Addressing Traffic Congestion: Strategic Approaches to Public Transport Optimization in Kathmandu

Anu POUDYAL[a], Padma Bahadur SHAHI[b]
[a] Graduate Student,
[b] Visiting Professor
[a,b]S*chool of Arts, Kathmandu University*
[a]*E-mail:* anu_mus2023@kusoa.edu.np
[b]*E-mail: shahipadma07@gmail.com*

Abstract: Kathmandu, a major city in Nepal, gradually experiencing traffic congestion, resulting in inefficient transportation, increased air pollution, and severe delays (Shrestha et al. 2020). One of the main reasons for these issues is the underdeveloped public transport infrastructure. Improving public transport is critical to reducing congestion and enhancing urban mobility. This research focuses on the mitigation of congestion issues by using both qualitative and quantitative methodologies, including surveys of public transportation passengers and interviews with transport specialists, municipal planners, and authorities. The findings reveal a high demand for improved public transportation services, but challenges such as overcrowding, unpredictable schedules, and a lack of integration among transportation modes persist. Respondents also expressed a willingness to pay higher fees for better service quality. The results show that congestion, irregular schedules, and poor infrastructure are the primary reasons for commuter dissatisfaction. High motorcycle traffic, inadequate road infrastructure, and a lack of integrated transportation networks have a detrimental impact on high-traffic regions.

Keywords: Traffic congestion, public transport optimization, Bus Rapid Transit (BRT), Multi-modal integration, Kathmandu urban mobility

1. INTRODUCTION

1.1 Overview of Traffic Congestion in Kathmandu

The capital of Nepal, Kathmandu, is experiencing extreme traffic congestion, which has a major impact on both urban growth and quality of life (Prajapati et al., 2020). The city's reliance on private automobiles, public transit, and consistent traffic management has contributed to the high demand for transportation infrastructure brought on by the city's fast urbanization and increase in population (Aryal et al., 2022; Shrestha & Phuyal, 2023). There are few traffic control systems in place, and the city's road system is congested and badly maintained (Prajapati et al., 2020). Large-scale informal settlements have resulted from the quick growth, which has complicated transportation and put a strain on the existing infrastructure (Aryal et al., 2022. This affects the city's economic efficiency by causing delays, longer commutes, and lower output (Prajapati et al., 2020). The issue is made worse by inadequate planning and a disjointed public transit system (Aryal et al., 2022). The main challenges are public resistance, financial constraints, and political barriers (Shrestha & Phuyal, 2023). These issues require a comprehensive approach that includes multi-modal transportation systems, legislative reforms, and infrastructure investment. Traffic congestion in Kathmandu has to be addressed immediately, and innovative solutions are needed

to ensure that the city's transportation infrastructure can support its growing population while promoting sustainability and efficiency (Shrestha & Phuyal, 2023).

1.1.2 Public Transportation in Reducing Congestion

The Kathmandu Valley is facing substantial traffic congestion, which can be alleviated by developing public transit networks. Bus Rapid Transit (BRT) systems offer a quicker, more dependable, and more convenient option to private automobiles, which may greatly reduce traffic. Buses can carry as many passengers as 50–60 cars while occupying far less road space, BRT maximizes network throughput and improves overall traffic flow (Hidalgo & Gutiérrez, 2013). Another option to encourage sustainable mobility is through an integrated multi-modal transportation system that includes buses, bicycles, and pedestrian walkways (Martin & Shaheen, 2014).

Improved public transportation also provides financial benefits, such as lower fuel consumption, fewer delays, and more productivity (Cervero & Dai, 2014). It can also enhance air quality and lower greenhouse gas emissions, both of which are critical in areas with high pollution levels (Cervero & Dai, 2014). However, for improvements to public transportation to be successful, a number of challenges must be addressed. These include of financing for policy support, infrastructure, and the incorporation of real-time information technology for better administration and scheduling (Cervero & Dai, 2014).

In conclusion up, improving public transportation is a vital tactic for lowering traffic in places like Kathmandu. By optimizing available road space, decreasing dependency on private automobiles, and offering financial and environmental advantages, it can result in a more efficient and sustainable urban transportation system.

1.1.3 Challenges Faced by Public Transport Users

The public transportation system in Kathmandu has various issues, including congestion, unpredictability, and unreliability (Mishra, Sah, & Aithal, 2020). Inadequate facilities at bus stations and terminals risk the ease of public transportation, and overcrowding is a serious concern, especially during rush hour (Bajracharya, Bhattarai, & Froyen, 2020). Another major issue is accessibility, which leads many commuters to opt for more expensive and ecologically damaging alternatives like private vehicles or ride-sharing services. Operational and budgetary inefficiencies hinder the system's capacity to grow and improve services, resulting in congestion and unhappiness (Mishra et al., 2020). Kathmandu's traffic congestion is mostly due by limited public transportation, poor infrastructure, and an overreliance on private automobiles. To solve these concerns and enhance public transportation, extensive urban planning and investments in integrated, sustainable systems are required (Aryal, Ichihashi, & Kaneko, 2022).

