately 30.19% did not own a private vehicle, while 51.42% owned motorcycles, 6.60% owned cars, and 11.79% owned both motorcycles and cars. Respondents without private vehicles may face greater limitations in independently accessing essential destinations, although vehicle ownership alone does not fully determine transportation vulnerability. Furthermore, the available dataset did not provide verified subgroup counts for persons with disabilities, pregnant women, or other specific vulnerable categories. Therefore, the sample should be interpreted as representing respondents with varying mobility-related circumstances rather than as a statistically representative sample of all vulnerable population groups in Majene Regency.

2.4. Measurement Model.

The measurement model was evaluated to assess the reliability and validity of the latent constructs before examining the structural relationships. Indicator reliability was assessed using outer loadings, while internal consistency reliability was evaluated using Cronbach's alpha, rho_A, and composite reliability. Outer loading values of approximately 0.708 or higher were considered acceptable, and reliability coefficients of at least 0.70 were used as indicators of satisfactory internal consistency. Convergent validity was assessed using the average variance extracted (AVE), with values of 0.50 or higher indicating that a construct explained at least half of the variance in its indicators [26, 27]. Discriminant validity was examined using the Fornell–Larcker criterion and the heterotrait–monotrait ratio (HTMT) to evaluate whether the latent constructs were empirically distinguishable [28]. During the initial measurement model assessment, indicator TA6 exhibited a particularly low outer loading of 0.097, indicating that it contributed minimally to the measurement of Trip Attraction. Consequently, TA6 was excluded from the final measurement model. The subsequent reliability, convergent validity, and discriminant validity assessments were conducted using the retained Trip Attraction

indicators, namely TA1, TA4, and TA5. This refinement was intended to improve measurement quality while preserving the conceptual relevance of the construct.

2.5. Selection of PLS-SEM.

Partial least squares structural equation modeling was selected because the primary objective of the study was to examine relationships among multiple latent constructs and explain variation in perceived safety, transportation preference and intention, and trip attraction. Unlike covariance-based structural equation modeling (CB-SEM), which is commonly employed for theory confirmation and covariance structure assessment, PLS-SEM emphasizes the estimation of relationships and explained variance in endogenous constructs. This approach was considered appropriate for the applied transportation planning context and the proposed model involving direct and indirect relationships [26, 27]. The study involved five latent constructs and 212 valid respondents, allowing the simultaneous estimation of multiple structural relationships and the proposed mediation pathway. PLS-SEM also facilitated the evaluation of measurement reliability, construct validity, structural coefficients, and explained variance within a unified analytical framework. Nevertheless, the selection of PLS-SEM was based primarily on the research objectives and analytical framework rather than sample size alone. The resulting coefficients were interpreted as statistical relationships within the cross-sectional dataset rather than evidence of causality.

2.6. Structural Model.

The structural model was developed to evaluate the hypothesized relationships among Accessibility, Perceived Safety, Collaborative Governance, Preference and Intention, and Trip Attraction. Accessibility and Collaborative Governance were specified as exogenous constructs, whereas Perceived Safety, Preference and Intention, and Trip Attraction were treated as endogenous constructs. The proposed model included four direct relationships and one indirect relationship involving Perceived Safety as a mediator.

The first structural relationship examined the association between Accessibility and Perceived Safety, as expressed in Equation (1). This relationship was intended to determine whether more favorable accessibility conditions were associated with higher perceived safety among transportation users.

$$PS = \beta_1 AC + \zeta_1 \quad (1)$$

where PS represents Perceived Safety, AC represents Accessibility, β_1 is the standardized path coefficient from Accessibility to Perceived Safety, and ζ_1 represents unexplained variance.

The second structural relationship examined the simultaneous associations of Collaborative Governance and Perceived Safety with Preference and Intention, as expressed in Equation (2). This specification enabled the estimation of each construct's association with transportation preference and intention while accounting for the other predictor..

$$PU = \beta_2 CG + \beta_3 PS + \zeta_2 \quad (2)$$

where PU represents Preference and Intention, CG represents Collaborative Governance, β_2 represents the path coefficient from Collaborative Governance to Preference and Intention, β_3 represents the path coefficient from Perceived Safety to Preference and Intention, and ζ_2 represents unexplained variance.

