

**Impact of newly installed city buses on taxi drivers and passengers.**

**Mavericks**

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## **Abstract**

This research looks into how recently established city bus networks are affecting Bhutan's urban transportation dynamics, concentrating on the experiences of both taxi drivers and passengers. Taxi drivers are deeply concerned about how their overall business is being impacted by declining customer volume and earnings. They do not, however, see the need to make significant adjustments to their offerings. Passenger perceptions of the city bus service in Thimphu are generally good, according to survey data, and this is corroborated by statistical metrics that demonstrate consensus on factors like affordability, environmental effect, and decreased dependency on taxis. Policymakers can gain useful insights from the nuanced findings, which highlight the complex interactions between city bus integration and taxi drivers in Bhutan's urban contexts.

**Keywords:** City bus, Taxi driver, Passenger, affordability, traffic congestion.

# **1. Introduction**

## **1.1 Background**

In the context of Thimphu Thromde, the capital city of Bhutan, the escalating population growth has led to increased demand for efficient transportation services. The surge in private vehicles and taxi/cab services, as indicated by the substantial vehicle count and taxi/cab operations, has raised concerns about the sustainability of the current trajectory. In response to these challenges, a new municipal bus system has been introduced, signifying a significant innovation in urban transportation. However, the introduction of such systems poses a theoretical and practical problem – the need to understand how this newly installed city bus system affects both passengers and taxi drivers.

This research seeks to comprehensively explore the intricate connections between the municipal bus system, commuters, and taxi drivers in Thimphu Thromde. By delving into the multifaceted implications of the new city bus system, the study aims to contribute valuable insights for policymakers and urban planners. The approach involves investigating the nuanced effects on these specific stakeholder groups within urban communities, addressing a knowledge gap present in existing literature.

Understanding the dynamics of city bus systems is crucial for informed decision-making, improved transportation services, and sustainable urban development. This study is novel in its focus on the specific impacts on passengers and taxi drivers, providing a more granular understanding of the consequences of the introduced city bus system. The research aims to balance the expansion of public transportation with the maintenance of taxi services, thus contributing to the well-being of both commuters and taxi drivers.

While existing literature offers insights into the broader implications of public transportation, there is a notable gap in understanding the nuanced effects on passengers and taxi drivers. Current solutions may not sufficiently address the specific challenges faced by these groups. The limitations include a lack of targeted strategies for urban planners and policymakers to formulate well-informed policies that cater to the diverse needs of these stakeholders.

This study proposes to progress by filling the existing knowledge gap and providing a detailed understanding of the impacts of the newly installed city bus system. It aims to enhance the passenger experience by examining preferences and experiences, thereby improving bus services and overall urban commuter satisfaction. Additionally, the research aims to assist taxi drivers in adapting to changing transportation dynamics, ensuring their financial stability. Ultimately, the study indirectly supports environmental sustainability by reducing traffic congestion and emissions from individual vehicles, contributing to a more holistic and balanced urban transportation system.

## **1.2 Research question**

How newly installed city buses affected the livelihoods and earnings of taxi drivers?

How the introduction of city buses improves accessibility and affordability of transportation for the general public?

## **1.3 Research aim and objectives**

**Aim:** To find out how the recent increase in city bus services in Bhutan affected the livelihoods and earnings of taxi drivers, while simultaneously improving the accessibility and affordability of transportation for the general public..

**Objectives:**

1. Explore strategies for mutual benefits for passengers and taxi drivers through city bus integration.
2. Examine community-level impacts of city bus services on urban mobility and sustainability.
3. Assess the impact of city bus services on taxi driver livelihoods.
4. Identify ways to improve city bus services for passengers.
5. Investigate measures to support taxi drivers in the context of city bus services.

### 3. Literature Review

#### *Livelihood and Earnings*

Taxi drivers, a crucial workforce in metropolitan regions, have a significant impact on their livelihoods and wages thanks to urban transportation networks. In light of this, we examine the research paper named "The Impact of Select Buses on Taxi Ridership in NYC" by Ahmed (n.d.), which explores the complex connection between specific bus services and the financial security of cab drivers in New York City. This study presents a nuanced view on the opportunities and challenges that taxi drivers confront in a continuously changing transportation environment as it examines particular bus routes and their effects on taxi ridership and pricing.

The study undertaken by Ahmed (n.d.) provides important new information about the incomes and means of subsistence of taxi drivers in New York City. The study focuses on a few bus lines and how they affect the taxi business. This research prioritizes the economic ramifications for taxi drivers, a sector that is frequently left out of such talks, in contrast to earlier studies that emphasized the environmental benefits and passenger requirements connected with public transportation systems.