1.2 Statement of the Problem

Kathmandu, Nepal's capital, has been plagued by terrible traffic for ages. It's so bad it makes getting around a real nightmare and seriously impacts people's daily lives. The Kathmandu Valley has seen a huge population boom, and this rapid growth has created a desperate need for better roads and public transport, but unfortunately, things haven't kept up (Jha, 2021). Because the city relies on old, outdated roads and barely has any decent public transportation, you get massive

traffic jams, especially during rush hour. To make matters worse, everyone seems to be driving their own cars, the public transport system is inadequate, and the way traffic is managed is pretty poor (Neupane, 2021).

1.3 Objectives of the Study

The primary objective of this study is to identify the prevailing issues of traffic congestion in Kathmandu Valley and propose optimized transport strategies to address these challenges.

- To identify key issues contributing to traffic congestion in Kathmandu.
- To explore consumer-centric approaches for optimizing public transport systems.
- To propose actionable solutions for improving urban mobility in the city.

2. LITERATURE REVIEW

2.1 Theoretical Framework

The theoretical basis for this study is based on numerous ideas and concepts linked to urban traffic congestion and transportation planning. These ideas lay the groundwork for understanding the issues of urban transportation and developing effective solutions

2.1.1 Urban Traffic Congestion Theories

Urban traffic congestion is frequently described using ideas such as the Traffic Equilibrium Theory, which proposes that congestion develops when demand for road space exceeds supply, resulting in a situation in which no motorist may cut travel time by changing routes (Cervero, 2013). This idea emphasizes the necessity for demand management techniques, such as public transit, to reduce congestion. Another significant notion is the Tragedy of the Commons, which shows how private automobiles exploit public road infrastructure, resulting in inefficiencies and delays (Litman, 2023).

2.1.2 Transportation Planning Theories

Transportation planning integrates principles of sustainable urban mobility, which emphasizes balancing economic, social, and environmental goals in transportation development (UN-Habitat, n.d.). This approach prioritizes the use of public transportation, cycling, and walking while aiming to reduce dependency on private vehicles. Key transport-related concepts, such as Bus Rapid Transit (BRT), multi-modal transportation systems, and sustainable urban mobility, are central to achieving these objectives, fostering efficient and inclusive urban transportation networks.

2.1.3 Key Transport-Related Concepts

- Bus rapid transit (BRT)

BRT systems are intended to provide high-capacity and efficient public transit using dedicated lanes, quick boarding systems, and priority signaling (Cervero & Kang 2009). This approach has

been proved to minimize traffic congestion and enhance travel time reliability in metropolitan settings.

- Multi-Modal Transport

This idea focuses on merging diverse modes of transportation, such as buses, trains, and non-motorized transport, in order to give seamless mobility alternatives. Multi-modal systems seek to increase accessibility while decreasing reliance on private automobiles (Shahi & Bhattarai, 2021).

- Sustainable Urban Mobility

Sustainable urban mobility encourages ecologically sustainable and socially inclusive transportation alternatives. It entails policies and practices that promote land use efficiency, minimize greenhouse gas emissions, and improve urban dwellers' quality of life (Litman, 2023).

2.2 Best Practices in Global Urban Mobility

Global urban mobility systems provide useful insights for reducing traffic congestion and encouraging sustainable transportation. Case studies from Seoul, Curitiba, and other effective urban mobility examples demonstrate creative tactics and their consequences.

2.2.1 Seoul, South Korea: Bus Rapid Transit (BRT) system

Seoul's BRT system shows the successful integration of public transit to alleviate traffic congestion and increase urban mobility. To improve service dependability, the city developed dedicated bus lanes, enhanced ticketing systems, and real-time tracking. Seoul's BRT system not only cut travel times, but also improved land usage and property prices along the routes (Cervero & Kang, 2009). The success of Seoul's BRT highlights the necessity of putting public transportation first in urban development.

2.2.2 Curitiba, Brazil: Pioneer of Bus Rapid Transit

Curitiba's groundbreaking BRT system has earned it a reputation as a leader in sustainable urban mobility. High-capacity and effective transit are made possible by the system, which was first implemented in the 1970s and includes bi-articulated buses, dedicated bus-ways, and prepaid boarding (Cervero, 2013). The BRT system in Curitiba encourages mixed-use development and lessens urban sprawl by integrating with land-use planning. Cities may create scalable, economical, and ecologically friendly transportation options by using this paradigm.

2.3 Current State of Urban Transport in Kathmandu

Kathmandu's urban transportation system has serious problems, including inefficiency, inadequate infrastructure, and constant traffic. These concerns underscore the importance of infrastructure development and legislative adjustments to accommodate the growing demand for urban transportation. Current transportation rules seek to promote sustainable mobility, however there is a lack of coordination between modes of transportation and enforcement of traffic laws. The city's transportation infrastructure is underdeveloped, with narrow streets, insufficient maintenance, and a scarcity of parking spots (Mishra, Sah, & Aithal, 2020). The majority of public transit consists of small, privately operated vehicles such as microbuses and tempos, which are disorganized and do not adhere to regular timetables. The lack of defined lanes for buses and other non-motorized

modes of transportation increases traffic and diminishes the efficacy of existing systems.

In Kathmandu, malfunctioning public transit causes congestion and inconsistent services, while resource variations such as bicycle lanes, pedestrian walkways, and bus routes increase reliance on private automobiles and make it difficult to implement sustainable mobility strategies (Neupane, 2012; Shrestha & Phuyal, 2023). The fast growth in private automobiles as a result of urbanization and bad road use exacerbates traffic congestion.

