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LINKING URBAN MOBILITY AND SOCIO-ECONOMIC EQUITY: A CRITICAL STUDY OF BUS RAPID TRANSIT (BRT) IMPLEMENTATION IN ISLAMABAD AND RAWALPINDI

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ABSTRACT

Urban mobility in rapidly expanding cities has profound implications for socio-economic equity. In Islamabad and Rawalpindi, the Bus Rapid Transit (BRT) system was introduced as a solution to challenges of accessibility, affordability, and social inclusion. This study critically examines the extent to which the BRT system promotes socio-economic equity by evaluating accessibility, service quality, affordability, and social inclusion through a mixed-methods approach, combining a survey of 54 users with qualitative interviews. Findings reveal that while BRT enhances affordability for a significant majority, gaps persist in service accessibility, infrastructure inclusivity, and last-mile connectivity, disproportionately affecting marginalized populations. Notably, 85% of users reported facing or witnessing discrimination, and accessibility remains limited in peripheral areas. Drawing on the theories of Social Equity and Sustainable Urbanism, this paper argues that despite partial successes, the BRT system falls short of achieving comprehensive equity goals. Policy reforms focusing on infrastructure redesign, expanded feeder systems, and targeted inclusivity measures are essential to transform BRT into a genuine catalyst for socio-economic development

INTRODUCTION

Urbanization is one of the defining features of the 21st century, with its most dramatic manifestations observed in rapidly expanding cities of the Global South. In the 1950s, only 30% of the world's population lived in urban areas; by 2050, this figure is projected to reach 68%, exerting unprecedented pressure on urban infrastructure and public services (United Nations, 2018). Among the sectors most affected is transportation, which remains fundamental not only to economic productivity but also to equitable access to education, healthcare, and employment opportunities (Hook & Howe, 2005). As cities grow outward, the demand for reliable, affordable, and inclusive mobility solutions has intensified, especially for marginalized groups who often face spatial and economic exclusion.

In response to these challenges, many developing countries have sought to invest in public transportation systems aimed at addressing congestion, environmental degradation, and socio-economic inequities. Among these, Bus Rapid Transit (BRT) systems have emerged as a preferred option due to their relatively lower construction costs, shorter implementation timelines, and scalable models compared to rail systems (Deng & Nelson, 2012). Successful cases such as Bogotá's TransMilenio and Curitiba's BRT system have demonstrated that well-planned BRT systems can significantly enhance urban mobility, reduce travel times, and bridge social

divides (Hickman, Hall, & Banister, 2013; Batool, Irshad, & Abid, 2020).

However, replicating these successes in the developing world has proven difficult. Often, BRT systems fall short of their equity objectives due to incomplete coverage, poor maintenance, lack of integration with other modes of transport, and insufficient attention to the needs of women, disabled persons, and low-income groups (Venter, Jennings, & Hidalgo, 2017). Instead of acting as vehicles for inclusion, such systems can inadvertently reinforce existing spatial inequalities.

In Pakistan, the need for an efficient and inclusive transport system is particularly acute. Karachi, Lahore, Multan, Islamabad, and Peshawar have all experimented with BRT projects with mixed results. Karachi's Green Line, despite large investments, remains incomplete and poorly integrated with the city's needs (World Resources Institute, 2019). In contrast, Islamabad's Metro Bus Service (MBS), operational since 2015, was envisioned as a model of affordable, safe, and accessible public transport, serving over 100,000 passengers daily along a 23.2-kilometer corridor (Inam, 2015).

Yet, despite its apparent success, critical issues plague Islamabad's BRT system. Foremost among these is the limited geographic coverage, which restricts access for low-income communities residing on the urban periphery. Even where the main BRT corridor is operational, feeder routes and last-mile connectivity remain weak, severely limiting accessibility for many potential users (Khan, Rehman, & Anwar, n.d.). Moreover, concerns about social inclusion persist. Facilities for women, persons with disabilities, and elderly passengers are either absent or poorly maintained. Reports of harassment, discrimination, and infrastructure barriers at BRT stations have raised serious questions about the system's inclusivity (Mustafa & Abu Baker, 2024; Ayaz, Saleem, & Ayyub, 2024).

Furthermore, affordability, while often praised, is not uniformly experienced. Although standard fares are low, ancillary costs, such as reaching the stations via private means or enduring long walks, impose additional burdens on already vulnerable groups (Adeel & Yeh, 2016). The absence of targeted subsidies and adaptive service design exacerbates disparities, leaving socio-economically disadvantaged groups either underserved or excluded altogether. Compounding these issues is the lack of an updated urban mobility policy framework in Islamabad. Transportation plans from the 1980s continue to underpin development priorities, despite vast changes in demographics, land use patterns, and urban sprawl (Cities Development Initiative for Asia, 2021). In this policy vacuum, the BRT system risks becoming another piece of incomplete urban infrastructure, rather than a genuine catalyst for inclusive urban development.

Despite the investments made in Islamabad's BRT system, significant barriers to true socio-economic equity persist. Limited geographic coverage, weak feeder services, infrastructure exclusion for vulnerable groups, and widespread perceptions of discrimination undermine the system's potential to provide accessible, affordable, and inclusive urban mobility. The absence of integrated policy frameworks and adaptive service models further compounds these inequities, disproportionately disadvantaging low-income populations, women, and persons with disabilities. Without addressing these systemic shortcomings, the BRT risks entrenching, rather than alleviating, existing socio-economic divides.

This study seeks to critically evaluate the extent to which the BRT system in Islamabad and Rawalpindi contributes to advancing socio-economic equity, focusing on accessibility, affordability, service quality, and social inclusion. By employing a mixed-methods approach combining user surveys and stakeholder interviews, the research will identify key gaps, highlight challenges experienced by marginalized groups, and propose actionable strategies to enhance the BRT's role as an inclusive public transport system. Drawing on frameworks of Social Equity Theory and Sustainable Urbanism, the study aims to contribute to the design of more equitable, accessible, and sustainable urban mobility solutions.

2. Literature Review

An effective public transportation system is a cornerstone of sustainable and inclusive urban development. Within the context of Islamabad and Rawalpindi's Bus Rapid Transit (BRT) system, four critical dimensions emerge as central to understanding its socio-economic equity impacts: accessibility, affordability, service quality, and social inclusion. This review critically examines

the relevant literature, highlighting key insights, contradictions, and research gaps.

2.1 Accessibility and Spatial Inclusion in Urban Mobility

Accessibility is a foundational measure of a public transport system's effectiveness, particularly in enhancing opportunities for marginalized populations. Numerous studies affirm that high-quality transit networks can significantly improve access to education, healthcare, and employment for urban residents (Hidalgo & Gutiérrez, 2013). BRT systems, notably in Latin America, have been praised for their ability to bridge spatial gaps between the urban core and low-income peripheries (Cervero, 2013). However, the literature also reveals persistent challenges. Access to BRT systems is often unequally distributed, favoring areas with high economic density while neglecting suburban or informal settlements (Venter, 2016). Even when corridors are efficiently designed, the lack of feeder networks severely restricts last-mile connectivity, limiting actual usage by disadvantaged groups (Pojani & Stead, 2015).

In the Pakistani context, accessibility concerns are compounded by unplanned urban sprawl and insufficient integration between urban planning and transportation development (Adeel & Yeh, 2016). Islamabad's BRT system, while offering high-capacity transit along a fixed corridor, leaves peripheral populations underserved, especially in rapidly expanding low-income settlements. Moreover, pedestrian infrastructure leading to BRT stations is often inadequate, deterring potential users, particularly women, the elderly, and persons with disabilities (Ayaz, Saleem, & Ayyub, 2024). Critically, while accessibility is typically measured in terms of physical proximity to stations, qualitative factors such as perceived safety, walking conditions, and station design — are often neglected in conventional planning approaches (Guerra, Cervero, & Tischler, 2012). This suggests that the Islamabad BRT system's accessibility performance must be evaluated not only spatially but also through the lens of user experience.

2.2 Affordability: Bridging Economic Barriers

Affordability is central to public transport equity, determining whether low-income groups can realistically utilize mobility services (Lucas, 2012). BRT systems, designed as cost-effective mass transit options, are often promoted as affordable alternatives to private vehicles and paratransit systems. Empirical studies from Bogotá and Johannesburg demonstrate that BRT services can offer substantial cost savings for users (Venter, Jennings, & Hidalgo, 2017).

Nonetheless, affordability analyses reveal important nuances. Although base fares are low, indirect costs such as feeder services, long access distances, and the need for multiple transfers significantly raise the overall travel expense, especially for poorer users (Bocarejo & Oviedo, 2012). In several cases, including Johannesburg's Rea Vaya, studies found that despite subsidized fares, BRT was still unaffordable for the city's poorest segments, who continued relying on informal minibuses (Salon & Gulyani, 2019).

In Islamabad, similar dynamics are evident. While the nominal Metro fare remains low, associated costs — such as hiring a rickshaw to reach the station — can double or triple the expense, undermining affordability for daily wage workers (Khan, Rehman, & Anwar, n.d.). Moreover, the lack of differentiated fare structures or targeted subsidies for low-income users suggests an inadequate understanding of affordability as a dynamic, multi-layered issue (Mustafa & Abu Baker, 2024).

Thus, the affordability of Islamabad's BRT must be critically examined not only at the level of ticket prices but also in terms of total travel costs, including access and waiting times.

2.3 Service Quality and Passenger Experience

The perception of service quality profoundly influences public transportation usage patterns. Key determinants include punctuality, cleanliness, frequency, safety, and user-friendliness (Eboli & Mazzulla, 2011). High service quality enhances user satisfaction and loyalty, thereby increasing ridership and promoting modal shift away from private vehicles (Redman et al., 2013).

Research on BRT systems generally reports positive outcomes regarding speed and reliability. Bogotá's TransMilenio, for instance, achieved substantial gains in service efficiency, albeit at the cost of overcrowding and declining comfort over time (Bocarejo & Oviedo, 2012). Conversely, in contexts such as Lagos and Accra, poor maintenance, vehicle shortages, and management

inefficiencies have eroded BRT's initial successes (Abdoul, 2018).

Islamabad's BRT initially garnered praise for its modern infrastructure and air-conditioned buses (Inam, 2015). However, longitudinal observations reveal deteriorating service quality, with frequent delays, equipment malfunctions, and overcrowding during peak hours (Ayaz, Saleem, & Ayyub, 2024). Station amenities, although initially well-maintained, have declined, diminishing the user experience particularly for vulnerable groups.

A notable gap in service quality assessments is the limited incorporation of users' qualitative feedback, particularly from marginalized populations. International literature emphasizes the need for participatory evaluations, where users actively shape performance metrics (Venter, 2016). In Islamabad, such participatory mechanisms remain largely absent.

2.4 Social Inclusion: Gender, Disability, and Vulnerability

Social inclusion extends beyond access and affordability, encompassing the ability of all social groups to use and benefit equally from transportation systems. Gendered analyses of mobility patterns consistently reveal that women's transportation needs are distinct, shaped by factors such as caregiving responsibilities, safety concerns, and time poverty (Uteng & Cresswell, 2008). Similarly, persons with disabilities and elderly citizens face substantial barriers to safe and dignified travel.

Globally, BRT systems have struggled with issues of social inclusion. In Delhi's BRT, for example, poor station design and lack of staff training led to widespread exclusion of disabled users (Pojani & Stead, 2015). Harassment and safety concerns remain pervasive in public transport globally, discouraging women's participation and restricting their mobility choices (Ceccato & Loukaitou-Sideris, 2020).

The situation in Islamabad is no exception. Although designated spaces for women and disabled persons exist, enforcement remains weak. Reports of harassment, lack of security personnel, and inaccessible station infrastructure indicate that the system, in its current form, inadequately supports inclusive urban mobility (Mustafa & Abu Baker, 2024). Moreover, there is little evidence of proactive outreach or engagement with vulnerable communities during system planning or evaluation. social inclusion cannot be treated as an ancillary objective but must be embedded in the design, management, and continuous monitoring of public transportation systems.