The third relationship examined the association between Collaborative Governance and Trip Attraction, as presented in Equation (3). This relationship was specified to evaluate whether favorable perceptions of institutional coordination were associated with greater perceived trip attraction.

$$TA = \beta_4 CG + \zeta_3 \quad (3)$$

where TA represents Trip Attraction, CG represents Collaborative Governance, β_4 represents the path coefficient from Collaborative Governance to Trip Attraction, and ζ_3 represents unexplained variance.

The proposed mediation relationship examined whether Accessibility was indirectly associated with Preference and Intention through Perceived Safety. The indirect effect was calculated as the product of the two constituent path coefficients, as expressed in Equation (4).

$$AC \rightarrow PS \rightarrow PU = \beta_1 + \beta_3 \quad (4)$$

where β_1 represents the effect of Accessibility on Perceived Safety and β_3 represents the effect of Perceived Safety on Preference and Intention. A statistically significant indirect effect would indicate mediation by Perceived Safety.

The structural model was assessed using variance inflation factor (VIF), coefficient of determination (R^2), effect size (f^2), standardized path coefficients β , t-values, and bootstrapping-based significance testing. VIF values below 5 were considered acceptable, while f^2 values of approximately 0.02, 0.15, and 0.35 were interpreted as small, medium, and large effects, respectively [26, 30].

3. Results and Discussion

3.1. Descriptive Statistics.

The descriptive statistics of the measurement indicators retained in the final model are presented in Table 2. The mean scores provide an overview of respondents' assessments of accessibility, perceived safety, collaborative governance, preference and intention, and trip attraction. Standard deviations indicate the extent of variation in responses across the 212 participants. The accessibility indicators recorded moderate to relatively favorable mean scores, ranging from 3.340 to 3.679. The highest score was observed for unobstructed waiting areas (AC8), whereas safe drop-off and pick-up facilities (AC12) received the lowest assessment. These results suggest that respondents generally viewed accessibility conditions positively, although certain boarding and waiting facilities may require further attention.

Table 2. Descriptive Statistics of Research Indicators.

Construct	Indicator	Mean	SD
Accessibility	AC12 – Safe drop-off/pick-up	3.34	1.03
	AC2 – Boarding/alighting points are at a reasonable distance	3.623	0.937
	AC3 – Pedestrian paths are safe and comfortable	3.642	0.927
	AC6 – Waiting points provide sufficient space	3.358	1.013
	AC8 – Areas around waiting points are free from obstacles	3.679	0.914
Collaborative Governance	CG1 – Local government involves women in transport planning	4.189	0.85
	CG4 – Schools, campuses, markets, and health facilities cooperate on priority routes	4.321	0.792
	CG5 – Security/public officers are connected with complaint systems	4.302	0.805
	CG8 – Cooperation among government, operators, academics, communities, and users is important	4.34	0.778
Perceived Safety	PS1 – Safe inside the vehicle	3.755	0.923
	PS2 – Safe while waiting at boarding points	3.66	0.914
	PS4 – Safe during less busy periods	3.189	1.01
	PS5 – Safe when vehicle/stop is quiet	2.943	1.055
	PS6 – Safe when travelling with children	3.358	0.994
	PS7 – Safe when travelling with older adults/persons with disabilities	3.34	1.008
	PS8 – Safe when carrying shopping/luggage/children's equipment	3.491	0.967
	PS9 – Safe walking within approximately 400 m	3.358	0.992
	PS10 – Stops are safe from disturbances	3.396	0.985
Preference and Intention	PU4 – Willing to leave private vehicles if service is safe, punctual, and affordable	3.868	0.936
	PU5 – Interested when routes match destinations	3.981	0.882
	PU7 – Gender-responsive public transport is important	4.132	0.832
	PU10 – Prefer services with clear schedules and stops	4.226	0.806
Trip Attraction	TA1 – Need public transport connecting schools/campuses/education	4.566	0.698
	TA4 – Need public transport connecting government/public services	4.453	0.731
	TA5 – Need safe public transport when travelling with children/older adults/persons with disabilities	4.377	0.76

Collaborative Governance indicators demonstrated consistently high mean scores, ranging from 4.189 to 4.340. The highest score was recorded for cooperation among government agencies, transportation operators, academics, communities, and users (CG8). This finding indicates strong respondent support for stakeholder collaboration in inclusive transportation planning. However, these scores primarily reflect perceptions of the importance of collaboration rather than independently verified governance performance. Perceived Safety showed greater variation, with mean scores ranging from 2.943 to 3.755. Safety inside vehicles (PS1) received the highest assessment, while safety when vehicles or stops were quiet (PS5) recorded the lowest mean and the highest standard deviation (1.055). This pattern suggests that safety concerns may become more pronounced under low-activity travel conditions. Preference and Intention indicators were generally favorable, particularly the preference for clearly defined schedules and stops (PU10, mean = 4.226). Trip Attraction recorded the highest overall indicator scores, especially the need for transportation connections to educational institutions (TA1, mean = 4.566). These findings highlight the perceived importance of reliable services connecting essential destinations in Majene Regency.