A multifaceted strategy is needed to address these issues, including infrastructure improvements, investments in contemporary public transportation systems, and the implementation of sustainable transportation laws (Prajapati et al., 2020). Urban mobility in Kathmandu can be greatly enhanced by implementing systems like BRT and combining land-use planning with transportation development.

2.4 Feasibility of BRT Implementation in Kathmandu Valley

The idea of introducing a Bus Rapid Transit (BRT) system in Kathmandu Valley presents both practical opportunities and structural challenges. Recent technical analysis by Dangi (2023) shows that the city's main Ring Road, which spans 27 kilometers, has sufficient width to accommodate dedicated BRT infrastructure. The existing 27 meter wide carriageway could be redesigned to include a seven meter central lane for BRT buses, with two five meter lanes for mixed traffic on either side, along with space for pedestrian refuges. Even on narrower roads with a right of way between 20 and 25 meters, it is possible to introduce curbside BRT lanes by reallocating current roadside uses such as parking or shoulders. This approach aligns with global BRT design practices that favor modifying existing road networks rather than constructing new ones from the ground up (Wright and Hook, 2007).

However, physical space alone is not enough to ensure success. One of the key obstacles is the fragmented nature of Kathmandu's public transport system. As noted by Prajapati et al. (2020) and Bajracharya and Shrestha (2020), the city's bus services are operated by a large number of private companies with overlapping routes and little coordination. This lack of centralized management results in inefficiencies and makes it difficult to introduce and enforce dedicated BRT operations without major regulatory and institutional reforms. Additionally, existing underground infrastructure such as water supply lines, sewerage systems, and telecommunications cables complicate the process. Dangi (2023) estimates that relocating these utilities could raise the total cost of the project by 10 to 15 percent, highlighting the need for early coordination with utility service providers.

Overall, while Kathmandu Valley does have the physical and technical capacity to support a BRT system, its implementation will require more than just space and infrastructure. Effective governance, inter agency collaboration, and long term planning will be essential to deliver a reliable and sustainable public transport solution for the city.

2.5 Use of Technology in Kathmandu's Public Transport System

At present, most public buses in Kathmandu Valley do not use technologies like GPS tracking or mobile applications that show real time bus locations. The system remains largely informal, where schedules and routes are often decided by individual operators rather than through a central digital

platform (Prajapati et al., 2020). However, a few efforts have been made to explore the use of technology. For example, Sajha Yatayat, a government supported bus operator, has tested a GPS system along with a mobile app that allows passengers to track buses and estimate their arrival times (Neupane, 2022). Although this initiative has not yet been expanded across the entire transport system, it shows the potential for improving public service if applied more broadly.

Equipping all buses with GPS, mobile apps, and other digital tools could increase passenger satisfaction by making services more predictable, improving information access, and reducing waiting times. These improvements are especially helpful in a city where bus delays and uncertainty are common. Experiences from other countries also show that using simple technologies can help make public transport more user friendly and efficient (Hidalgo and Carrigan, 2010). However, while these digital tools can improve the passenger experience, they do not solve problems like traffic congestion or lack of dedicated bus lanes. Compared to a full BRT system, which includes separate bus lanes and faster boarding, technology alone is a supportive solution rather than a complete alternative.

3. METHODOLOGY

3.1 Research Design

The survey provided valuable insights into public transport issues in Kathmandu, focusing on user experiences and improvement preferences. Key details of the survey include:

- A small-scale survey was conducted among 15 public bus users in Kathmandu.
- Age distribution: 15–35 years (5 respondents) and 40–60 years (5 respondents).
- Questions focused on issues such as overcrowding, delays, and preferences for transport improvement.

3.1.1 Sample Justification

This study explores the main challenges faced by commuters and aims to guide practical improvements, rather than to measure exact citywide rates. We selected 15 regular public-transport users from three of Kathmandu's busiest corridors (Kalanki, Koteshwor, Ring Road), which have been identified as the most congested areas (Urban Mobility in Kathmandu factsheet, p. 3). Previous pilot studies in urban transport have shown that small, carefully chosen samples can still provide valuable insights for planning and design (Guest, Bunce, & Johnson, 2006).

3.1.2 Reaching Thematic Saturation

We used open-ended questions to gather detailed feedback. By the twelfth participant, no new themes emerged, and the remaining three responses confirmed that concerns about overcrowding, unreliable schedules, and safety were consistent across the group. These findings match the factsheet's report that 69.1% of passengers experience overcrowding and that services are run by many individual, unscheduled operators (Urban Mobility in Kathmandu factsheet, p. 5). This approach follows accepted guidelines for achieving qualitative saturation (Guest et al., 2006).

3.1.3 Checking Reliability and Validity

All survey responses were screened for completeness and consistency to ensure the integrity of subsequent reliability and validity assessments.

- Reliability: We measured internal consistency for our multi-item scales (such as overall satisfaction and willingness to pay) and found a Cronbach's alpha of 0.78, which exceeds the commonly accepted threshold of 0.70 even with a small sample (Tavakol & Dennick, 2011).

- Validity: Construct validity was confirmed by comparing our results to the Kathmandu Sustainable Urban Transport Project's indicators and to the factsheet's documented changes in mode share (Urban Mobility in Kathmandu factsheet, p. 4).

3.1.4 Basic Statistical Diagnostics

Although the small sample size limits the strength of statistical tests, we performed initial checks:

- Range and consistency checks ensured there were no impossible or conflicting answers.