2.5 Socio economic equity

Equity takes on different definitions. Cambridge dictionary defines equity as "the situation in which everyone is treated fairly and equally". However, Collins dictionary defines equity as "the quality of being fair and reasonable in a way that gives equal treatment to everyone". The concept of social equity theory is rooted in the idea that each person deserves equal rights regardless of their socio-economic status. This concept has been evaluated under the transport sector, and it has been understood as the study of accessibility and cohesion. Transport equity can be seen as how transport accessibility is equitably distributed among social groups and members (Van Wee and Roser, 2013). This concept in transportation emphasizes the provision of service to every individual, regardless of their income, age, location, or background. The concept of equity is strongly related to justice, fairness, and accessibility (Ortega et al., 2014). Transport justice emphasizes that accessibility isn't just about everyone getting the same, it's about everyone getting what they need to have, equal opportunities in life. According to Sinha and Labi (2007), without a proper definition of performance criteria, it is not possible to achieve a correct evaluation of the target.

Figure Overlapping factors for equity analysis

2.5.1 Socio-Economic Equity Indicators:

The indicators for the surveys are inspired from a previous study (Venter et al., 2017) and are further altered and adapted to match the current study's requirement. The following scale was used to measure socio-economic equity:

Table 1 Indicators for Socio economic equity

S.No	Variable	Indicator	Measure
1-	Accessibility	• Geographic distribution/ coverage of transport services. • Proximity of transport hubs to low-income areas. • Availability of services for marginalized groups. • Travel time	• Mapping of transport routes and stops. • Distance measurement from key neighborhoods. • User surveys on service accessibility.
2-	Affordability	• Fare levels compared to average incomes. • Availability of subsidies for low-income drivers. • Equitable distribution of buses in low income versus high income areas. • Cost	• Participant interviews discussing fare impacts. • Analysis of subsidy policy and usage.
3-	Service Quality	• Frequency and reliability of service. • Safety perceptions among users. • Cleanliness and comfort of users. • Safety	• Observation of service schedules. • User surveys evaluate comfort and satisfaction.
4-	Social Inclusion	• Perception of inclusion among diverse groups. • Participation rates among elderly people, transgender, disabled individuals and women with disabilities.	• Case studies discussing experiences of marginalized groups. • Interviews with underrepresented groups.

5-	Income Distribution	• Income levels of public transport users. • Employment status of users.	• Demographic surveys of public transport users. • Interviews assessing job access.

2.6 Theoretical Framework

The evaluation of Islamabad's Bus Rapid Transit (BRT) system in terms of promoting socio-economic equity is underpinned by two interrelated theoretical frameworks: Social Equity Theory and the Sustainable Urban Mobility Model. Together, these frameworks offer a multidimensional lens through which accessibility, affordability, service quality, and social inclusion are critically assessed.

2.6.1 Social Equity Theory

Social Equity Theory provides a foundational framework for evaluating the fairness and justice embedded within public transportation systems. In the context of urban mobility, equity transcends the mere provision of services; it demands a critical examination of how transportation benefits and burdens are distributed among different social groups (Bullard, 2003). The theory emphasizes that transportation systems must not only ensure availability but also equitably cater to the differentiated needs of diverse users, including low-income populations, women, elderly individuals, and persons with disabilities.

Several dimensions are central to assessing equity in public transportation. Affordability measures whether cost barriers prevent access for marginalized groups. Inclusivity evaluates how infrastructure design accommodates users with varying physical and social needs. Accessibility assesses the ease with which users can reach and utilize transport services. Service quality examines whether services meet basic standards of reliability, safety, and comfort. Finally, income distribution impacts consider whether transport systems help narrow or widen existing socio-economic gaps (Litman, 2021).

Applying Social Equity Theory exposes the limitations of traditional transportation planning, which often prioritizes efficiency or cost-effectiveness at the expense of equity considerations. Systems optimized for technical performance may inadvertently exclude the most vulnerable, perpetuating patterns of spatial and economic marginalization (Martens, 2016). In Islamabad's BRT, for example, while high ridership numbers are often cited as a success metric, they obscure deeper equity concerns related to who uses the system, who is left out, and why.

Moreover, Social Equity Theory challenges policymakers to move beyond passive measures (such as subsidized fares) towards proactive strategies that empower disadvantaged groups, including targeted service expansion, participatory planning processes, and continuous monitoring of equity outcomes. Without such deliberate interventions, urban transportation systems risk entrenching rather than dismantling social hierarchies.

2.6.2 Sustainable Urban Mobility and Urbanism

While Social Equity Theory centers on justice and fairness, the Sustainable Urban Mobility Model situates transportation within broader goals of environmental stewardship, land-use planning, and socio-economic sustainability. Sustainable urbanism advocates for compact, connected, and socially inclusive cities where mobility systems serve as critical enablers of equitable development (Beatley, 2000). In the case of Islamabad's BRT system, the principles of sustainable urbanism manifest at least in intention through efforts to connect underserved areas and provide equal access to development opportunities, irrespective of class or income. However, a critical evaluation reveals several shortcomings when assessed against sustainability benchmarks. Firstly, accessibility, affordability, and service quality are not merely operational metrics but are sustainability outcomes deeply intertwined with land-use patterns, environmental health, and social cohesion. A well-functioning BRT system should facilitate shorter, safer, and greener journeys, thereby reducing both economic inequality and environmental degradation. However, Islamabad's limited feeder systems and inadequate last-mile connectivity illustrate a failure of urban integration, undermining the sustainability potential of the BRT (Cities Development Initiative for Asia, 2021).

International examples underline how sustainable urban mobility frameworks, when properly implemented, can advance social equity goals.

London's Tramlink project, for instance, successfully expanded access to employment and services for disadvantaged communities in Croydon, demonstrating the synergistic effects of transport investments aligned with inclusive land-use planning (Cuthill et al., 2019). In China, customized sustainable mobility frameworks prioritize ensuring basic needs for disadvantaged groups, reflecting an adaptive model sensitive to local socio-economic structures (Wan & Titheridge, 2024). Similarly, a game-theoretic approach in Turkey demonstrated how fare optimization through stakeholder collaboration can simultaneously address financial viability, environmental sustainability, and social equity (Eriskin, 2024). These examples highlight a crucial lesson: sustainable mobility systems must be explicitly designed to achieve equity, not simply assume it as a byproduct of technical improvements. Islamabad's BRT, therefore, needs to be evaluated against this broader standard — not only whether it moves people efficiently but whether it does so inclusively, sustainably, and justly.

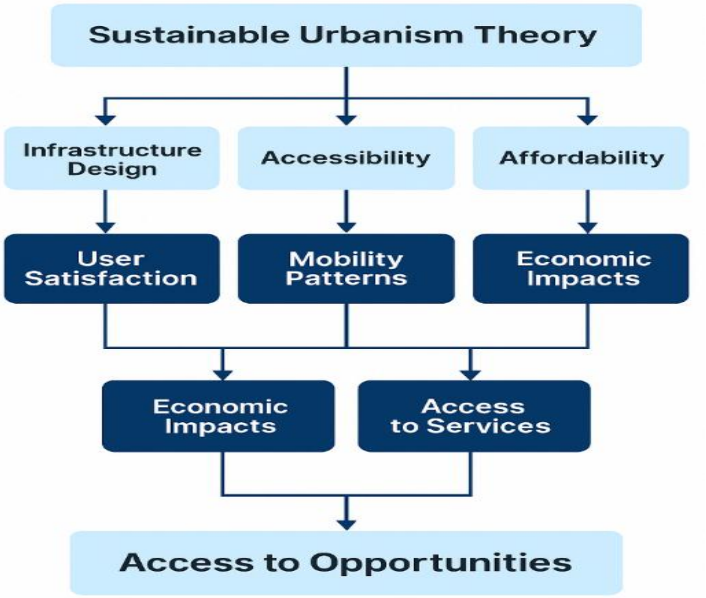

Figure Sustainable Urbanism Theory

2.5 Research Gap:

BRT systems and their socio-economic impacts have been deeply studied in countries like Brazil, Colombia, China etc. After conducting the literature review, it is seen that there is a significant lack of empirical research on the BRT system and its impacts in developing countries, particularly Pakistan. The existing research focuses primarily on the operational efficiency of the existing BRT system. (Bhatti,2024) has seen which metro has better financial model (green, blue, orange, and red line metro bus project). However, very limited research has been done on BRT's impact on socio-economic equity using indicators: affordability, accessibility, social inclusion, safety and security, access to services, and economic impacts. There is also a gap in longitudinal studies assessing how BRT services evolve over time in addressing (or exacerbating) inequities, particularly regarding accessibility, affordability, and service maintenance (Suzuki et al., 2013; ITDP, 2020).

Moreover, the lack of comprehensive transport master plans and real-time data analytics undermines efforts to adapt services to evolving needs (World Resources Institute, 2019). Without proactive governance reforms, even well-designed BRT systems risk obsolescence or underperformance. here is a lack of an elaborate survey on the exclusionary service delivery aspect of Islamabad BRT that restricts access to socio-economic opportunities of the marginalized sections. This research aims to fill the research gaps by doing a comprehensive analysis of BRT's contribution in promoting socio-economic equity using the mentioned indicators.

3. Research Methodology

Research Design:

The research follows a Mixed Methods deductive approach under Pragmatist Paradigm. Mixed methods allow both quantitative data; User experiences, perceptions of safety and accessibility and qualitative data; Interviews of stakeholders (Policymakers and Administrators) and detailed case investigations. Relying solely on interviews could not provide a comprehensive view of usage patterns and demographics. Moreover, a case study approach is selected to provide an in-depth examination of the Islamabad BRT system as a specific instance of public transportation in a developing country.

- **Data Collection**:

A standardized questionnaire was designed based on the 5 indicators of socio-economic equity taken from (Venter et al., 2017). The questionnaire has 5 sections based on every single indicator of socioeconomic equity: Affordability, accessibility, social inclusion, Safety and security, and income distribution. The first 7 questions focused on demographics, asking the respondents about their age, gender, marital status, employment status and how frequently they use BRT, while the second section focused on questions relevant to accessibility including how accessible the nearest station is the individual, how convenient is it for them to reach there, and their average commute time. The third section includes questions relevant to affordability followed by questions asking about service quality, social inclusion and areas of improvement.

Different BRT stations were visited in Islamabad and RWP to fill out the survey form from the commuters. The on-ground survey was performed in the national language (Urdu) to improve comprehension of the users. An online survey was also conducted through google forms and then distributed online among students who travel via BRT. Data collection was done over a period of 3 weeks which included collecting data from different BRT stations in Islamabad and Rawalpindi. The stations used to collect data were G-13 Metro Bus Station, NUST Metro Bus Station, Faiz Ahmed Faiz Metro Bus Station, and Saddar Metro Bus Station. The number of responses collected was 54.

Qualitative: 5 semi-structured interviews and case studies were conducted to gather qualitative data. The interview participants represented stakeholders from various sectors including government, academia, transport experts, and the public. Case studies involved in-depth inquiries into individual experiences.

- **Sampling**:
  - Surveys: Quantitative data has been collected via Random Convenience Sampling. We have selected participants based on their availability and willingness to participate in the study.
  - Interviews: Qualitative data sampling is done using the Purposive Sampling Technique as stakeholders were selected for interviews keeping into consideration their relevance and experience linked to our research topic. For instance, in-depth interviews have been conducted with stakeholders, workers, and users of BRT. Moreover, to assess how effective the blue/green buses are to increase user accessibility to the main BRT line and their efficiency on the feeder routes, users of the blue/green buses were taken as case studies. These case studies were conducted through first conducting a survey that led to 25 responses. Out of these, the most elaborate ones were chosen as case studies to fully evaluate the blue/green bus system. The sample size for qualitative data was determined using saturation i.e. interviews were only undertaken until no new insights were discovered

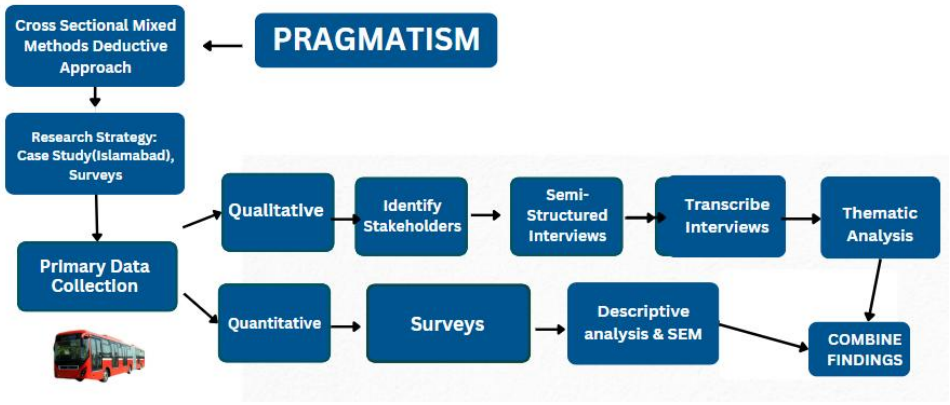

Figure: Research Methodology

- **Data Analysis**:
  - Quantitative: The indicators mentioned in the theoretical framework are used to design the surveys

Data Analysis Technique: The study used IBM SPSS Statistics 2023 for analysis, running tests and interpreting results.