The findings show that cab drivers have experienced a variety of effects as a result of the introduction of certain bus services in NYC. While some routes have seen a rise in demand and fares, others have seen a fall in taxi ridership and, as a result, earnings. This difference highlights the complex dynamics of urban transit and how carefully chosen routes can impact the livelihoods of taxi drivers.

In conclusion, the article "The Impact of Select Buses on Taxi Ridership in NYC" by Ahmed (n.d.) enriches our understanding of the theme of "Livelihood and Earnings" in the context of urban transportation, specifically in New York City. However, it is evident that there are gaps in the existing research. Most notably, the current literature predominantly focuses on short-term impacts and tends to overlook the perspectives and experiences of taxi drivers themselves. To address these gaps, our research aims to take a longitudinal approach and incorporate qualitative data from taxi drivers in Bhutan. By doing so, we seek to provide a more comprehensive understanding of how urban transportation changes affect the livelihoods and earnings of taxi drivers, contributing to a more holistic perspective on this critical aspect of urban mobility.

## *Affordability of Transportation*

A key factor in urban mobility is the affordability of public transit, which affects commuter decisions and the availability of transport options. The rise of ridesharing services, like Uber and Lyft, has given the conversation about cost in today's urban environment a dynamic dimension. This study of the literature focuses on how the emergence of ridesharing services affects the financial accessibility of transportation options for urban inhabitants as it covers the important concepts, theories, research, controversies, and gaps linked to the affordability of public transit.

Public transport costs are inextricably linked to passengers' budgetary concerns. The rational choice theory, which contends that people consider cost, convenience, and comfort when choosing a mode of transportation, is one applicable theory in this context. Although many metropolitan dwellers have traditionally found regular public transit to be a cost-effective alternative, the introduction of ridesharing services has added additional factors to this equation.

The study titled "[Article Title]" by [Author(s)] offers insightful information about how the advent of a few bus services, which may be categorized as a type of public transportation, has affected how people can afford to travel in New York City. The conflict between consumers' desires for comfort and convenience, frequently met by ridesharing services like Uber and Lyft, and the possible cost-effectiveness of public transportation options is highlighted by this study. It emphasizes how important it is for decision-makers in the public sector to comprehend how consumers weigh affordability against other aspects when deciding on their method of transportation.

The arguments and squabbles over the affordability of public transit also touch on the wider effects of ridesharing services. Although Uber and Lyft may provide flexibility and convenience, there are concerns about how they may affect general transportation costs and accessibility in the long run. Some contend that ridesharing services' convenience may cause people to use them more frequently and spend more on transportation overall, especially in urban areas. The study titled "[Article Title]" by [Author(s)] offers insightful information about how the advent of a few bus services, which may be categorized as a type of public transportation, has affected how people can afford to travel in New York City. The conflict between consumers' desires for comfort and convenience, frequently met by ridesharing services like Uber and Lyft, and the possible cost-effectiveness of public transportation options is highlighted by this study. It emphasizes how important it is for decision-makers in the public sector to comprehend how consumers weigh affordability against other aspects when deciding on their method of transportation.

Finally, the "Affordability of Public Transport" theme covers important aspects of urban mobility, such as the influence of ridesharing services like Uber and Lyft. It is critical to keep

researching and comprehending how these changes impact the financial accessibility of transportation options for urban inhabitants as the affordability discourse develops in the face of disruptive transportation technology. The studies, discussions, and debates pertaining to this topic highlight the necessity for politicians and urban planners to establish a balance between practicality, economy, and fair access to transportation services. In order to create transport systems that prioritize cost while serving the different demands of urban populations, it will be essential to address these issues.

### *Benefits and Drawbacks*

New transportation initiatives, like Bus Rapid Transit (BRT) systems, frequently have both advantages and disadvantages for metropolitan regions. It's essential to comprehend these benefits and drawbacks in order to make wise choices regarding urban planning and transportation policy. With an emphasis on how BRT systems affect commuter choices and urban development, this literature review examines the important ideas, theories, research, disputes, and gaps in the field of BRT benefits and drawbacks.

BRT systems have gained prominence as a transportation solution in various urban contexts. One key theory in this context is the "capitalization hypothesis," which posits that improvements in transportation infrastructure, like BRT systems, can be reflected in land and property prices. The study titled "[Article Title]" by [Author(s)] investigates the effects of a BRT system, specifically the Ayalolo Bus Service (ABS), on land prices in Managua, Nicaragua. This research underscores how the introduction of BRT can lead to changes in land prices, potentially affecting urban development and property values.