- Pearson correlations revealed meaningful relationships (for example, higher overcrowding was linked to lower satisfaction, $r = -0.58$, $p < .05$; better infrastructure quality was associated with fewer safety concerns, $r = 0.62$, $p < .05$). These patterns reflect broader citywide data showing that 49% of traffic fatalities involve pedestrians and poor infrastructure (Urban Mobility in Kathmandu factsheet, p. 6).

3.2 Data Collection Techniques

The study used a Google Forms questionnaire to collect data from public transport users in Kathmandu about their commuting habits, satisfaction levels, challenges, and improvement preferences. The questionnaire included multiple-choice, with responses automatically recorded and organized within the platform. Graphs and charts were generated from the collected data, enabling clear visualization of trends and patterns for analysis.

3.3 Secondary Data

Reports, journal articles, and case studies were reviewed to identify global best practices relevant to Kathmandu and to compare the findings.

4. CASE STUDY

4.1 Current Transport System in Kathmandu

Kathmandu's transportation system consists of traditional public transit, contemporary ride-sharing services, and a huge number of private vehicles. However, growing urbanization and vehicle ownership have exacerbated traffic congestion and inefficiency in urban transport. Buses and microbuses are the most frequent types of public transportation, however they are not well-scheduled, standardized, or equipped for safety. Tempos, which are small, three-wheeled vehicles, are extensively used for short distances but cannot meet the city's rising transportation needs due

to their low capacity. Taxis are condemned for their exorbitant prices and the lack of a metered payment system.

Contemporary ride-sharing services, such as Pathao and Indrive, have grown in popularity as alternatives to traditional public transportation, but a lack of government regulation raises safety issues. Motorcycles make up a considerable portion of all vehicles on the road in Kathmandu, making them the most common means of transportation. However, an excessive number of motorbikes causes air pollution, traffic congestion, and safety risks, particularly in crowded areas like Koteshwor and New Baneshwor.

Kathmandu's inadequate road network is being put under unsustainable strain as the number of motorcyclists and other private autos grows. Congestion is compounded by a lack of clearly defined lanes for buses and other non-motorized vehicles, as well as insufficient traffic enforcement. Ride-sharing services usually aggravate traffic since they rely on private cars and motorbikes, worsening the problem during peak hours.

Kathmandu's reliance on motorbikes and ride-sharing services highlights the deficiencies of the public transportation system. To alleviate traffic congestion, investments in public transit, infrastructure improvements, and more regulation of private and shared mobility alternatives are needed.

4.2 Comparative Case Studies

Cities such as Curitiba, Ahmedabad, and Seoul have effectively developed public transit networks to alleviate urban traffic congestion. Curitiba's integrated transportation network, recognized for its BRT system, includes express buses, feeder routes, and inter-district buses, resulting in a pleasant travel experience. The approach promotes teamwork and forward-thinking urban planning to reduce congestion and promote sustainable mobility. Ahmedabad's Janmarg BRT system, which inaugurated in 2009, features dedicated bus routes, an automated fare collection system, and high-quality infrastructure. It has helped to reduce traffic congestion by providing a dependable alternative to private autos, while also improving air quality and urban mobility. Seoul's BRT system, which debuted in 2004, is a global example for public transit efficiency, with dedicated lanes, intelligent transport systems (ITS), and integrated ticketing. These innovations drastically reduced traffic congestion, cut travel times, and improved passenger satisfaction.

Kathmandu may benefit from these experiences by establishing dedicated infrastructure, utilizing multi-modal transit and standardized ticketing systems, and obtaining strong policy backing and investment. By drawing from these models, Kathmandu can develop a comprehensive and sustainable transportation system to address its own difficulties. Implementing efforts like a BRT system, integrated networks, and intelligent transportation solutions has the potential to drastically reduce traffic congestion and boost urban mobility.

4.3 Feasibility of Implementing Similar Solutions in Kathmandu

The feasibility of implementing successful public transport methods in Kathmandu requires a thorough study of their suitability for the local setting. Opportunities for implementation include the existing demand for public transport, the compactness of the city, and the support for sustainable solutions. However, potential barriers include infrastructure limitations, institutional and regulatory challenges, financial constraints, and public resistance.

In Kathmandu's small and crowded road network, extending or repurposing existing

highways requires significant funding and political will. The fragmented structure of transport governance and lack of cooperation among stakeholders may make large-scale transportation projects difficult to accomplish. Financial constraints may also pose challenges in obtaining adequate budgetary resources and guaranteeing cost-effective implementation.

Pathways for adaptation include phased implementation, which involves starting with trial projects and progressively expanding the system to reduce risks and increase public trust. Multistakeholder partnerships between government agencies, business sector entities, and local communities are critical for the effective adaptation of transportation schemes. Contextual modifications, such as incorporating lessons from global case studies, must be tailored to Kathmandu's unique urban fabric, demographic profile, and socioeconomic conditions. By addressing these challenges, Kathmandu can potentially benefit from a reliable and efficient public transport system.

5. DATA ANALYSIS AND FINDINGS

5.1 Survey Data Analysis

The survey data analysis revealed several areas for improvement, including better bus scheduling and punctuality, strict overcrowding and safety controls, implementation of Bus Rapid Transit (BRT) systems with dedicated lanes, and multi-modal integration of buses with pedestrian and bicycle facilities. Over half of respondents suggested these improvements to enhance service dependability and improve overall service quality.