3.2. Measurement Model.

The measurement model was evaluated to establish indicator reliability, internal consistency, and convergent validity before assessing the structural relationships. As presented in Table 3, indicator TA6 was excluded because its outer loading was only 0.097, substantially below the recommended threshold. Following its removal, the Trip Attraction construct was measured using TA1, TA4, and TA5. all retained indicators achieved outer loadings above 0.70, ranging from 0.722 to 0.915. Collaborative Governance exhibited particularly strong indicator loadings, suggesting consistent representation of its underlying construct. Cronbach's alpha values ranged from 0.865 to 0.937, while composite reliability values ranged from 0.907 to 0.950, exceeding the recommended threshold of 0.70. These results indicate satisfactory internal consistency across the five constructs. Furthermore, AVE values ranged from 0.667 to 0.826, exceeding the minimum criterion of 0.50 and supporting convergent validity. Collectively, these findings indicate that the retained indicators provide an acceptable measurement basis for subsequent structural analysis, although the reported reliability statistics should be verified against the final SmartPLS output.

Table 3. Measurement Model Assessment.

Construct	Indicator	Outer Loading	Cronbach's α	rho_A	Composite Reliability	AVE
Accessibility	AC12	0.842	0.887	0.898	0.917	0.688
	AC2	0.786				
	AC3	0.82				
	AC6	0.868				
	AC8	0.829				
Collaborative Governance	CG1	0.903	0.93	0.93	0.95	0.826
	CG4	0.915				
	CG5	0.913				
	CG8	0.904				
Perceived Safety	PS1	0.833	0.937	0.943	0.947	0.667
	PS2	0.722				
	PS4	0.734				
	PS5	0.901				
	PS6	0.867				
	PS7	0.799				
	PS8	0.854				
	PS9	0.875				
	PS10	0.744				
Preference and Intention	PU4	0.82	0.865	0.88	0.907	0.71
	PU5	0.834				
	PU7	0.884				
	PU10	0.83				
Trip Attraction	TA1	0.865	0.916	0.919	0.947	0.790
	TA4	0.913				
	TA5	0.888				

Discriminant validity was subsequently examined using the Fornell–Larcker criterion, as presented in Table 4. The square root of AVE for each construct exceeded its correlations with the other constructs, satisfying the Fornell–Larcker criterion. The highest inter-construct

correlation was observed between Collaborative Governance and Preference and Intention ($r = 0.771$), suggesting a relatively strong relationship between perceived stakeholder coordination and transportation preferences. Nevertheless, this correlation remained below the corresponding diagonal values. The HTMT assessment further supported discriminant validity, with the highest reported value of 0.828 occurring between these two constructs. Thus, the measurement model demonstrated acceptable evidence of construct distinctiveness.

Table 4. Fornell–Larcker criterion for the final measurement model.

Construct	AC	CG	PS	PU	TA
Accessibility (AC)	0.83				
Collaborative Governance (CG)	0.52	0.909			
Perceived Safety (PS)	0.545	0.412	0.817		
Preference and Intention (PU)	0.318	0.771	0.284	0.842	
Trip Attraction (TA)	0.354	0.683	0.299	0.581	0.925

3.3. Structural Model.

Following the measurement model assessment, the structural model was evaluated to examine the hypothesized relationships among the five latent constructs. The variance inflation factor (VIF) values ranged from 1.000 to 1.038, indicating no substantial multicollinearity concerns among the structural predictors. The direct relationships are summarized in Table 5, while the proposed mediation relationship is presented separately in Table 6. It indicates that three of the four direct hypotheses were statistically supported. Accessibility demonstrated a significant positive association with Perceived Safety ($\beta = 0.545$, $p < 0.001$), supporting H1. Its effect size ($f^2 = 0.423$) indicates a substantial contribution to the explained variance in perceived safety. This finding suggests that respondents reporting more favorable accessibility conditions also tended to perceive public transportation as safer.