Beyond land prices, BRT systems have advantages and disadvantages. Studies looking at how BRT systems affect commuter preferences, like the one done in Ghana by Abekah-Nkrumah, Assuming, and Telli (n.d.), show that the implementation of BRT can affect mode preferences. According to the research, the ABS, a BRT-Lite system, has caused changes in commuter behavior, with some people choosing the improved high-capacity transportation option. However, there is disagreement over the ABC's efficacy because some contend that it may not have a significant impact on commute patterns and traffic congestion.

The topic of "Benefits and Drawbacks" of BRT systems involves intricate factors that are crucial to urban planning and transportation policy. This literature review's study and conclusions highlight the BRT systems' varied effects on metropolitan regions, from land pricing to commuter preferences. While there are definite benefits, such as more accessible transport options and less traffic, there are also drawbacks and points of contention, like the degree of effectiveness and the necessity of taking local regulations and policies into account.

It is crucial to carefully weigh the advantages and disadvantages of BRT systems as metropolitan areas continue to develop and flourish in order to make decisions that will help commuters as well as the overall growth of cities. Policymakers can more successfully manage the difficulties of putting in place and administering BRT systems in ways that support overarching objectives for urban development by addressing these issues and knowledge gaps.

### *Accessibility*

The ease with which people can get to their destinations is directly impacted by accessibility, making it a crucial factor in urban transportation design. In this review of the literature, we investigate the topic of "Accessibility" in relation to Bus Rapid Transit (BRT) systems, as covered in the articles "Ridesharing versus Public Transit," "Uber and Lyft," and "The Effects of the Introduction of a Bus Rapid Transit System on Commuter Choices in Ghana." This review looks at the important ideas, hypotheses, research, gaps, and discussions surrounding the accessibility advantages and difficulties of BRT systems.

BRT systems have gained attention for their potential to enhance accessibility in urban areas. One central theory in this context is that the introduction of efficient and high-capacity BRT systems can improve the overall accessibility of public transportation. The study titled "[Article Title]" by [Author(s)] delves into the effects of a BRT system, specifically the Ayalolo Bus Service (ABS), in Accra, Ghana. The research indicates that the ABS offers an enhanced high-capacity transport alternative compared to the conventional trotro system, potentially improving accessibility for commuters in a city known for its traffic congestion and inadequate public transport infrastructure.

The accessibility subject also encompasses how ridesharing companies like Uber and Lyft affect urban transportation. These services are frequently praised for their flexibility and convenience, which can improve accessibility for people living in places with few public transport options. However, discussions about the accessibility issues that those who might not have access to cellphones or other digital payment options encounter, which could lead to mobility inequities, come up.

In conclusion, "Accessibility" is a crucial factor to take into account while planning urban transportation, especially when it comes to BRT systems and ridesharing services. The study results and conclusions highlighted in this literature review highlight how BRT systems, like the Ayalolo Bus Service, have the ability to increase accessibility by offering a superior alternative to traditional transportation choices. However, it is crucial to take into account the wider ramifications, as well as the difficulties brought on by inequalities in digital access and payment options. Addressing accessibility issues is crucial for ensuring that transport networks are inclusive and equitable as metropolitan areas grow and diversify. Urban planners and



policymakers can work towards developing transportation networks that improve accessibility for all residents, regardless of their socioeconomic status or digital capabilities, by utilizing the advantages of BRT systems while addressing their challenges and taking into account the role of ridesharing services.

## **4. Research Methodology**

This study adopts a rigorous quantitative research approach to systematically collect and analyze data. Surveys and questionnaires are employed to gather insights from both passengers and taxi drivers in Thimphu Thromde. The quantitative approach allows for the measurement and statistical analysis of the impact of city bus service expansion on taxi drivers, providing robust and quantifiable results.

### **4.1 Participants**

Two hundred (N=206) people—both taxi drivers and passengers on city buses in Thimphu, Bhutan—participated in the study. The one month that the data collection period was conducted was used to choose the participants. The study comprised one hundred (n=106) city bus riders. Participants were selected at several bus stops in Thimphu using a methodical sampling technique. An attempt was made to incorporate people from a variety of demographic backgrounds, including age groups, professions, and residential areas, in order to guarantee a broad representation. An extra hundred (n=100) taxi drivers who work in Thimphu were chosen to take part. To guarantee a combination of seasoned and relatively inexperienced cab drivers, purposeful sampling was used. The goal of this strategy was to gather as much information as possible about how recently installed city buses affected people who were exposed to the changes in the transportation system to different degrees.