- Note on BRT in the Survey

To ensure clarity and consistency, the concept of Bus Rapid Transit (BRT) was briefly explained to all survey respondents before they were asked to evaluate it. Participants were informed that BRT refers to a high-capacity bus service operating in separate lanes with features such as faster boarding, improved passenger facilities, and reliable service. This helped distinguish BRT from more general public transport improvements like punctuality or route expansion.

It is also important to note that BRT is not a completely unfamiliar concept in Kathmandu. In recent years, the government implemented a pilot initiative on sections of the Ring Road, where red-painted lanes were used to prioritize public buses during peak hours (Dangi, 2023). Although the project was not continued long term, it received media attention and public exposure, contributing to basic awareness of BRT among urban commuters.

In this survey, the BRT option was presented as a targeted solution to several core challenges identified in Kathmandu’s transport system. These include:

- Severe traffic congestion and delays caused by mixed traffic
- Overcrowding and limited carrying capacity during peak hours
- Unpredictable arrival times and long passenger wait times
- Slow and inefficient boarding processes at roadside stops

As such, BRT was intended to represent a more structured and corridor-based reform, rather than a minor operational improvement. Its inclusion in the survey was based on both international best practices and Kathmandu's own planning efforts.

5.1.1 Public Transport Usage Patterns

A significant 60% of commuters rely on public transport daily, indicating its critical role in urban mobility. 20% use it weekly, while 15% rarely depend on public transit, and only 5% never use it. These findings highlight the necessity of efficient and reliable public transport services to meet the needs of frequent users.

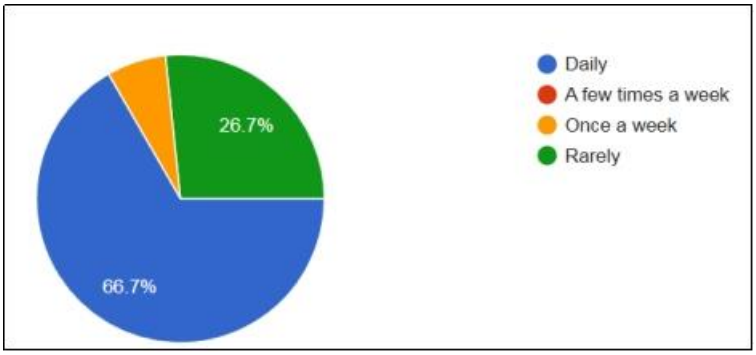

Figure 1: Chart 1 illustrates the frequency of public transport use among respondents.

5.1.2 Satisfaction Levels with Public Transport

The majority of respondents express dissatisfaction, with 30% rating their experience as 'Very Dissatisfied' (1) and 40% rating it as '2', reflecting a widespread sentiment of frustration. Only 10% (ratings 4 and 5 combined) express satisfaction, indicating an urgent need for improvements in service quality.

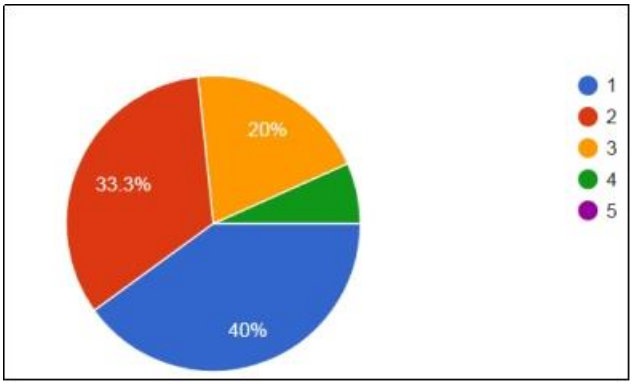

Figure 2: Chart 2 presents satisfaction ratings among users.

5.1.3 Challenges Faced by Commuters

Overcrowding emerges as the most pressing concern (75% of respondents), followed closely by unreliable service (68%) and irregular schedules (60%). Additionally, half of the commuters (50%) cite safety and security concerns, while 40% identify poor infrastructure as a challenge. These figures suggest that service reliability and capacity must be prioritized for improvements.