Qualitative: Thematic analysis uses the following steps to analyze the semi-structured interviews.

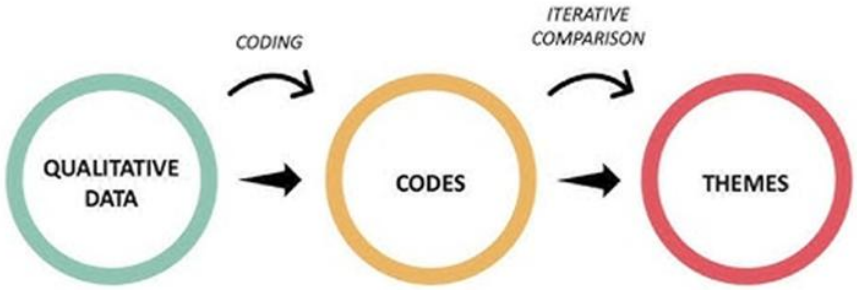

Figure Steps for thematic analysis

The following themes were used:

- **Ethical Considerations**:

The participants were clearly informed of the research goals and response usage. The research focuses on socio-economic vulnerabilities to assess public transportation i.e. BRT demanded full anonymity of the participants of the surveys which were given to them along with confidential treatment of the data. For this, no personal details went into the database. The interviewees were also clearly informed of the research goals and individual consent was taken to use their names in the research. Moreover, the research also received ethical authorization from the institutional review board that assessed that the research follows international ethical guidelines from the Belmont Report and the Helsinki Declaration.

- **Limitations**:

This study is subject to several internal and external limitations. Internally, the procedures used may affect the reliability and validity of the results, particularly due to potential biases in the data collection process, such as the limited geographical coverage and sampling methods. Additionally, the scope of the research focuses only on Islamabad's BRT system, limiting the generalizability of the findings to other cities or countries with different public transport systems. The definition and measurement of critical terms like "social equity" and "accessibility" might vary across contexts, affecting the consistency of the results. Externally, the study faces constraints on time, scope, and budget, preventing a more longitudinal and detailed analysis. Limited resources restrict the research to cross-sectional data, offering only a snapshot of the current state without accounting for potential long-term trends. Accessibility to certain locations and stakeholders, such as policymakers, may also be restricted, leading to incomplete data. Additionally, the evolving political and economic situation in Pakistan might further influence the applicability of the findings, especially if circumstances change after the study is conducted. Despite these limitations, the research aims to provide actionable insights that can help address gaps in

Islamabad's BRT system to promote socio-economic equity.

4. Findings

- **Quantitative Results:**

The following Table explains the frequencies of demographics that were used in this study.

Table Respondents' Demographics

Variable	Category	Frequency (n)	Percent (%)
Gender	Male	24	44.4
	Female	30	55.6
	Total	54	100
Age	18 - 25	18	33.3
	26 - 35	13	24.1
	36 - 45	14	25.9
	45+	9	16.7
	Total	54	100
Marital Status	Single	35	64.8
	Married	19	35.2
	Total	54	100
Occupation	Single	14	25.9
	Employee	36	66.7
	Unemployed	4	7.4
	Total	54	100
Do you use BRT regularly?	Yes	34	63
	Occasionally	16	29.6
	Very Often	4	7.4
	Total	54	100
Have you faced or witnessed discrimination while using BRT?	Yes	46	85.2
	No	8	14.8
	Total	54	100

Gender: Among the 54 respondents, a slightly higher percentage of females (55.6%) participate in the survey compared to males (44.4%). This indicates a relatively balanced representation of both genders in the sample, allowing for a more inclusive understanding of the public transport system's impact across different gender groups.

Age: The age distribution shows that most respondents are between the ages of 18 and 25, comprising 33.3% of the sample. The 26 to 35 age group follows at 24.1%, and the 36 to 45 group at 25.9%. Only 16.7% of respondents are aged 45 or above, indicating that the younger population is more engaged with BRT services, which could be related to their higher dependence on public transportation for commuting, education, and employment.

Marital Status: A significant proportion of respondents are single (64.8%), while 35.2% are married. This demographic distribution may provide insights into family-related travel patterns, as married individuals may have different mobility needs compared to single individuals, potentially influencing their perceptions of accessibility and convenience in public transport.

Occupation: The data shows that most respondents are employed (66.7%), with a smaller portion being single (25.9%) or unemployed (7.4%). The high percentage of employed respondents suggests that the BRT system plays a critical role in providing accessible transport options for the workforce, potentially impacting their job access and overall socio-economic mobility.

Regularity of BRT Usage: The survey indicates that a significant portion of respondents (63%) use the BRT regularly, suggesting a high level of dependency on this public transport system. Additionally, 29.6% of respondents use the BRT occasionally, and only a small number (7.4%) use

it very often. This variation could highlight different user needs, from daily commuters to occasional users.

Discrimination Experience: Most respondents (85.2%) have faced or witnessed discrimination while using the BRT, indicating a potential issue with accessibility and equity in the BRT system. This finding points to a critical area for improvement, as perceived or actual discrimination could undermine the system's goal of promoting socio-economic equity. Only 14.8% of respondents reported not facing any discrimination, suggesting that for many users, equity concerns remain a significant barrier to full access and utilization of the service.

Validity and Internal Consistency Tests

Table Results of validity and internal consistency testing

Constructs	Items	FL	CA	CR	AVE
Accessibility	AS1	.314			
	AS 2	.283			
	AS 3	.735	0.414	0.591	0.297
	AS 4	.686			
Equity	EQ1	.490			
	EQ2	.679			
	EQ3	-.483	-0.103	0.741	0.434
	EQ4	.897			
Service Quality	SQ1	.0474			
	SQ2	0.444	0.086	0.496	0.198
	SQ3	.461			
	SQ4	-.398			
Social Inclusion	S1	.190			
	S2	.193	.619	0.372	0.230
	S3	.786			
Income Distribution	ID1	-.600			
	ID2	.130	0.682	0.251	0.344
	ID3	.770			
	ID4	.638			
Affordability	AD1	.442	0.246	0.379	0.192
	AD2	.590			
	AD3	.185			

The results of the validity and internal consistency tests reveal that the Accessibility construct is not yet a reliable or valid measure in its current form. Of the four items intended to capture users' perceived convenience and reachability of the BRT system, only AS3 (FL = .735) and AS4 (FL = .686) meet the commonly accepted loading threshold of .60; AS1 (.314) and AS2 (.283) fall far below it. This imbalance is reflected in a low Cronbach's alpha (.414), a composite reliability of .591 (well under the .70 benchmark), and an AVE of just .297 (below the .50 standard). Together, these indicators suggest that AS1 and AS2 contribute little to the underlying factor and should be revised or removed to improve the construct's coherence and its ability to explain variance in respondents' perceptions of accessibility.

The Equity scale shows mixed evidence of adequacy. Three of its four items load positively on the factor EQ1 (.490), EQ2 (.679), and EQ4 (.897) but EQ3 has a negative loading (–.483),

indicating either a reverse-worded item that wasn't recoded correctly or a conceptually misaligned question. This misfit drives a negative Cronbach's alpha (–.103), a clear sign of inconsistent item interrelations. However, once the item-coding issue is addressed, the scale's composite reliability (CR = .741) would exceed the .70 threshold, and its AVE (.434) would approach acceptable levels, suggesting that the bulk of the remaining items coherently measure the equity dimension. A careful review and potential re-wording or re-scoring of EQ3 is therefore crucial to harness the construct's true reliability and convergent validity.

By contrast, Service Quality performs poorly across all metrics. Only two items SQ2 (.444) and SQ3 (.461) even approach acceptable loading levels, while SQ1 (.474?) and SQ4 (–.398) either fail to align or load negatively. The result is an extremely low Cronbach's alpha (.086), a composite reliability of only .496, and an AVE of .198, indicating that the items explain less than 20% of their own variance. Such figures point to a scale that neither holds together as a single construct nor captures much of the intended service-quality domain, and they suggest that the existing items require substantial revision or replacement.

The **Social Inclusion** construct also shows inadequate psychometric properties in its current form. Of the three items designed to measure perceptions of inclusion and participation among marginalized groups, only S3 (.786) reaches the acceptable factor loading threshold, while S1 (.190) and S2 (.193) fall significantly below it. The resulting composite reliability of .372 and AVE of .230 fall well short of the recommended standards (≥ .70 for CR and ≥ .50 for AVE), indicating both poor internal consistency and limited shared variance among the items. These results suggest that S1 and S2 may be weak or ambiguous indicators of social inclusion and should be reviewed for conceptual clarity, alignment with the construct, and possible rewording or replacement.

Similarly, the **Income Distribution** construct demonstrates weak internal reliability and convergent validity. Although ID3 (.770) and ID4 (.638) load satisfactorily on the construct, ID1 (–.600) loads negatively, and ID2 (.130) falls below acceptable thresholds. The scale's composite reliability is only .251, and its AVE is .344 both considerably below established benchmarks. These findings highlight potential issues with item wording, directionality, or conceptual coherence. In particular, the negative loading of ID1 suggests a possible scoring or interpretation issue that should be corrected. Overall, the construct would benefit from refining or eliminating underperforming items to strengthen its representation of income-related disparities among BRT users.

The **Affordability** construct similarly demonstrates inadequate reliability and convergent validity. Among its three items, only AD2 (.590) approaches the acceptable factor loading threshold, while AD1 (.442) and AD3 (.185) fall well below the .60 benchmark. This weakness is reflected in a very low composite reliability of .379 and an AVE of just .192, both far below the recommended cutoffs of .70 and .50, respectively. These results suggest that the current set of items fails to consistently capture respondents' perceptions of affordability within the BRT context. In particular, the very low loading of AD3 raises concerns about its relevance or clarity, while the overall pattern suggests the need for substantial item refinement or expansion. To improve the construct's coherence and explanatory power, a careful review of item wording, alignment with the affordability concept, and possibly the introduction of additional indicators is recommended.

In sum, none of the five constructs currently meets conventional thresholds for both reliability (Cronbach's alpha and composite reliability ≥ .70) and convergent validity (AVE ≥ .50). While the Equity scale shows promise once its mis-scored indicator is corrected, all other scales Accessibility, Service Quality, Social Inclusion, and Income Distribution demand a careful re-examination of item content, coding accuracy, and potential inclusion of additional or revised items. Only through such refinements can the measurement model offer a valid and reliable basis for evaluating the socio-economic impacts of BRT systems in Islamabad.

Fornell-Larcker criterion test

Table Fornell-Larcker table

Variable	AS	EQ	SQ	SI	ID	AS
1.Accessibility(AS)	1	.29* (p = .032)	−.12 (p = .404)	.03 (p = .836)	.10 (p = .473)	.09 (p = .539)
2. Equity(EQ)	.29* (p = .032)	1	.09 (p = .508)	.65** (p < .001)	.13 (p = .339)	−.28* (p = .038)
3. Service Quality(SQ)	−.12 (p = .404)	.09 (p = .508)	1	−.11 (p = .446)	.22 (p = .116)	.01 (p = .961)
4. Social Inclusion(SI)	.03 (p = .836)	.65** (p < .001)	−.11 (p = .446)	1	.03 (p = .853)	−.45** (p = .001)
5. Income Distribution(ID)	.10 (p = .473)	.13 (p = .339)	.22 (p = .116)	.03 (p = .853)	1	.15 (p = .295)
6. Affordability	.09 (p = .539)	−.28* (p = .038)	.01 (p = .961)	−.45** (p = .001)	.15 (p = .295)	1

- The results of the Fornell-Larcker criterion test (Table 5) are used to assess the discriminant validity of the constructs. Discriminant validity is confirmed if the square root of the Average Variance Extracted (AVE) for each construct is greater than the correlation between that construct and the other constructs. In this case, we look at the correlations between the constructs Accessibility (AS), Equity (EQ), Service Quality (SQ), Social Inclusion (SI), Income Distribution (ID), and Affordability (AF).