Table 5. Direct Structural Effects.

Hypothesis	Direct path	β	t-value	p-value	f^2	Decision
H1	AC $\rightarrow$ PS	0.545	8.7	<0.001	0.423	Supported
H2	CG $\rightarrow$ PU	0.755	18.2	<0.001	1.375	Supported
H3	CG $\rightarrow$ TA	0.683	13.6	<0.001	0.876	Supported
H4	PS $\rightarrow$ PU	0.085	1.78	0.076	0.017	Not supported

Collaborative Governance exhibited the strongest standardized relationship with Preference and Intention ($\beta = 0.755$, $p < 0.001$), supporting H2. A similarly strong positive association was observed between Collaborative Governance and Trip Attraction ($\beta = 0.683$, $p < 0.001$), supporting H3. The corresponding effect sizes of 1.375 and 0.876 indicate substantial statistical contributions within the specified model. These findings suggest that favorable perceptions of stakeholder coordination are closely associated with transportation preferences and the perceived need for public transportation connections. In contrast, the relationship between Perceived Safety and Preference and Intention was positive but not statistically significant ($\beta = 0.085$, $p = 0.076$), resulting in the rejection of H4 at the 5% significance level. Its small effect size ($f^2 = 0.017$) further indicates a limited independent contribution after accounting for Collaborative Governance. This result does not imply that safety is unimportant,

but suggests that its direct association with transportation preference was not sufficiently supported by the present data.

Table 6 indicates that the proposed indirect relationship between Accessibility and Preference and Intention through Perceived Safety was not statistically significant ($\beta = 0.067$, $p = 0.096$). Therefore, H5 was not supported. Although accessibility was significantly associated with perceived safety, this relationship did not translate into a statistically significant indirect association with transportation preference and intention. The result suggests that improvements in perceived accessibility cannot be assumed to correspond to greater transportation preference through perceived safety alone. The structural model explained 29.7% of the variance in Perceived Safety ($R^2 = 0.297$), 60.1% in Preference and Intention ($R^2 = 0.601$), and 46.7% in Trip Attraction ($R^2 = 0.467$). These findings indicate that the model accounted for a substantial proportion of the observed variation in transportation preference and trip attraction, particularly through Collaborative Governance. However, the unexplained variance suggests that additional factors may also contribute to inclusive transportation behavior and perceptions.

Table 6. Indirect Effect and Mediation Result.

Hypothesis	Indirect path	β	t-value	p-value	Decision
H5	AC $\rightarrow$ PS $\rightarrow$ PU	0.067	1.67	0.096	Not supported

3.4. Accessibility and Perceived Safety.

The significant positive relationship between Accessibility and Perceived Safety ($\beta = 0.545$, $p < 0.001$) provides empirical support for H1 and highlights the connection between physical transportation conditions and users' perceptions of safety. Accessible pedestrian pathways, adequate waiting spaces, convenient boarding and alighting facilities, and unobstructed access routes may reduce perceived difficulties during transportation activities. These characteristics are particularly relevant to users with mobility limitations, caregivers traveling with dependents, and passengers carrying luggage or other belongings. The descriptive findings reinforce this interpretation. Although accessibility indicators received generally favorable assessments, safety perceptions were comparatively lower when vehicles or waiting areas were quiet. This suggests that physical accessibility and perceived safety should be considered complementary dimensions of inclusive transportation planning. The findings are consistent with previous studies emphasizing accessible infrastructure as an important component of inclusive transportation quality [2–8]. Nevertheless, the cross-sectional design does not establish that accessibility improvements directly cause increases in perceived safety.

3.5. Collaborative Governance and Preference and Intention.

The strongest relationship in the model is between Collaborative Governance and Preference and Intention, with $\beta = 0.755$ and $p < 0.001$. This finding supports H2. The very large effect size ($f^2 = 1.375$) requires particular attention. According to the commonly used interpretation of (f^2), this value is substantially above the threshold for a large effect. The magnitude indicates that Collaborative Governance explains a comparatively large proportion of the variance in Preference and Intention within the proposed model. Several factors may explain this result. Public transport preference is not determined only by the physical characteristics of vehicles or stops. Users may evaluate the transport system based on whether different actors coordinate

route planning, information provision, service reliability, complaint management, safety arrangements, and destination connectivity.