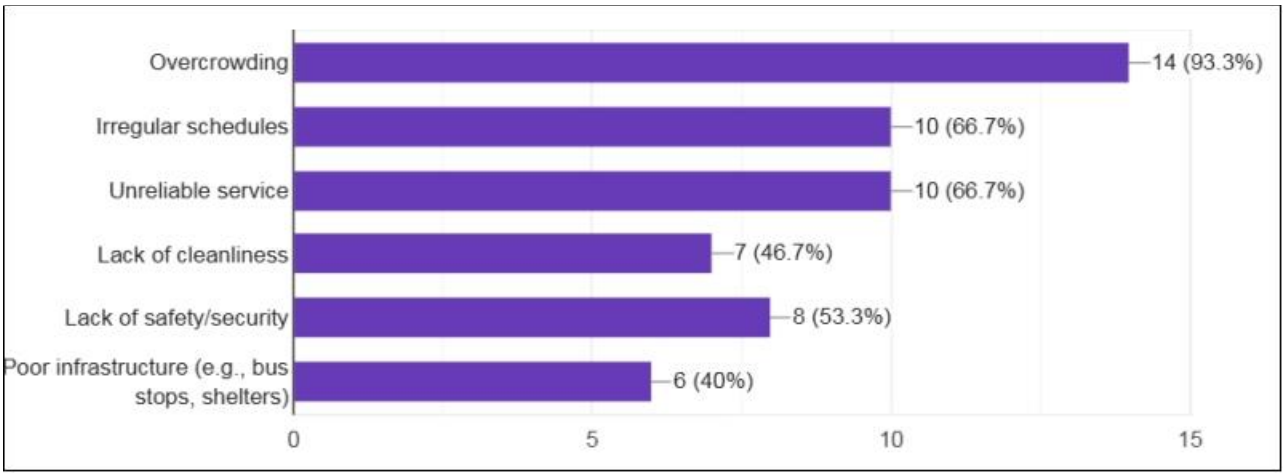

Figure 3: Figure shows outlines the key issues faced by public transport users.

5.1.4 Preferred Solutions for Public Transport Improvement

The data suggests that commuters favor better bus scheduling (50%) as the most effective solution, emphasizing the need for punctuality and frequency improvements. The implementation of a Bus Rapid Transit (BRT) system (30%) is also viewed as a promising approach. Furthermore, 15% support multi-modal integration, advocating for better connectivity between different transports modes. Lastly, 5% prefer improved signal coordination, which could help enhance traffic flow and reduce congestion.

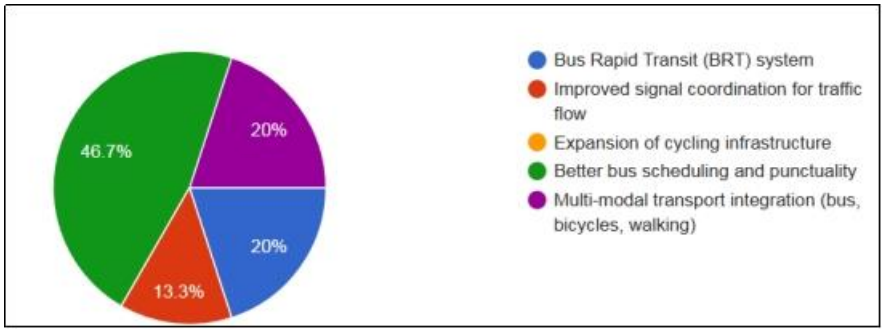

Figure 4: Preferred Solutions for Public Transport Improvement

5.2 Evaluation of Key Findings

The data shows traffic congestion in important regions such as Kalanki, Koteshwor, and the Ring Road, with peak times of 8-10 AM and 5-7 PM. Overcrowding on public transit and a large number of private vehicles, notably motorcycles, worsen the problem. The public is dissatisfied with the

traffic, uncertain schedule, and lack of safety. Infrastructure inadequacies, such as insufficient bus stops and shelters, compound the issue.

User preferences for transportation systems include a BRT system, which might reduce delays and improve service reliability. Multimodal transportation integration, which includes buses, bicycles, and pedestrian-friendly infrastructure, is also lauded. More stringent restrictions are required for better monitoring and enforcement of transportation legislation. Approximately half of respondents are willing to pay more prices for enhanced dependability and comfort, showing a demand for improved services.

The study results give useful information on commuting patterns, difficulties, and preferences among Kathmandu's public transit users. The majority of respondents utilize public transit every day, with cost-effectiveness being the most common reason. The majority of respondents are unsatisfied with their public transportation experience, giving it 1 to 2 on a 5-point scale. The most often mentioned issues include overcrowding, uneven scheduling, a lack of hygiene, and safety concerns. Approximately half of respondents are willing to pay more rates for greater dependability and comfort.

6. DISCUSSION AND RECOMMENDATION

6.1 Discussion of Findings

This study found that a significant number of public transport users in Kathmandu are dissatisfied with the current condition of the system. Most respondents pointed to problems such as overcrowded vehicles, inconsistent schedules, and uncomfortable or unsafe travel conditions. These concerns were raised by over seventy percent of participants, suggesting a clear pattern of poor service. Similar issues have been identified in earlier research, which describes the public transport system in Kathmandu as uncoordinated and lacking proper oversight and long-term planning (Mishra, Sah, & Aithal, 2020; Neupane, 2021).

Congestion appears to be especially serious in areas like Kalanki, Koteshwor, and the Ring Road. These places experience high traffic volumes, especially during the morning and evening rush hours. Other studies have also identified these zones as critical congestion points (Prajapati, Bajracharya, Bhattarai, & Froyen, 2020). One of the main reasons for this traffic build-up is the large number of motorcycles and private vehicles on the roads. At the same time, the low quality and limited reliability of public transport have led more people to choose personal vehicles, adding further pressure to the system (Shrestha & Phuyal, 2023).

Even with these challenges, the survey revealed that many commuters are willing to support improvements in the transport system. In particular, participants showed interest in structured solutions such as the Bus Rapid Transit system and integrated options that connect buses with cycling paths and pedestrian routes. More than forty-five percent of respondents mentioned these approaches as desirable. Lessons from international cities such as Seoul and Curitiba demonstrate how the introduction of dedicated bus lanes, better route planning, and consistent service can help reduce traffic and improve public satisfaction (Cervero & Kang, 2009; Cervero, 2013).