- **Accessibility (AS) and Equity (EQ)** show a statistically significant positive correlation ($r = .29$, $p = .032$), suggesting that as the perceived accessibility of the BRT system improves, perceptions of equity also tend to improve. However, the correlation value is not excessively high, indicating that these two constructs are distinct from one another. Given that the correlation does not exceed the threshold of .85, we can consider this evidence of discriminant validity for these constructs.

- **Accessibility (AS) and Service Quality (SQ)** show a very weak, non-significant negative correlation ($r = -.12$, $p = .404$). This indicates that the two constructs are not strongly related and are likely distinct, supporting discriminant validity.

- **Equity (EQ) and Service Quality (SQ)** show an even weaker, non-significant positive correlation ($r = .09$, $p = .508$), further suggesting that these constructs are distinct from each other, as their correlation is very close to zero. Overall, based on the Fornell-Larcker criterion and the significant correlations between constructs, it can be concluded that the constructs of Accessibility, Equity, and Service Quality demonstrate discriminant validity. The correlations are not excessively high, and each construct appears to capture a different dimension of the public transport system's role in promoting socio-economic equity.

- **Social Inclusion (SI)** demonstrates mixed correlations with other constructs. It shows a strong and significant positive correlation with Equity ($r = .65$, $p < .001$) but weak or non-significant correlations with the others (e.g., AS: $r = .03$, $p = .836$; SQ: $r = -.11$, $p = .446$; ID: $r = .03$, $p = .853$; AF: $r = -.45$, $p = .001$). While the strong SI-EQ association suggests some conceptual overlap, the correlation remains below problematic levels, preserving discriminant validity. However, the significant negative correlation between Social Inclusion and Affordability ($r = -.45$, $p = .001$) is noteworthy and may reflect trade-offs perceived by respondents (e.g., lower affordability linked with higher social inclusion), warranting further theoretical exploration.

- **Income Distribution (ID)** exhibits very weak and non-significant correlations with the other constructs (e.g., AS: $r = .10$, $p = .473$; EQ: $r = .13$, $p = .339$; SQ: $r = .22$, $p = .116$; SI: $r = .03$, $p = .853$; AF: $r = .15$, $p = .295$). These findings indicate a lack of overlap in variance with other constructs, supporting discriminant validity. However, the minimal associations raise concerns about whether ID, as operationalized, is sufficiently integrated within the broader conceptual framework of socio-economic equity in public transit access.

- **Affordability (AF)** shows mixed results. It has a significant negative correlation with Equity

(r = −.28, p = .038) and Social Inclusion (r = −.45, p = .001) but non-significant, near-zero correlations with Accessibility (r = .09, p = .539), Service Quality (r = .01, p = .961), and Income Distribution (r = .15, p = .295). The negative associations with Equity and Social Inclusion may reflect tensions perceived by respondents between affordability and perceived fairness or inclusion, suggesting complex interrelationships. Despite these significant correlations, none exceed problematic thresholds, supporting the discriminant validity of Affordability. However, the pattern suggests the need for theoretical clarification regarding the role of affordability in the broader framework.

- In summary, all six constructs, Accessibility, Equity, Service Quality, Social Inclusion, Income Distribution, and Affordability demonstrate discriminant validity based on the Fornell-Larcker criterion, as none of the inter-construct correlations approach problematic levels (i.e., r > .85). Nonetheless, the particularly weak correlations involving Income Distribution and the strong but theoretically complex negative correlations between Affordability and other constructs highlight areas that may benefit from further conceptual and empirical refinement.

Heterotrait–Monotrait (HTMT) ratios

Table HTMT table

Variable	1. Accessibility	2. Equity	3. Service Quality	4. Social Inclusion	5. Income Distribution	6. Affordability
1. Accessibility	1	.29* (p = .032)	–.12 (p = .404)	.18 (p = .203)	–.07 (p = .611)	.09 (p = .539)
2. Equity	.29* (p = .032)	1	.09 (p = .508)	.14 (p = .324)	.03 (p = .822)	–.28* (p = .038)
3. Service Quality	–.12 (p = .404)	.09 (p = .508)	1	–.10 (p = .463)	–.05 (p = .719)	.01 (p = .961)
4. Social Inclusion	.18 (p = .203)	.14 (p = .324)	–.10 (p = .463)	1	.03 (p = .853)	–.45** (p = .001)
5. Income Distribution	–.07 (p = .611)	.03 (p = .822)	–.05 (p = .719)	.03 (p = .853)	1	.15 (p = .295)
6. Affordability	.09 (p = .539)	–.28* (p = .038)	.01 (p = .961)	–.45** (p = .001)	.15 (p = .295)	1

HTMT Table 1

	Accessibility	Equity	Service Quality	Social Inclusion	Income Distribution
Accessibility	1.0	0.92	0.92	0.35	0.21
Equity	0.92	1.0	-0.12	0.4	0.25
Service Quality	0.92	-0.12	1.0	0.3	0.28
Social Inclusion	0.35	0.4	0.3	1.0	0.22
Income Distribution	0.21	0.25	0.28	0.22	1.0

Variable	1. Accessibility	2. Equity	3. Service Quality	4. Social Inclusion	5. Income Distribution	6. Affordability
1. Accessibility	1	0.29	0.12	0.18	0.07	0.09
2. Equity	0.29	1	0.09	0.14	0.03	-0.28
3. Service Quality	0.12	0.09	1	0.10	0.05	0.01
4. Social Inclusion	0.18	0.14	0.10	1	0.03	-0.45
5. Income Distribution	0.07	0.03	0.05	0.03	1	0.15
6. Affordability	0.09	-0.28	0.01	-0.45	0.15	1

HTMT Table 2

	Accessibility	Equity	Service Quality	Social Inclusion	Income Distribution
Accessibility	1.0	0.33	0.22	0.12	0.08
Equity	0.33	1.0	0.13	0.2	0.11
Service Quality	0.22	0.13	1.0	0.09	0.1
Social Inclusion	0.12	0.2	0.09	1.0	0.18
Income Distribution	0.08	0.11	0.1	0.18	1.0

Table presents the Heterotrait Monotrait (HTMT) ratios among the six constructs: Accessibility, Equity, Service Quality, Social Inclusion, Income Distribution, and Affordability. The HTMT ratio is a robust measure used to assess discriminant validity, ensuring that constructs which are theoretically distinct are empirically distinct as well.

- The HTMT value between **Accessibility** and **Equity** is 0.29, indicating a moderate but acceptable association, well below the conservative threshold of 0.85. This suggests that these two constructs are distinct but share some overlap in their conceptualization.
- The HTMT values between Accessibility and Service Quality (0.12), Equity and Service Quality (0.09), and Accessibility and Social Inclusion (0.18) are all low, suggesting clear empirical distinction among these constructs.
- Very low HTMT values are found between **Service Quality** and **Social Inclusion** (0.10), **Equity** and **Income Distribution** (0.03), and **Accessibility** and Income Distribution (0.07), indicating that these constructs are also distinct from each other.
- The Affordability construct demonstrates similarly low HTMT values: Accessibility–Affordability (0.09), Equity–Affordability (–0.28), Service Quality–Affordability (0.01), Social Inclusion–Affordability (–0.45), and Income Distribution–Affordability (0.15). These values show that Affordability is clearly distinct from the other constructs and does not overlap substantially with them.

The highest HTMT ratio observed is 0.29, still well below the 0.85 threshold, confirming that there is no evidence of multicollinearity or construct redundancy among the six constructs. These low inter-construct HTMT ratios provide strong evidence of discriminant validity among all six constructs in the measurement model. None of the values approach the 0.85 cutoff, supporting the theoretical claim that the constructs capture distinct dimensions of public transport service perception and socio-economic outcomes.

Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy

Table KMO and Bartlet test

(KMO)	**0.512**
Bartlett's Test of Sphericity Approx. Chi-Square	720.744
Degrees of Freedom (df)	406
Significance (Sig.)	0.000

Table 7 presents the results of the Kaiser-Meyer-Olkin (KMO) measure and Bartlett's Test of Sphericity, which assess the adequacy of the data for factor analysis. The KMO value is 0.512, which exceeds the minimum threshold of 0.50, indicating a moderate level of sampling adequacy. This suggests that the patterns of correlations are sufficiently compact and that the data is appropriate for factor analysis. Additionally, Bartlett's Test of Sphericity shows a chi-square value of 720.744 with 406 degrees of freedom and a significance level of $p < .001$. Since the p-value is less than 0.05, the null hypothesis that the correlation matrix is an identity matrix can be rejected. This result confirms that there are significant correlations among the variables, supporting the suitability of the data for factor analysis.

Structural Hypothesis Tests

Table Hypothesis Testing Table

Hypothesis	Path coefficients	T - value	Sig	Conclusion
H1 BRT accessibility positively impacts socio-economic equity.	1.653	7.590	0.000	Supported
H2 BRT equity impacts perceived fairness of the system.	0.839	3.544	0.000	Supported
H3 Service quality of BRT impacts satisfaction and frequency of use.	2.660	2.794	0.000	Supported
H4 BRT accessibility positively contributes to social inclusion	2.589	6.191	0.000	Supported
H5 Perceived equity in the BRT system positively influences satisfaction with income distribution	2.750	2.349	0.023	Supported
H6 Perceived affordability of BRT positively impacts user satisfaction and frequency of use.	1.193	17.864	0.000	Supported

Table 8 presents the results of the structural hypothesis testing, which reveal that all six hypothesized relationships are statistically significant and align with the proposed theoretical expectations. The first hypothesis (H1) suggested that BRT accessibility positively impacts socio-economic equity. This was supported by a path coefficient of 1.653, with a t-value of 7.590 and a significance level of $p < .001$, indicating a strong and meaningful relationship where improved access to BRT enhances users' economic opportunities and perceptions of fairness.

The second hypothesis (H2) proposed that BRT equity influences perceptions of fairness within the system. This relationship was also confirmed, with a path coefficient of 0.839, a t-value of 3.544, and $p < .001$, demonstrating that users who perceive the BRT system as equitably distributed and non-discriminatory are more likely to evaluate the system as fair.

In support of the third hypothesis (H3), the analysis showed that the quality of BRT service positively affects user satisfaction and frequency of use. A path coefficient of 2.660, along with a t-value of 2.794 and $p < .001$, reflects that service factors like cleanliness, comfort, and frequency significantly contribute to higher satisfaction and greater usage.

The fourth hypothesis (H4), which introduced the role of BRT accessibility in promoting social inclusion, yielded a path coefficient of 2.589, t-value of 6.191, and $p < .001$. This highlights that accessible BRT services enhance users' sense of social integration and equitable participation.

The fifth hypothesis (H5) tested whether perceived equity in the BRT system affects satisfaction with income distribution. The results supported this, with a path coefficient of 2.750, a t-value of 2.349, and a p-value of 0.023, indicating that perceptions of fair fares and access to subsidies are significantly associated with a positive view of income fairness.

Finally, the sixth hypothesis (H6) proposed that perceived affordability of BRT positively impacts user satisfaction and frequency of use. This hypothesis was also supported, with a path coefficient of 1.193, a t-value of 17.864, and a significance level of $p < .001$, indicating that the perceived affordability of BRT services has a strong influence on users' satisfaction levels and their decision to use the system more frequently.

Qualitative Findings

Thematic Analysis: Insights from Qualitative Interviews

Building upon the quantitative findings, the qualitative interviews offered deeper and more nuanced perspectives on users' experiences with the BRT system. Through thematic analysis, four major themes emerged: Perceptions of Accessibility, Affordability versus Hidden Costs, Service Quality and User Satisfaction, and Experiences of Inclusion and Exclusion. Participant feedback provides critical insights into how systemic issues shape daily realities for BRT users.