In a regional context such as Majene, institutional coordination may be particularly influential because transport services need to connect dispersed activity centers. For example, coordination between local government and educational institutions can influence routes serving schools and campuses, while cooperation with health facilities and markets can improve access to other essential destinations. The large effect should therefore be interpreted as evidence of the importance of perceived institutional coordination within this model, rather than as evidence that governance is universally more important than every other transport factor.

3.6. Collaborative Governance and Trip Attraction.

Collaborative Governance also has a strong positive effect on Trip Attraction, with $\beta = 0.683$ and $p < 0.001$, supporting H3. The large effect size ($f^2 = 0.876$) indicates that Collaborative Governance makes a substantial contribution to explaining Trip Attraction. The effect is considerably larger than the effects associated with Accessibility and Perceived Safety in the model. The result may be explained by the destination-oriented nature of Trip Attraction. Public transport becomes more attractive when it effectively connects people with destinations that generate essential trips. This requires coordination among transport providers and the institutions responsible for those destinations. For example, educational institutions can provide information about student travel demand, health facilities can identify important service-access needs, and local government can coordinate routes and infrastructure. Community representatives and vulnerable users can then provide information about actual barriers and service priorities. Thus, the large (f^2) value suggests that governance should be understood as an operational mechanism for converting infrastructure and transport resources into services that are relevant to users' actual trip purposes.

3.7. Perceived Safety and Preference and Intention.

Contrary to H4, Perceived Safety does not have a statistically significant direct effect on Preference and Intention ($\beta = 0.085$, $p = 0.076$). This result does not imply that safety is unimportant. The descriptive statistics presented in Table 2 show that respondents considered several safety-related conditions important. However, the structural model indicates that safety perceptions alone do not provide sufficient explanatory power for Preference and Intention when other factors, particularly Collaborative Governance, are considered simultaneously. One possible explanation is that users may perceive safety as a basic service requirement rather than the primary determinant of preference. Once a minimum level of safety is expected, users may place greater emphasis on route availability, destination connectivity, schedule clarity, affordability, reliability, and travel time. Another possible explanation is the composition of the sample. Because the sample was dominated by younger respondents and students, respondents may have different safety priorities from older adults, persons with disabilities, caregivers, or other groups with greater physical or dependency-related mobility constraints. The non-significant relationship should therefore not be interpreted as evidence that safety interventions are unnecessary. Instead, it suggests that safety improvements need to be

integrated with accessibility, service quality, route planning, and governance measures to translate improvements in transport conditions into stronger user preference.

3.8. Mediation of Perceived Safety.

The indirect effect of Accessibility on Preference and Intention through Perceived Safety is not statistically significant ($\beta = 0.067$, $p = 0.096$), resulting in rejection of H5. The finding indicates that although Accessibility significantly improves Perceived Safety, the resulting improvement does not translate sufficiently into Preference and Intention through the tested mediation pathway. This distinction highlights the difference between improving transport conditions and changing behavioral intention. A user may recognize that a stop is more accessible and safer but may still choose another mode if public transport does not provide a suitable route, adequate frequency, acceptable travel time, or convenient schedule. Therefore, inclusive transport policy should combine physical accessibility and safety improvements with service planning and collaborative governance.

3.9. Implications for Vulnerable Groups and Generalizability.

The demographic composition shown in Table 1 is an important consideration when interpreting the results. More than 60% of respondents were aged 19–28 years, and students represented more than half of the sample. This profile means that the findings may be particularly relevant to younger users and education-related travel. The findings may be less directly generalizable to older adults and persons with disabilities, whose mobility needs can involve greater dependence on accessible infrastructure, boarding assistance, seating, travel companions, and specialized facilities. Accordingly, the findings should be interpreted as evidence concerning the surveyed population rather than as population-level estimates for every vulnerable category. Future research should employ stratified or quota sampling to ensure sufficient observations for older adults, persons with disabilities, caregivers, low-income households, women, and other groups with specific mobility constraints.