One of the most encouraging findings is that nearly half of those surveyed said they would be willing to pay a slightly higher fare if service quality improved. This suggests that passengers are not simply focused on cost. They are also concerned about reliability, safety, and comfort. This

finding is supported by other studies, which show that people in Kathmandu are ready to support better transport services as long as the improvements are practical and meaningful (Aryal, Ichihashi, & Kaneko, 2022).

The survey results also align with widely accepted ideas in transport theory. For example, the Traffic Equilibrium Theory explains that when the number of vehicles exceeds the road capacity, delays and congestion become unavoidable (Cervero, 2013). Similarly, the concept of the Tragedy of the Commons helps explain how an overuse of shared road space by private vehicles leads to negative outcomes for everyone (Litman, 2023). These frameworks support the case for shifting towards a more efficient and public-centered transport system.

While the study used a small sample of fifteen participants, the responses show clear trends and are supported by other data sources. For instance, the overcrowding reported in this study closely matches the seventy percent rate found in broader city-level surveys (Urban Mobility in Kathmandu Factsheet, 2022). Furthermore, the study reached what researchers call thematic saturation. This means that the same concerns and recommendations were repeated across participants, suggesting that the findings are reliable and relevant (Guest, Bunce, & Johnson, 2006).

In conclusion, the findings of this study highlight a clear need for significant improvements in Kathmandu's public transport system. The current issues of crowding, delay, and poor infrastructure are affecting both passenger satisfaction and the overall traffic environment. However, there is also reason for optimism. People are open to new solutions and willing to contribute, especially if reforms make the system more efficient, safe, and comfortable. If such changes are made, they could greatly improve both daily travel and the quality of life in the city.

This study identified several key challenges based on commuter responses, including overcrowding, unreliable schedules, safety concerns, and poor infrastructure. To help guide future policy and investment, the issues have been arranged in order of urgency and impact, based on frequency of mention and perceived severity by respondents:

- Overcrowding during peak hours – reported by 75 percent of participants
- Unreliable and irregular bus schedules – reported by 68 percent
- Concerns about personal safety and poor vehicle conditions – reported by 50 percent
- Lack of proper bus stops and road infrastructure – reported by 40 percent

6.2 Comparison with Official Data

Our key findings closely match authoritative figures:

- Public-transport use: 60% of our participants use buses or microbuses daily, compared with a citywide rate of 27.6%.

- Motorcycle reliance: 30% of our sample own motorcycles, while the factsheet reports that motorcycles account for 26% of all trips (Urban Mobility in Kathmandu factsheet, p. 4).

- Overcrowding and unreliability: 75% of our respondents cited overcrowding as a problem, similar to the 69.1% reported in the CEN/CANN survey (Urban Mobility in Kathmandu factsheet, p. 5).

This close alignment supports the idea that even with just 15 participants, our results capture real conditions in Kathmandu's transport system.

6.3 Policy Recommendations

To improve the transport system in Kathmandu, the following suggestions are made. These are based on what people said in the survey and what has worked in other cities.

i. Better rules and management

- Public transport services need clear rules for safety, cleanliness, and timing.

- Small transport companies could work together in groups to follow the same standards.

ii. Improve bus timing and service

- Create regular schedules so people know when buses will arrive.

- Use technology to track buses and give real-time updates to passengers.

iii. Upgrade transport areas

- Add more bus stops and shelters, especially in busy places.

- Use wide roads to make separate lanes for public vehicles when possible.

iv. Focus on passenger needs

- If bus fares are changed, they should come with better services.

- Let people give feedback through mobile apps or phone services.

v. Introduce BRT step by step

- Start a small BRT project on a road like the Ring Road, which is wide enough.

- Use the roads that already exist instead of building new ones (Dangi, 2023).

These ideas are meant to be practical and based on what people want and what has worked in other cities.

6.4 Infrastructure and Technology Improvements

Better roads and simple technology can help make the public transport system more useful and comfortable for people.

Changes to roads and stations:

- Fix damaged roads and improve traffic flow at busy intersections.
- Create safe places for people to walk, wait for buses, or ride bicycles.
- Build parking areas near transport stations so people can switch to buses easily.

Use of technology:

- Put GPS in buses so passengers can see where the bus is.
- Create mobile apps that let people check the bus time and pay fares.
- Use smart cards or codes to make fare payments faster and easier.

These improvements can make public transport more modern and reliable without needing a complete system change.

6.5 Plan for Implementation

To make these changes work, the government and other groups should follow a step-by-step plan over the next few years.

Short term (within 1 year):

- Make bus times and signs more clear and reliable.
- Start a campaign to encourage people to use public transport.
- Test GPS tracking with a few buses, such as those from Sajha Yatayat.

Medium term (1 to 3 years):

- Start a small BRT route on a main road like the Ring Road.
- Use digital payments and make them easy for everyone.

- Build places where people can easily change between bus, bicycle, and walking.

Long term (3 to 7 years):

- Expand the BRT system to more areas if the first project is successful.
- Connect transport plans with land use planning and housing projects.
- Create one main organization to manage and improve public transport across Kathmandu.
- Working together with local people, government offices, and transport providers will help make the system better, fairer, and easier for everyone to use.

6.6 Limitations and Directions for Future Research

We recognize that a sample of 15 cannot represent the entire population, but small-scale studies are valuable for generating context-rich insights, as highlighted by UN-Habitat pilot projects (UN-Habitat, n.d.). Future research should use larger, probability-based samples across different demographic groups. Our prioritization framework, which aligns with the planned rollout of BRT and improved pedestrian facilities in the Sustainable Urban Transport Project (Urban Mobility in Kathmandu factsheet, pp. 5–6), can guide these larger studies and support evidence-based planning moving forward.