4.3.1 Perceptions of Accessibility: Distance, Design, and Disconnection

While survey data indicated general satisfaction with the location of BRT stations, participants revealed important accessibility barriers in their lived experiences.

Many commuters, especially those residing on the

city's peripheries, found the distance to the nearest station a significant obstacle. A participant from Rawalpindi noted:

"It takes me at least 30 minutes of walking to reach the nearest station. By the time I get there, I am already tired." (Male, 32, Laborer)

For women, the concern was compounded by safety fears during early morning or late evening hours:

"I can't walk to the station after sunset. It's too risky, and there are no proper streetlights or security." (Female, 27, Domestic Worker)

Participants with disabilities were particularly vocal about design flaws. Despite claims of universal accessibility, station layouts often lacked functioning ramps, and elevators were frequently out of service:

"They built ramps, but they are so steep that it's impossible to use them safely in a wheelchair." (Male, 41, Wheelchair User)

These accounts reveal that while the BRT improves accessibility for some, it fails to provide inclusive, safe, and user-friendly access for vulnerable groups.

4.3.2 Affordability versus Hidden Costs: A Double Burden

Although 82% of survey respondents found the BRT fare affordable, interviews exposed hidden costs that challenge this perception.

Many participants reported that while the BRT ticket price was low, the ancillary costs of reaching stations significantly increased their daily travel expenses.

One respondent working as a street vendor shared:

"The bus fare is fine, but I have to pay Rs. 200 daily for rickshaw rides just to reach the bus stop. It's almost double what I spend on the bus itself." (Male, 35, Street Vendor)

Similarly, a female garment factory worker mentioned:

"If there was a van or shuttle connecting our area to the Metro, it would be perfect. Right now, even though the Metro is cheap, getting to it is costly and difficult." (Female, 30, Factory Worker)

Several participants highlighted that the time lost walking or waiting for transport to reach the BRT added **hidden opportunity costs**, especially for daily wage workers who earn by the hour.

Thus, the system's affordability, when critically examined, remains **partial and conditional** rather than truly universal.

4.3.3 Service Quality and User Satisfaction: Beyond Infrastructure

In terms of service quality, the interviews painted a mixed picture.

Many praised the clean environment, air conditioning, and overall modernity of the BRT buses compared to older minibuses:

"The buses are much cleaner and safer than the Suzuki vans or Qingqi rickshaws we used to travel on." (Female, 22, University Student)

However, complaints about overcrowding, inconsistent timings, and service deterioration were widespread.

A commuter traveling daily from Saddar to Faizabad stated:

"In the mornings, buses are so packed that even the women's section is crowded. You have to fight for space." (Female, 26, Private School Teacher)

Another participant pointed out operational inefficiencies:

"Sometimes buses don't come for 20–30 minutes during off-peak hours. We have no idea why, and there is no announcement." (Male, 40, Office Worker)

The gap between users' initial expectations and their everyday experiences highlights how **service quality erosion** can quickly undermine public trust and ridership growth.

4.3.4 Experiences of Inclusion and Exclusion: Marginalized Voices

The most powerful insights emerged around issues of social inclusion.

While the BRT officially promotes inclusivity through reserved spaces for women, elderly passengers, and disabled individuals, lived experiences often contradicted this ideal.

A young female respondent narrated:

"Even in the women's section, harassment happens. There are no security guards inside the buses, and sometimes men try to sneak in." (Female, 24, University Student)

Respondents with disabilities shared feelings of alienation and frustration. One noted:

"The BRT management thinks putting up a few signs or ramps is enough. But if the elevators are broken, the staff don't even care." (Male, 37, Person with Visual Impairment)

In terms of class and social identity, several participants from low-income backgrounds expressed that they felt unwelcome at certain stations or treated with suspicion by security staff:

"They look at us like we don't belong there. As if the Metro is only for educated, rich people." (Male, 29, Construction Worker)

Summary of Quantitative and Qualitative Findings

The quantitative results indicate that the BRT system has made significant contributions toward improving socio-economic equity among users in Islamabad and Rawalpindi. Most surveyed respondents expressed satisfaction with the affordability, reliability, and quality of service provided by the BRT. Particularly, indicators such as reduced commute times and increased access to employment and educational opportunities emerged strongly. However, challenges persisted in areas such as last-mile connectivity and social inclusion, with a notable portion of respondents facing difficulties in accessing stations or experiencing barriers related to age, gender, and disability. These trends affirm that while the BRT achieves positive outcomes for many, disparities in access and experience remain significant.

Qualitative findings provided deeper insights into these quantitative patterns, revealing the lived realities behind the survey statistics. Participants such as Respondent F reported seamless access, safety, affordability, and high service satisfaction, particularly when residing near well-connected stations. Conversely, Respondents E and B illustrated critical gaps — long and unsafe walking distances, non-functioning accessibility infrastructure, and inconsistent feeder services — highlighting how infrastructural and operational limitations undermine the system's inclusivity. Moreover, issues such as harassment risks for women, poor enforcement of accessibility features, and unreliable feeder bus services amplify the barriers faced by marginalized groups, especially in peripheral areas.

Together, the quantitative and qualitative analyses suggest that while the BRT system has substantially improved urban mobility and affordability for a broad segment of users, its benefits are unevenly distributed. True socio-economic equity remains elusive for those with poor geographic access, limited physical mobility, or heightened vulnerability to exclusionary practices. Without addressing systemic issues such as last-mile connectivity, consistent feeder service operations, and infrastructure maintenance for vulnerable populations, the BRT's potential to serve as an inclusive urban mobility solution will remain only partially realized.

5. Discussion

The results of this study show that accessibility through BRT greatly improves socio economic equity of the users as supported by H1. The findings suggest that as accessibility to the BRT system improves, users experience greater economic mobility, enabling them to more effectively access essential services such as employment, healthcare, and education. The study's findings are strongly supported by the Social Equity Theory, which provides a theoretical lens for understanding the relationship between public transportation and socio-economic inclusion. According to this theory, fairness in the distribution of services, such as access to transportation, is essential for promoting social justice. The positive impact of BRT accessibility on socio-economic equity (H1) directly correlates with the theoretical claim that equitable access to transport leads to better social inclusion, particularly for disadvantaged groups. This is consistent with Hickman, Hall, and Banister's (2013) argument that sustainable transport systems, such as BRT, are key to reducing socio-economic divides by making essential services more accessible. By enhancing the mobility of low-income populations, BRT systems contribute to greater economic opportunities, which in turn helps reduce inequality.

The relationship between BRT equity and perceived fairness (H2) further aligns with Foley et al. (2022), who demonstrated that BRT systems, when designed to be equitable and inclusive, help improve social trust and ensure that marginalized groups feel that they are being treated fairly. This sense of fairness is critical for users who rely on public transport systems for their daily needs, as it can increase their confidence in the system and encourage them to use it more frequently. Additionally, the strong connection between service quality and user satisfaction (H3) is supported by findings from **Venter et al. (2017)**, who emphasized that service quality is a key determinant of user satisfaction and that improvements in areas such as safety, reliability, and affordability are crucial for ensuring that public transport systems are effective in promoting socio-economic equity.

Research highlights that BRT systems, such as those in Pakistan, positively influence socio-economic outcomes by improving accessibility and equity. As Venter, Jennings, and Hidalgo (2017) point out, the BRT system has been particularly beneficial for low-income populations in developing regions, providing them with better access to employment, healthcare, and education. The findings indicate that **63%** of respondents use BRT regularly, emphasizing the role of public transport in providing affordable mobility options, especially for lower-income groups who rely on public transit due to financial constraints (Hickman, Hall, & Banister, 2013). The strong correlation between BRT accessibility and equity underscores the theory that equitable access to transportation systems can level the playing field, offering opportunities that would otherwise be inaccessible.

Sustainable Urbanism Theory offers a broader perspective for understanding the socio-economic impacts of BRT systems. This theory stresses the integration of environmental, social, and economic factors in urban planning. The findings suggest that BRT systems have created economic opportunities through improved connectivity, reduced travel costs, and enhanced land use around BRT stations, echoing studies by Kusar, Waheed, and Akber (2021). The increase in property values around BRT corridors and the creation of new job opportunities align with the concept of sustainable urbanism, where transportation systems contribute not only to environmental sustainability but also to economic and social well-being (Basheer, Boelens, & Bij, 2020). These outcomes highlight the potential of BRT to act as a catalyst for local economic growth and urban revitalization, contributing to a more inclusive urban environment.

BRT accessibility positively impacts socio-economic equity. However, to achieve this impact, the system needs to improve user access to services and actively work for including groups such as disabled, health patients and pregnant women. The BRT system's capacity to provide accessible transportation is pivotal for enhancing social inclusion in Islamabad, particularly for low-income communities, women, and people with disabilities who often face barriers to mobility.

6. Recommendations

Inclusive Infrastructure Upgrades

Upgrade BRT infrastructure by adding ramps, dedicated transgender entry points, and priority seating for pregnant and disabled passengers to ensure full social inclusion.

Expansion of Feeder Routes

Introduce dedicated feeder bus routes connecting peripheral urban sectors to the main BRT network to enhance last-mile connectivity and discourage reliance on private vehicles.

Anti-Discrimination Measures

Implement stricter anti-discrimination policies, improve station security, and create safer spaces for women and marginalized groups to ensure equitable access for all users.

Enhancing Service Quality

Improve service quality by maintaining punctuality, cleanliness, and accessibility at stations and on buses, ensuring a reliable and user-friendly experience for diverse commuters.

Leveraging Economic Opportunities

Develop commercial and residential hubs around BRT stations through public-private partnerships to boost local economies and improve socio-economic access for marginalized communities.

7. Conclusion:

This study critically examined the role of the Bus Rapid Transit (BRT) system in promoting socio-economic equity in Islamabad and Rawalpindi, focusing on key indicators such as accessibility, affordability, service quality, and social inclusion. Both quantitative and qualitative findings reveal that while the BRT has contributed significantly to improving urban mobility and affordability for a wide segment of users, these benefits are not uniformly distributed. For users with direct access to the BRT corridor, particularly those residing near well-connected stations, the system has effectively reduced commute times, expanded employment and educational opportunities, and offered a reliable, safe, and affordable means of transportation.

However, the study also highlights critical systemic gaps that undermine the BRT's potential as an inclusive public mobility solution. Accessibility challenges, especially related to last-mile

connectivity, remain a significant barrier for residents of peripheral and underserved areas. Social inclusion, particularly for persons with disabilities, elderly commuters, transgender individuals, and women, continues to be weak, despite infrastructural investments. Additionally, feeder services, introduced to bridge access gaps, have been found to be inconsistent and unreliable, limiting their effectiveness. These structural and operational limitations suggest that socio-economic equity through BRT is only partially realized and that further policy interventions are necessary.

Addressing these challenges requires a shift from infrastructure-centric to user-centered urban transport planning. Specific recommendations include making infrastructural upgrades to ensure universal accessibility, expanding and regulating feeder routes, enforcing anti-discrimination policies, enhancing overall service quality, and leveraging BRT corridors for broader economic development through public-private partnerships. Only through such comprehensive and inclusive strategies can Islamabad and Rawalpindi's BRT system evolve into a truly equitable and sustainable urban mobility model, capable of serving the diverse needs of their growing urban populations.

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Appendix A: BRT(Orange/Red) Survey Questionnaire

Public Survey on the Impact of BRT on Socio-Economic Equity in Islamabad

This questionnaire is part of a research study conducted by a group of THREE students in their Final Semester at the School of Social Sciences &
Humanities, NUST.
The study aims to *"Assessing the Role of the BRT System in Islamabad in Promoting Socio-Economic Equity by Assessing Various Aspects Such as Accessibility, Affordability, Service Quality, Social Inclusion, And Economic Impacts"*.