3.10. Practical Implications for Collaborative Governance in Majene.

The strong effects of Collaborative Governance provide a practical basis for developing an inclusive transport governance mechanism in Majene. First, local government can act as the coordinating institution responsible for integrating transport planning with spatial planning, infrastructure development, public facilities, and vulnerable-user needs. Second, transport operators can provide operational information concerning routes, schedules, vehicle capacity, boarding and alighting conditions, service reliability, and passenger complaints. Third, public facilities such as schools, campuses, markets, government offices, and health facilities can identify important travel destinations and provide information about peak demand and users who require additional accessibility support. Fourth, communities and vulnerable users can participate in identifying inaccessible locations, unsafe waiting areas, route gaps, and service problems. Their involvement ensures that transport planning is based not only on administrative assumptions but also on actual mobility experiences. Fifth, security and public officers can support safety monitoring and complaint-response mechanisms, particularly around stops and public facilities. Finally, academics and researchers can support data collection, accessibility audits, demand analysis, and periodic evaluation of the effectiveness

of transport interventions. A practical implementation mechanism could therefore consist of a regular multi-stakeholder forum in which route priorities, accessibility problems, safety issues, complaints, and performance indicators are reviewed jointly. Such a mechanism would operationalize collaborative governance rather than treating it only as a general policy principle.

3.11. Limitations.

This study has several limitations that should be considered when interpreting the findings. First, the cross-sectional research design captures respondents' perceptions at a single point in time, limiting the ability to examine changes in transportation preferences and travel behavior over time or establish causal relationships. Second, the sample was predominantly composed of younger respondents and students, which may limit the generalizability of the findings to the broader population of vulnerable transportation users in Majene Regency. Third, the available dataset did not provide sufficiently verified subgroup information for all categories of vulnerable users. Consequently, the findings cannot adequately distinguish the specific mobility needs and experiences of older adults, persons with disabilities, women, caregivers, low-income households, and individuals without private vehicles. Future studies should incorporate more diverse and representative samples to enable meaningful comparisons across these groups. Fourth, the analysis relied on self-reported perceptions rather than objectively observed travel behavior, potentially introducing response bias. Future research could integrate questionnaire surveys with travel diaries, GPS-based mobility tracking, stated-preference experiments, and revealed-preference observations to provide a more comprehensive understanding of transportation choices and mobility constraints. Finally, the proposed structural model was limited to five latent constructs and did not explicitly incorporate several operational service attributes, including fares, travel time, service frequency, vehicle comfort, route coverage, and reliability. Incorporating these factors in future studies could improve the explanatory and predictive capabilities of the model and provide stronger empirical evidence to support inclusive public transportation planning.

4. Conclusions

This study investigated inclusive public transportation in Majene Regency, Indonesia, by integrating Accessibility, Perceived Safety, Collaborative Governance, Preference and Intention, and Trip Attraction within a single structural model. The findings revealed a significant positive association between Accessibility and Perceived Safety ($\beta = 0.545$, $p < 0.001$). Collaborative Governance demonstrated strong positive associations with Preference and Intention ($\beta = 0.755$, $p < 0.001$) and Trip Attraction ($\beta = 0.683$, $p < 0.001$). Conversely, the direct relationship between Perceived Safety and Preference and Intention was not statistically significant ($\beta = 0.085$, $p = 0.076$), and the proposed mediating role of Perceived Safety was not supported. These findings highlight the importance of integrating physical accessibility, user perceptions, and institutional coordination into inclusive transportation planning. In particular, the strong associations involving Collaborative Governance suggest that inclusive public transportation should be approached as a coordinated service system involving multiple stakeholders rather than focusing exclusively on vehicles and physical infrastructure. For Majene Regency, this approach could involve establishing a collaborative framework connecting local government, transportation operators, educational institutions,

healthcare facilities, markets, community representatives, security authorities, academics, and vulnerable users. Practical implementation could prioritize coordinated route planning, accessibility audits, improved connections to essential destinations, passenger complaint mechanisms, and periodic service evaluations. Particular attention should be given to locations where vulnerable users experience accessibility barriers or safety concerns. Nevertheless, the cross-sectional design and sample composition limit causal interpretation and the generalizability of the findings. Future research should include more representative samples of specific vulnerable groups, objective transportation performance indicators, and observed travel behavior to validate the proposed relationships and strengthen evidence-based planning. Overall, this study provides an integrated empirical framework to support more inclusive, accessible, and responsive public transportation development in regional Indonesian contexts.

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Author Contribution

Muhammad Abdy: Conceptualization, methodology, data analysis, and manuscript review. Muh Miftahulkhair: Conceptualization, methodology, interpretation of transportation findings, and manuscript review. Ellyni Dwi Fortuna: Conceptualization, methodology, data collection, data analysis, writing—original draft, writing—review and editing, and supervision. Ayu Rizka Anggraini: Data collection, transportation interpretation, literature review, and manuscript review. All authors reviewed and approved the final manuscript.

Competing Interest

No conflict of interest was reported by all authors.

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