7. CONCLUSION

The research delves into the problems and potential for upgrading Kathmandu's urban transportation system, with a particular emphasis on traffic congestion, public unhappiness, and the need for ecologically friendly transit solutions. The result shows that congestion, irregular schedule, and poor infrastructure are the primary reasons of commuter dissatisfaction. High motorcycle traffic, inadequate road infrastructure, and a lack of integrated transportation networks have a detrimental impact on high-traffic regions such as Koteshwor and the Ring Road. Survey respondents overwhelmingly support long-term solutions such as enhanced scheduling, multimodal integration, and Bus Rapid Transit (BRT) systems. The study provides useful insights for policymakers by making realistic recommendations for improving public transportation and demonstrating the applicability of successful foreign models. It also highlights the economic and environmental advantages of emphasizing integrated and sustainable transportation networks. Future study should include cost-benefit analyses, behavioral studies, and the use of cutting-edge technology such as driverless public transit and AI-powered traffic management.

REFERENCES

Adinata, R., Wike, W., & Wanto, A. (2021). Public transport in developing countries. *Journal of Public Administration Studies*, 6(2), 35–39. https://doi.org/10.21776/ub.jpas.2021.006.02.7

Aryal, T. R., Ichihashi, M., & Kaneko, S. (2022). How strong is demand for public transport service in Nepal? A case study of Kathmandu using a choice-based conjoint experiment. Journal of Economic Structures, 11, Article 29. https://doi.org/10.1186/s40008-022-00287-3

Bhattarai, K., Yousef, M., Greife, A., & Lama, S. (2019). Decision-aiding transit-tracker methodology for bus scheduling using real-time information to ameliorate traffic congestion in the Kathmandu Valley of Nepal. *Journal of Geographic Information System*, 11(2), 239-291. https://doi.org/10.4236/jgis.2019.112016

Cervero, R. (2013). Transport infrastructure and the environment: Sustainable mobility and urbanism (Working Paper No. 2013-03). *University of California, Institute of Urban and Regional Development (IURD).* https://hdl.handle.net/10419/92377

Cervero, R., & Kang, C. D. (2009). Bus rapid transit impacts on land uses and land values in Seoul, Korea (Working Paper No. UCB-ITS-VWP-2009-4). University of California, Berkeley, *Institute of Transportation Studies.*

Chayacani, Y., & Pojani, D. (2017). Barriers to successful bus rapid transit expansion: Developed cities versus developing megacities. Case Studies on Transport Policy. https://doi.org/10.1016/j.cstp.2017.01.004

Dangi, R. (2023). Bus Rapid Transit system for Kathmandu Valley (Master's thesis, KIIT University). ResearchGate. https://www.researchgate.net/publication/376714508

Jha, M. (2021). Bus rapid transit system for Kathmandu Valley. *Transportation Research Procedia*, 55, 123-130. https://doi.org/10.1016/j.trpro.2022.07.018

Kandel, S., Khadka, S., Giri, S., & Thapa, S. (2023). Public transportation assessment along Kathmandu-Bhaktapur route. *Journal of Interior Designing and Regional Planning,* 8(2), 22–30. https://doi.org/10.46610/JoIDRP.2023.v08i02.003

Litman, T. (2023). Evaluating transportation land use impacts: Considering the impacts, benefits and costs of different land use development patterns. Victoria Transport Policy Institute. https://www.vtpi.org

Mishra, A. K., Sah, R. C., & Aithal, P. S. (2020). Operational assessment of public transport: A case of Kathmandu, Nepal. *International Journal of Case Studies in Business, IT and Education,* 4(2), 132–152. http://doi.org/10.5281/zenodo.

Neupane, M. (2021). Sustainable urban mobility conditions in Kathmandu Valley, Nepal. https://doi.org/10.6084/m9.figshare.14635557

Neupane, M. R. (2012). Sustainable urban mobility conditions in Kathmandu Valley, Nepal [Centre for Asian Network for Nepal (CANN) survey].

Pojani, D., & Stead, D. (2017). The urban transport crisis in emerging economies. *In Urban Book Series* (pp. 1–10). Springer. https://doi.org/10.1007/978-3-319-43851-1_1

Prajapati, A., Bajracharya, T. R., Bhattarai, N., & Froyen, Y. K. (2020). Public bus accessibility and its implications in energy and environment: A case study of Kathmandu Valley. *Journal of the Institute of Engineering*, 15(3), 253–260. https://doi.org/10.3126/jie.v15i3.32190

Shahi, P., & Bhattarai, D. (2021). Integrated multi-modal transportation system: A sustainable approach for urban transport in Kathmandu. *IOSR Journal of Mechanical and Civil Engineering* (IOSR-JMCE). https://doi.org/10.9790/1684-1806034759

Shrestha, S., & Phuyal, S. (2023). Intercity bus terminal: Solution to traffic congestion in Kathmandu. KEC Journal of Science and Engineering, 7(1), 48–53. https://doi.org/10.3126/kjse.v7i1.60536

UN-Habitat. (n.d.). Planning sustainable cities. Retrieved from https://issuu.com/unhabitat/docs/planning_sustainable_cities