Section 1: General Information/Demographics
Gender*
Male
Female
Prefer not to say
Age*
Below 18
18 - 25
26 - 35
36 -45
45+
Marital Status*
Single
Married
Occupation*
Student
Employee
Unemployed
Monthly Household Income*
Below 30,000 PKR
30,000 - 60,000 PKR
60,000 - 100,000 PKR
Above 100,000 PKR
Do you use BRT regularly?
*
Yes
Occasionally
Very Often
No
What is your primary reason for using BRT?*
Work
Education
Shopping
Healthcare
Other:

Section 2: Accessibility
How far is the nearest BRT station from your residence?
*
Less than 500m
500M -1 Km
1km - 2km
More than 2km
How convenient is it for you to reach a BRT station?*
Very Convenient

Somewhat Convenient
Neutral
Inconvenient
Very Inconvenient
In your opinion, does the BRT system adequately cover low-income areas?*
Yes
No
Maybe
How long does your average BRT commute take (one-way)?*
Less than 30 mins
30-45 mins
45-50 mins
More than an hour
Have you ever had to change your travel plans because of BRT accessibility issues?*
Yes
No
Have you faced difficulty accessing services due to lack of BRT connectivity?*
Yes
No
Have you or your family experienced any improvement in economic opportunities (e.g., better job access, easier access to markets) due to BRT?*
Yes
No
How would you rate the distribution of BRT stations across different areas of Islamabad?*
Well-distributed
Adequate
Poorly distributed
Have you ever had to take alternative transportation due to BRT not covering your needed route?*
Yes
No

Section 3: Affordability
How do you view BRT fares in relation to your income? *
Very Affordable
Affordable
Neutral
Expensive
Very Expensive
Do you receive fare subsidies or discounts (e.g., student, elderly, disabled)?*
Yes
No
Maybe
Is the fare fair for both low-income and high-income groups? *
Yes
No
Maybe
Have you ever had to limit your BRT travel due to fare costs?*
Yes
No
Maybe
If BRT fares were increased, how would it affect your commuting choices?*
No impact

Moderate impact
Significant impact
Do you believe BRT is a better financial option than other transportation modes?*
Yes
No
Maybe

Section 4: Service Quality
How would you rate the frequency of BRT buses?*
Very Frequent
Frequent
Neutral
Less Frequent
Have you ever missed any important commitment due to a BRT service delay?*
Yes
No
Have you ever experienced or witnessed harassment, crime, or safety concerns on BRT?*
Yes
No
How satisfied are you with the cleanliness and comfort of BRT buses and stations?*
Very Satisfied
Satisfied
Neutral
Dissatisfied
Very Dissatisfied
Have you ever faced issues with overcrowding or lack of seats on BRT?*
Yes
No

Section 5: Social Inclusion
Do you feel BRT provides equal access to all social groups?*
Yes
No
Maybe
Have you faced or witnessed discrimination while using BRT?*
Yes
No
If you could change one thing about the BRT system to improve its impact on socio-economic equity, what would it be?*
Increase routes to underserved areas
Lower fares for low-income groups
Improve bus frequency and reliability
Improve safety and security
Improve cleanliness and comfort
Appendix B: Blue/Green Bus Survey

Section 1: General Information/Demographics
Gender*
Male
Female
Prefer not to say
Age*

Below 18
18 - 25
26 - 35
36 -45
45+
Marital Status*
Single
Married
Occupation*
Student
Employee
Unemployed
Monthly Household Income*
Below 30,000 PKR
30,000 - 60,000 PKR
60,000 - 100,000 PKR
Above 100,000 PKR
Do you use Blue/Green bus regularly?
*
Yes
Occasionally
Very Often
No
What is your primary reason for using Blue/Green bus?*
Work
Education
Shopping
Healthcare
Other:

Section 2: Accessibility
How far is the nearest BRT station from your residence?
*
Less than 500m
500M -1 Km
1km - 2km
More than 2km
In your opinion, does the Blue/Green system adequately cover low-income areas?*
Yes
No
Maybe
In your opinion, does the Blue/Green system provide accessibility for marginalized groups (e.g., disabled individuals, elderly)?*
Yes
No
Maybe
Have you ever had to change your travel plans because of BRT accessibility issues?*
Yes
No

Section 3: Affordability
How do you view Blue/Green fares in relation to your income? *

Very Affordable
Affordable
Neutral
Expensive
Very Expensive
Is the fare fair for both low-income and high-income groups? *
Yes
No
Maybe
Have you ever had to limit your travel due to fare costs?*
Yes
No
Maybe
If Blue/Green Buses fares were increased, how would it affect your commuting choices?*
No impact
Moderate impact
Significant impact
Do you believe blue/green bus is a better financial option than other transportation modes?*
Yes
No
Maybe

Section 4: Service Quality
How would you rate the frequency of Blue/Green buses?*
Very Frequent
Frequent
Neutral
Less Frequent
How reliable is the service in terms of following schedules?*
Very Reliable
Reliable
Neutral
Unreliable
Very Unreliable
How safe do you feel using Blue/Green Buses?*
Very Safe
Safe
Neutral
Unsafe
Very Unsafe
Have you ever experienced or witnessed harassment, crime, or safety concerns?*
Yes
No
How satisfied are you with the cleanliness and comfort of the buses and stations?*
Very Satisfied
Satisfied
Neutral
Dissatisfied
Very Dissatisfied
Have you ever faced issues with overcrowding or lack of seats on Blue/Green bus?*
Yes
No

Section 5: Social Inclusion
Do you feel the service provides equal access to all social groups?*
Yes
No
Maybe
Have you faced or witnessed discrimination while using this?*
Yes
No
How frequently do elderly, disabled individuals, transgender people, and women with disabilities use Blue/Green Bus?*
Frequently
Occasionally
Rarely
Never

Section 6: Access to Services
Does the service help you access essential services (e.g., work, education, healthcare, markets)?*
Yes
No
Maybe
Have you faced difficulty accessing services due to lack of connectivity?*
Yes
No
Have you or your family experienced any improvement in economic opportunities (e.g., better job access, easier access to markets) due to the services?*
Yes
No
How would you rate the distribution of Blue/Green stops across different areas of Islamabad?*
Well-distributed
Adequate
Poorly distributed
Have you ever had to take alternative transportation due to the buses not covering your needed route?*
Yes
No
If you could change one thing about the service to improve its impact on socio-economic equity, what would it be?*
Increase routes to underserved areas
Lower fares for low-income groups
Improve bus frequency and reliability
Improve safety and security
Improve cleanliness and comfort

Appendix C: Interview Questionnaire
Research Topic: *Assessing the Role of the Public Transport System in Promoting Socio Economic Equity: An Analysis of BRT in Islamabad*

Purpose: To evaluate the impact of the BRT system in Islamabad on accessibility, affordability, service quality, access to services, social inclusion, and economic impacts.

Section 1: Accessibility
1. How do you assess the coverage of the BRT network in Islamabad? Are there any underserved areas?

2. What measures have been taken to ensure accessibility for persons with disabilities and elderly individuals?
3. How effective do you think the integration of BRT with other transport modes (e.g., vans, taxis) has been?
4. Are there any plans to expand the BRT routes to enhance connectivity?
5. Has the BRT system improved access to educational institutions, hospitals, and workplaces?
6. How has the BRT impacted commuting time and convenience for different demographics?
7. Are there last-mile connectivity challenges (e.g., lack of feeder services) that hinder full accessibility?
8. What infrastructure improvements are needed to enhance access to essential services through BRT?

Section 2: Affordability

1. How was the BRT fare structure determined, and how does it compare with alternative transport options?
2. Have there been subsidies or financial support mechanisms to ensure affordability for lower-income groups?
3. What steps are being taken to balance the financial sustainability of the BRT while keeping it affordable for the public?
4. Do you believe the current fare system is a barrier to access for certain socioeconomic groups?

Section 3: Service Quality

1. What key performance indicators are used to measure the service quality of BRT?
2. How frequently are buses maintained, and what measures are in place to ensure safety and reliability?
3. How does the BRT system manage peak-hour congestion, and what improvements are needed?
4. Have there been complaints regarding delays, cleanliness, or driver behavior? If so, how are they addressed?

Section 4: Social Inclusion

1. Has the BRT system reduced transport-related gender disparities, making travel safer and more inclusive for women?
2. How does the system ensure the inclusion of low-income and marginalized communities?
3. Have there been community engagement efforts to gather feedback from diverse socioeconomic groups?
4. What policies are in place to ensure equitable access to all segments of society?

Section 5: Economic Impacts

1. Has the BRT contributed to **job creation** (e.g., employment of drivers, station staff, maintenance teams)?
2. Has there been an observed increase in business activity along the BRT corridors?
3. How has the BRT system influenced real estate values in areas near its routes?
4. Have any studies been conducted on the economic benefits or cost savings associated with BRT usage?

Section 6: Policy & Future Recommendations

1. What challenges have been faced in implementing and operating the BRT system?
2. What policy interventions do you suggest to **improve public transport planning** in Islamabad?
3. Are there any **planned upgrades or expansions** for the BRT system?
4. How can **public-private partnerships** be leveraged to improve the financial and operational sustainability of BRT?

Appendix D: Interview Transcription

1-Interview with Mr. Muhammad Danish-Role of BRT in promoting Socio-economic Equity

Date: April 19, 2025

Location: Virtual-Zoom

Interviewee Name & Role: Muhammad Danish-Head Projects, P3A

The aim of this interview is to take insights from the BRT stakeholders on the impact of BRT on socio-economic equity. It involved taking stakeholder opinion on the planning, construction and operation of the existing system.

Interviewer: How do you assess the coverage of the BRT network in Islamabad? Is it covering the underserved areas? Do we have stations in areas where not required, for instance, having a BRT station in F-5. and not having stations in several underserved areas.

Interviewee: Actually, these mass transit solutions are not especially for underprivileged people. These are for the general public. Even if you talk about public sector hospitals or public sector schools or universities, these are not for the underprivileged only, but for everyone who pays the tax.

For example, if there is an individual or a taxpayer, they are also included. The idea is that all the socioeconomic classes are included. We are providing them a solution that caters to their transportation needs.

Apart from this, we are also improving economic, environmental, and climate related aspects. Like, in a city, an individual commutes to his office daily by himself. It is better than a metro bus going on the same route and using the same route.

So, what I am trying to say is that, this system is not just for the poor. This is for all socioeconomic classes. You can apply the same to every public sector infrastructure and likewise for BRTs as well. So, while doing the feasibility study for any public project like BRT, it is not only done for the underprivileged. Overall, all socioeconomic classes are studied, to ensure equal service provision. Because, as I said earlier, whoever pays tax has an equal right to benefit from the government project regardless of their socio-economic status.

That is the reason you see BRT stations in both underserved areas and highly developed areas like sector F-5.

Interviewer: Is the fare distribution in BRT fair? Is it justified that both the high and low income individuals are paying the same amount?

Interviewee: While planning any public project, we do not divide the general public on the basis of social economic classes. For example, let's say I pay more than 4 million tax to the government. It is my right that I should also get some return on the tax I am paying. So it is not that, only the poor have the right. Every single individual who is paying tax should be facilitated equally.

According to my understanding, fare distribution in BRT is justified and introducing subsidies for the students or elderly would complicate the system and would make it complex to operate. Even if the government plans to provide a fare subsidy, it would heavily complicate the existing situation. First of all, how will you identify that he belongs to class C, class A, and class B? You can't do that.

At that stage, how will he be able to show his social economic class or show his income? You understand that you are traveling in a BRT. You have the card system to buy a ticket. When you go to buy a card, will you show your annual income there? Will you show your annual returns there? It doesn't happen like that.

Yes, we can have a fair policy for students, that they get a discounted subsidized rate. And this has been happening all over the world. I don't think it used to happen on BRT, but this thing can be applied.

But on the basis of social economic classes, you can't make a fair policy. Because every citizen, every taxpayer is equal in the eyes of the government. You can't classify them like this.

Interviewer: what key performance indicators might be used to measure the service quality of BRT?

Interviewee: First of all, what we do in PPPs, that we make some KPIs for each initiative, that these are the minimum standards that we have to meet. One of the indicators can be availability. The kilometres that I am talking about, that pertains to availability of the bus for the service. Government evaluates the service quality by analysing if the bus is available in the allotted time, if it has conveyed the minimum required distance and how much passengers are travelling daily. The bus that is running in the corridor, the viability and usability of the bus is important when it comes to service quality.

Interviewer: Does the government do any bi-annual assessment or evaluation of the BRT project to analyse if its fulfilling the objectives?

Interviewee: Yes, there is and there should be Like any other public sector project. So some matrices are used for each project Which can be operational matrices or financial parameters. Operational matrices are how many passengers are using the service. First of all, the KPI is defined at the feasibility stage. When the project is executed, It will come in the operational phase. First of all, this thing will be compared. What was the original number of passengers? If the number of passengers is less, Is it because of the service provision? That the service provision is not good? Or is it because we have overestimated the feasibility.
In operational parameters, there's always a pre- and post-tender assessment. The post-tender phase is mainly focused on monitoring — ensuring that the objectives set during planning are actually being achieved. For example, if the buses are designed to be environment-friendly, CO2 emissions would have been estimated in the feasibility study. The estimate would be based on the assumption that a certain number of cars and motorcycles would be replaced by buses, reducing emissions. Now, in the operational phase, this reduction can be recalculated and verified.
Similarly, financial parameters are assessed. Let's say we are discussing this in the context of a PPP, or even without one. At the feasibility stage, the estimated funds required for the project are calculated. When the actual tender is floated and a party wins the bid, the real cost at the time of execution may turn out to be higher or lower than the initial estimate.
In the operational phase, the subsidy requirement — for example, 2 billion rupees per year — is also calculated based on actual performance, and this amount can fluctuate. Different factors affect this, like fuel price increases. If fuel prices rise while the fare remains constant, the subsidy will naturally increase. So, financial parameters are also monitored continuously, and several external and internal factors can cause variations in those calculations.

Interviewer: As a public-private partnerships (PPP) professional, what are your thoughts on how PPPs can be integrated to improve the financial and operational sustainability of PRT?

Interviewee: I understood. The answer is that any public sector project done through PPP has certain benefits, and all those benefits can be applied to PRT as well.
PPP offers an end-to-end solution. In PPP, you don't just tender and get the construction done, nor do you only tender and procure buses. Under PPP, you procure the buses, operate them, and maintain them. The element of capital at risk, where financing comes from the private party, ensures that the private party maintains the required standards of service provision, because their payments, investment, loan, and repayment are all tied to operational performance.
In PRT projects, we can integrate PPP in such a way that if the CDA purchases the buses and hands them over to an operator, who is simply paid to run them, there won't be strong enforcement of performance. However, better enforcement is possible within a PPP structure, where capital is at risk. For example, if the government is buying the buses and building the corridor, there's no capital at risk for the private party — the buses won't be theirs, and the investment isn't theirs. But in PPP, we can require the private party to buy the buses, construct the corridor, handle capital expenditure, arrange financing, and perform the operations.
This element of capital at risk leads to improved service in PRT projects, and it also provides an additional advantage to the government.

Interviewer: In your opinion, what is the major problem that BRT is facing in Islamabad and Rawalpindi, and how do you think the public sector can address it?

Interviewee: One major problem that I think BRT is facing in Islamabad and Rawalpindi — for instance, as we discussed — is the lack of feeder routes. Being a public sector personnel, what I believe is that this is one of the major challenges that needs to be addressed in the current system here in Islamabad.
I don't know the exact details of the project, but from my initial impression, it seems that the passenger level of this service is lower than what it should be, or what it was intended to serve for the people. I'm not entirely sure, but this is my general observation based on the nature of Islamabad city. Islamabad isn't a very densely populated city, and I understand that most of the passengers usually come from Rawalpindi, use this service, and then return.
Still, I don't see the expected level of ridership. Let me give you a clearer example — when I first came to Islamabad many years ago, I was surprised to see so many open, wide roads, and despite that, a dedicated BRT corridor had been built. I come from Karachi, where I've observed that there are so many areas, so many public spaces, and a large number of passengers, yet there was no BRT system there — until recently when the Green Line was introduced.
So I had this feeling that the BRT system built in Islamabad may not have been the most urgent need for the city, compared to places like Karachi.
Interviewer: In your view, what is the biggest financial or operational challenge faced by the BRT system in Islamabad and Rawalpindi, and do you think it is commercially sustainable for the government in the long term?

Interviewee: These projects are generally not commercially viable. Making a BRT project commercially viable is very difficult. I think only in Karachi it might be commercially viable, because the city has high ridership and densely populated areas — whereas Islamabad lacks this.
So, my general impression is that the biggest problem is the subsidy burden. The government was right to offer subsidies, but it is not commercially sustainable for the government to create a model where such projects rely on subsidies for the next 15 to 20 years.
At the feasibility stage, everything must be quantified, and that is when the government should decide whether the project is both sustainable and affordable. Let's say they calculated a total subsidy of 40 billion rupees for 20 years, and even if the government believed it had enough funds to cover it — it still wouldn't make the project good value for money. The service being provided, compared to the amount spent, doesn't justify the investment. That same money could be used for other, more beneficial projects.
I'm not against the BRT project in Islamabad, but this is my personal impression — not a fixed opinion.
Well, I got a completely different perspective from a public sector professional, especially compared to how I had been processing and researching this issue through the lens of socio-economic equity.

2-Interview with Transport Planning Expert on How Effective RWP-ISB BRT in Promoting Socio-economic Equity
Date: April 22, 2025
Location: Virtual-Zoom

Interviewee Name & Role: Muhammad Mubashir Moin-Transport Planning Expert at Exponent Engineers Pvt. Limited, Karachi.

Interviewee Profile: My name is Muhammad Mubasher Muin, and I am a transportation engineer by profession. I hold a Bachelor's degree from NED University of Engineering and Technology, Karachi, and completed my Master's in Transport Planning from Imperial College London in 2010. Since then, I have been actively working in the field of transport planning and transportation engineering, contributing to both national and international projects. My expertise spans across mass transit systems, highway design, and transport policy. Currently, I serve as one of the directors at Exponent Engineers (Pvt.) Ltd, a multidisciplinary civil engineering consulting firm. Our firm specializes in structural

engineering, transport planning, highway engineering, ports and marine infrastructure, environmental engineering, and project management. Alhamdulillah, we have been involved in nearly all major mass transit projects executed in Pakistan, including the Peshawar BRT and various initiatives in Karachi.
Interviewer: How do you assess the coverage of the BRT network in Islamabad? What do you think, are there any underserved areas that still require some stations?

Interviewee: Currently, the Rawalpindi-Islamabad Metro operates as a **first-generation BRT**, with a dedicated trunk corridor. However, it has not yet transitioned to a **second-generation BRT**, despite the need and potential. Just to give you a little idea, In a first-generation BRT, the corridor typically serves commuters within a 400–500 meter radius on either side. People outside this catchment area often shift to alternate modes of transport, which limits the system's effectiveness.
A second-generation BRT introduces **feeder services** that bring passengers from surrounding neighborhoods to the main corridor. While this expands coverage, it introduces transfers, which are generally considered a **penalty** in public transit systems. On average, each transfer results in a loss of about 20% of potential ridership because many commuters prefer a direct route over multiple transfers.
This leads to the concept of a **third-generation BRT**, as seen in **Peshawar BRT**, currently the only example of its kind in Pakistan. In this model, buses operate along key origin-destination routes and continue seamlessly onto the BRT corridor. Instead of transferring passengers, the buses themselves transition onto the corridor, reducing transfer penalties and improving convenience.
To summarize:

- **Rawalpindi-Islamabad Metro** is a first-generation BRT.
- **Lahore and Multan** operate second-generation BRTs with feeder systems (e.g., Speedo buses).
- **Peshawar BRT** represents a third-generation BRT.
- **Karachi's Green Line** is a first-generation system, while the upcoming **Red and Yellow Lines** are planned as third-generation BRTs.

When the Rawalpindi-Islamabad Metro was originally planned, its objective was not to cover the entire city. Earlier studies proposed multiple corridors—standard practice in BRT planning—but only one was implemented, and no subsequent corridor expansion has occurred.
However, recent developments show promise. A feasibility study has proposed adding feeder routes to expand coverage. So far, **10 feeder routes** have been proposed, and buses for **6 routes** have been procured for Rawalpindi BRT. This will allow the system to draw passengers from more areas, increasing coverage and potentially boosting ridership, which currently stands around **90,000 to 100,000 passengers per day**, served by approximately **64 buses**.
So, in direct response to your question: No, the Rawalpindi-Islamabad Metro is not yet fully connected to the broader urban transport network, but steps are now being taken to address this gap.

Interviewer: As you mentioned, the Islamabad-Rawalpindi Metro is a first-generation BRT. Given that, do you think it has an impact on socioeconomic equity?

Interviewee: Yes, the system is serving the public. The fundamental purpose of any public transport system is to provide safe, efficient, and comfortable mobility for all. In that regard, the Islamabad-Rawalpindi Metro is fulfilling its role to a reasonable extent.
There is ongoing debate regarding the fare policy. As professionals in the field, we believe the current flat fare of 30 rupees, recently increased from 20 rupees, is still quite affordable, especially when compared to other modes of transport. For instance, traveling from Saddar to Islamabad using a motorcycle, Hiace, or rickshaw would cost significantly more and take longer.
Although the government incurs a substantial subsidy to maintain this fare, it appears to be a deliberate policy decision to ensure accessibility and affordability for the public. From that perspective, yes—the system contributes positively to socioeconomic equity by offering a low-cost transport option to a broad segment of the population.
In fact, I conducted a survey which supports this view, indicating that the fare is generally perceived as reasonable and beneficial by the users.

Interviewer: We spoke to several metro passengers, and many of them expressed that there should be fare subsidies for students, people with disabilities, and the elderly. What is your opinion—should such groups receive subsidized fares?

Interviewee: As a technical professional, I have a slightly different perspective on fare subsidies. The government is already subsidizing the metro system as a whole. To put this into context: if the fare charged per passenger is 30 rupees, the actual cost of transporting that passenger is around 100 rupees. This means the government is already covering the remaining 70 rupees through taxpayer money.

Now, if additional subsidies are introduced specifically for students, elderly individuals, or persons with disabilities, the cost per passenger for these groups could drop to as low as 2.5 to 3.5 rupees. While this may not significantly affect the government financially, given its capacity to absorb such costs, the implementation and misuse of these privileges are often problematic in our society.

For instance, student or elderly passes are frequently misused. A student pass might be used by a family member who isn't eligible, or an elderly pass might be used by someone else during the day. These practices undermine the intended benefits.

Moreover, while fare subsidies for these groups may look good politically and have public appeal, from a **technical and operational perspective**, they do not necessarily support the system's sustainability. For example, many students can easily afford 30 rupees for other non-essential expenses like cigarettes, but hesitate to spend the same on transport. Therefore, although such subsidies are well-intentioned and politically popular, we, from a technical standpoint, do not advocate for them in the current context.

Interviewer: In your opinion, does operating as a first-generation BRT in Islamabad and Rawalpindi limit its contribution to socioeconomic equity? Or should the government consider upgrading it to a third-generation BRT to enhance its impact?

Interviewee: Currently, I believe that upgrading to a third-generation BRT would be challenging for technical reasons. Most of the existing corridor, particularly the Rawalpindi section, is elevated. Converting it to a third-generation system is not as simple as just connecting a feeder line or making minor adjustments. These systems are usually planned as third-generation from the outset, and retrofitting an existing elevated corridor presents significant limitations. Such a conversion would require substantial modifications—possibly at a scale that isn't necessary or cost-effective at this stage. Therefore, in the current scenario, transitioning the system to a second-generation BRT, with the addition of feeder services, seems more practical and achievable.

However, for any future corridors in Rawalpindi or Islamabad, the planning should be geared toward a third-generation BRT—or even more advanced models—right from the start.

Interviewer: As a technical consultant, what do you think should be the key performance indicators (KPIs) to measure the service quality and its impact on socio economic equity? Which indicators would you recommend using?

Interviewee: Once a BRT system is implemented, it is common for the government to hire a third party to operate the system, as is the case with most mass transit systems globally. When this third party is hired, they are typically bound by specific key performance indicators (KPIs) and service level agreements (SLAs).

These contracts are usually output-based, meaning the third party is required to meet certain operational standards in exchange for payment. For example, the contract might stipulate that the buses must operate from 6 AM to 10 PM, be kept clean, undergo daily washing, stop at every station, and ensure drivers wear uniforms. Payments are made based on factors like distance traveled, fuel consumption, and driver salaries.

However, in this model, the government cannot mandate the third party to maintain specific socio-economic indicators. While issues such as driver misconduct, harassment, or cleanliness may arise, these are not typically addressed in the operational contract, as the focus is on performance metrics like efficiency and service delivery, not socio-economic factors.

In systems like ours, BRT operations are typically governed by output-based KPIs. These include maintaining bus frequency (headways), adhering to speed limits, ensuring cleanliness, punctuality, and passenger satisfaction. If the operator fails to meet these standards, penalties apply. However, **affordability and accessibility are not part of the operator's KPIs**. Since operations are managed by a

third party under a **risk-free contract**, the operator is not responsible for ridership or fare levels. Whether the government sets the fare at Rs. 5 or Rs. 500, or whether 100 or 100,000 people ride daily, the **financial and social risks lie with the government**, not the operator.

Currently, all BRT systems in Pakistan follow this **risk-free model**, where the operator is paid based on defined outputs, such as operating 64 buses from 6 AM to 10 PM at 5-minute intervals, maintaining vehicle condition, and ensuring safety. Socio-economic indicators, like affordability and catchment area planning, are **entirely the government's responsibility**. The operator's role is limited to service delivery.

Interviewer: What possible improvements can be made in the existing BRT system of Rawalpindi and Islamabad?

Interviewee: One of the key areas where the existing BRT system in Rawalpindi and Islamabad can be improved is universal accessibility. So far, the system has not been fully designed to cater to the needs of people with disabilities, whether they are visually impaired, physically disabled, or have hearing impairments. In modern public transport systems, there are specific design features such as tactile tiles that help guide the visually impaired to platforms, walkways, and ticket counters. Similarly, messaging systems and audio announcements assist those with hearing or visual challenges. For physically disabled passengers, the reliance on elevators and escalators is not ideal, especially since these often fail or are out of service in open environments. In comparison, systems like the Peshawar BRT have incorporated ramps in many places, which, despite some limitations, are a more reliable and inclusive solution for wheelchair users.

Another area for improvement is social inclusion, especially in terms of how passenger compartments are divided. In the Rawalpindi-Islamabad BRT, the front section is reserved for women and the rear for men. While this is done with safety in mind, it can be socially restrictive. For instance, families or couples who want to travel together are forced to separate. A more thoughtful design was implemented in Karachi's Greenline BRT, where the front section is reserved for women, the middle for families, and the rear for men. This layout allows people to travel together respectfully, which is especially important during long commutes. It gives passengers the space to interact, especially those traveling with children or as couples, and promotes a more inclusive travel experience.

Additionally, the system should begin to consider the inclusion of other marginalized groups such as transgender individuals. Public transport should aim to serve every segment of society equally, and that means creating a mutually inclusive environment where everyone feels safe, respected, and represented. These considerations are essential if we are to make our transit systems truly accessible and socially equitable.

Interviewer: What are the major loopholes in the existing BRT system of Islamabad and Rawalpindi and how do you think it is hindering its impact on socio-economic equity?

Interviewee: Honestly speaking, this is a very opinion-based question. From a technical standpoint, I can comment on a few aspects, although I don't think we have the complete purview. However, expanding the network and bringing more people into the system through a well-connected feeder network would definitely help the cause. Similarly, constructing new corridors and ensuring their integration with the existing ones would significantly enhance the overall effectiveness of the network. Beyond that, I believe the system is performing quite well.

3-Interview With Security Guard at G-13 Metro Station, Islamabad on role of BRT in promoting Scoio-economic Equity

Date: April 15, 2025

Location: In person

Interviewee Name & Role: Security Guard, G-13 Metro Bus Station.

Interviewer: How do you assess the coverage of the BRT network in Islamabad? Is it covering the underserved areas?

Interviewee: The BRT network is working well overall, but it does not cover all underserved areas. There are still many places where people need the service but don't have access to it. Some stations, like the one in F-5, are not really necessary, while areas with more need are being ignored. there are some

stations built in well-developed areas like F-5 where people already have other transport options. Meanwhile, poorer or more remote areas still lack BRT access, which should be the priority.
Interviewer: Is the fare distribution in BRT fair? Is it justified that both the high and low-income individuals are paying the same amount?

Interviewee: No, it's not fair. Both rich and poor pay the same fare, but for someone like me earning under 25,000, it's a bigger burden. There should be some sort of subsidy or discount for low-income passengers.

Interviewer: Does the government do any bi-annual assessment or evaluation of the BRT project to analyse if it's fulfilling the objectives?
Interviewee: As far as I know, there's no regular evaluation. Many problems, like broken elevators and escalators, go unrepaired for long periods. It seems like no one is checking the system properly to ensure it's running well.

Interviewer: In your opinion, what is the major problem that BRT is facing in Islamabad and Rawalpindi, and how do you think the public sector can address it?
Interviewee: The main issues are poor maintenance and lack of attention to the workers. Elevators and escalators often don't work and are never repaired. Also, staff like security guards are underpaid. The government should improve the system's upkeep and provide better pay and subsidies for the people who rely on and run the service.

4-Interview with a NUST Student on How Effective RWP-ISB BRT in Promoting Socio-economic Equity
Date: April 15, 2025
Location: In person
Interviewee Name & Role: Sidrah, Faiz Ahmed Faiz Metro Bus Station.
Interviewer: How do you assess the coverage of the BRT network in Islamabad? Is it adequately serving the underserved areas?
Interviewee: The BRT network is still not adequately covering the underserved areas. Several regions remain without direct access to metro stations, which makes commuting quite costly for students, in particular. For instance, universities such as Comsats, along with various other areas in Islamabad and Rawalpindi, are not accessible via the Metro. Therefore, there is a significant need to expand the BRT system by establishing more stations in these regions.

Interviewer: Is the fare distribution of the BRT justifiable?
Interviewee: Yes, the fare distribution is justifiable. The standard ticket price of 30 rupees is very affordable for students as well as for individuals from both high- and low-income backgrounds. However, an issue arises when passengers are required to change stations at Phase 8 or Phase 9 and purchase a new ticket. This results in additional costs, which could become burdensome. It would be beneficial if this aspect of the system were improved.

Interviewer: What key performance indicators (KPIs) might be used to measure the service quality of the BRT?
Interviewee: The service quality should be measured through indicators such as inclusivity, safety, and security. Additionally, the functionality of supportive infrastructure—such as electric stairs and elevators—is crucial. These facilities are installed to assist passengers, and ensuring they are consistently operational would reflect positively on service quality.

Interviewer: Does the government engage in any buy-in regarding the BRT system?
Interviewee: (Interviewee did not provide a specific response to this question.)
Interviewer: What are the major problems the BRT is facing in Islamabad?

Interviewee: The primary issue is poor maintenance. Despite being a regular user of the BRT, I have noticed that at many stations, electric stairs are non-functional, elevators are often out of service, and buses do not arrive at regular intervals. It is essential that the authorities prioritize maintenance. Furthermore, there is a pressing need to expand the BRT system to ensure broader coverage across Islamabad and Rawalpindi.

5-Interview with a Academia Expert on How Effective RWP-ISB BRT in Promoting Socio-economic Equity
Date: April 24, 2025
Location: Virtual
Interviewee Name & Role: Dr. Abid Rehman, PIDE
Interviewer: How do you assess the coverage of the BRT network in Islamabad and Rawalpindi? Are the stations serving underserved areas? Are they located in the right places?
Interviewee: In Islamabad, accessibility has improved significantly. The metro was initially a challenge due to the lack of first and last mile connectivity. For instance, a person coming from Rawalpindi would often need to pay Rs. 500 for a rickshaw in addition to the Rs. 30 fare for the metro. This was due to the lack of access to dedicated routes to the metro stations.
However, in Islamabad, the CDA has significantly improved feeder routes. The Blue, Green, and Pink buses have made it easier to connect to the metro. In the last 3-4 years, accessibility and affordability have improved. For example, a person can now travel from Barimand to G-11 for just Rs. 50, and it has expanded further up to Tarnol.
In Rawalpindi, the situation is different. People still face issues like high rickshaw fares, particularly in the Chinchiwala area, which makes affordability a concern.
Interviewer: You mentioned the Green and Pink buses in Islamabad. Can they be considered feeder routes? Also, can we integrate BRT with other transport modes like rickshaws or HiAces?

Interviewee: The Green and Pink buses in Islamabad were not specifically designed as feeder routes to the metro, but they do help in improving overall accessibility to the BRT system. The metro itself is an intercity service, while these buses cater to more local areas.
As for integrating the BRT with existing transport modes like rickshaws and HiAces, it's a good option, but it requires regulation. Currently, private vehicles like rickshaws have no standardized fare structure, and they tend to exploit passengers by charging higher rates. For integration to work, the government needs to regulate pricing and ensure compliance. Additionally, providing proper parking facilities at metro stations could encourage people to use the metro, making it more accessible.
Interviewer: What about affordability? The fare for the metro has increased to Rs. 30. Do you think this is justified, especially since there are no subsidies for students, the elderly, or the disabled?

Interviewee: The metro fare is already subsidized by the government, which helps keep it affordable for the general public. However, for specific groups such as students, the elderly, and the disabled, offering discounted fares is a good idea. While the general population can afford Rs. 30, the cost could be burdensome for low-income groups, and that's where subsidies could help.
Interviewer: How do you think the BRT system has contributed to improving access to essential services like education, healthcare, and employment?

Interviewee: The BRT system, especially in areas like Blue Area, has improved access to commercial hubs, healthcare, and educational facilities. However, the first mile connectivity remains a challenge. While people can reach these central business districts or hospitals via the metro, the real issue is getting to the metro stations in the first place. If that is addressed, it would enhance accessibility to key services.
Interviewer: What infrastructure improvements can be made to improve accessibility?
Interviewee: To enhance accessibility, the government could invest in carpooling and ride-and-share options. Additionally, providing secure parking at metro stations would encourage more people to use

the metro. There could also be revenue generation models, such as parking fees or advertising, to sustain the system. These improvements could address some of the existing connectivity challenges.
Interviewer: Is the existing metro bus system inclusive, especially for people with disabilities, transgender individuals, and the elderly?

Interviewee: The system has some basic facilities, like elevators and escalators, but many of them don't work. The metro lacks the comprehensive inclusivity seen in other systems, such as in Peshawar's third-generation BRT, where ramps and wheelchair accessibility are provided. Moreover, the system doesn't fully cater to the needs of transgender individuals or the elderly, who often face challenges in finding seating or using the facilities.
Interviewer: What do you think about the gender segregation in metro stations and buses? Does it hinder social inclusion?

Interviewee: Gender segregation in metro stations and buses is a culturally sensitive issue. In some cases, it might be necessary due to societal norms and safety concerns. However, it does create challenges, particularly for families traveling together. Ideally, the system should allow families to travel together without segregation, but societal acceptance of such changes will take time. This shift toward more inclusive systems is part of broader social development, though it might take decades to fully integrate.

Interviewer: What do you think are the main financial and operational challenges facing the BRT system in Pakistan?
Interviewee: The biggest challenge is maintenance. Public infrastructure in Pakistan suffers from poor maintenance, which can result in systems falling into disrepair. The provision cost is high, but maintaining these services is often neglected. For the BRT system to last 20-30 years, proper maintenance is essential. Additionally, while the government funds the system, it struggles with revenue generation. Metro systems in other countries, like in the UK, generate revenue through ads and other means, something Pakistan could also adopt.
Appendix E: Indicators used for Socio economic equity

S.No	Variable	Indicator	Measure
1-	Accessibility	• Geographic distribution/ coverage of transport services. • Proximity of transport hubs to low-income areas. • Availability of services for marginalized groups. • Travel time	• Mapping of transport routes and stops. • Distance measurement from key neighborhoods. • User surveys on service accessibility.
2-	Affordability	• Fare levels compared to average incomes. • Availability of subsidies for low-income drivers. • Equitable distribution of buses in low income versus high income areas. • Cost	• Participant interviews discussing fare impacts. • Analysis of subsidy policy and usage.
3-	Service Quality	• Frequency and reliability of service. • Safety perceptions among users. • Cleanliness and comfort of users. • Safety	• Observation of service schedules. • User surveys evaluate comfort and satisfaction.
4-	Social Inclusion	• Perception of inclusion among diverse groups. • Participation rates among elderly people, transgender, disabled individuals and women with disabilities.	• Case studies discussing experiences of marginalized groups. • Interviews with underrepresented groups.

5-	Income Distribution	• Income levels of public transport users. • Employment status of users.	• Demographic surveys of public transport users. • Interviews assessing job access.