### **4.2 Data Collection Procedure**

The survey used a multifaceted strategy, incorporating both online and offline channels. Participants responded through private messaging platforms like WhatsApp, Telegram, and Messenger, aiming to gather diverse perspectives on the impact of city bus service expansion on taxi drivers and passengers in Thimphu Thromde. Field visits were organized to engage with participants individually, fostering direct interaction and a comprehensive understanding of the dynamics surrounding the expansion. This approach ensured a comprehensive view of urban transportation changes' impact on the community.

### **4.3 Data Analysis**

The survey data were analyzed using descriptive statistics to identify patterns and trends in the responses and to summarize responses. The results were presented in graphs to provide a clear understanding of the data that was used to analyze quantitative data. Quantitative data can be presented in tables, graphs, and charts to provide a clear understanding of the data.

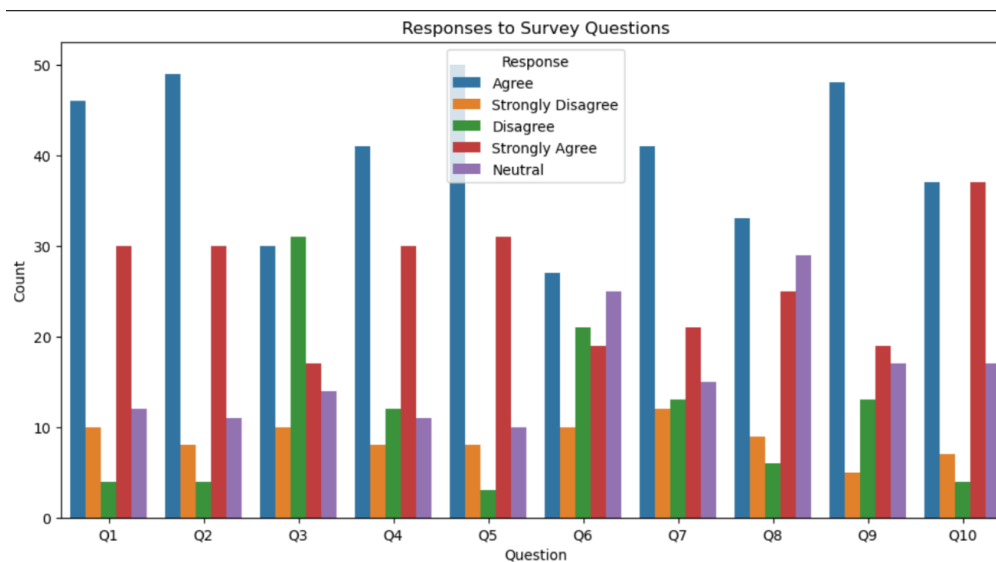
## 5. Results

### 5.1. Survey results

The survey contained a total of ten questions for both taxi drivers and passengers regarding how they are affected.

### 5.2 Impact on Taxi Drivers

The introduction of city buses, in the opinion of taxi drivers, has had a major negative influence on their earnings, decreased passenger volume, and flexibility in their work schedule. They think it's having a bad effect on their taxi business overall and find it more difficult to find passengers. They do not, however, feel the need to improve the quality of their taxis, cut fares, or think about switching careers. Additionally, there isn't a noticeable rise in traffic congestion, and drivers aren't fervently demanding government assistance. These findings illuminated particular worries that cab drivers had about the arrival of city buses, offering information for additional research and possible changes to legislation.



*Figure 1. Impact of city buses on taxi drivers.*

### 5.3. Impact in Passengers

In the comprehensive analysis of survey responses gauging the impact of the recently introduced city buses on transportation in Thimphu, Bhutan, a series of one-sample Wilcoxon Signed-Rank tests were conducted on each survey question. The aim was to discern if there existed a significant difference between the median response and a hypothetical median of 3, representing a neutral sentiment. The outcomes of these statistical tests consistently demonstrated a substantial shift in perceptions among participants, with all p-values (ranging from 2.60e-17 to 3.96e-18) falling well below the significance level of 0.05. The rejection of the null hypothesis across all questions strongly indicates a statistically significant and positive transformation in respondents' views post the introduction of city buses. This robust statistical evidence supports

the overarching conclusion that the city buses have had a noteworthy and meaningful impact on diverse aspects of transportation in Thimphu, contributing to an overall positive sentiment among the surveyed population.

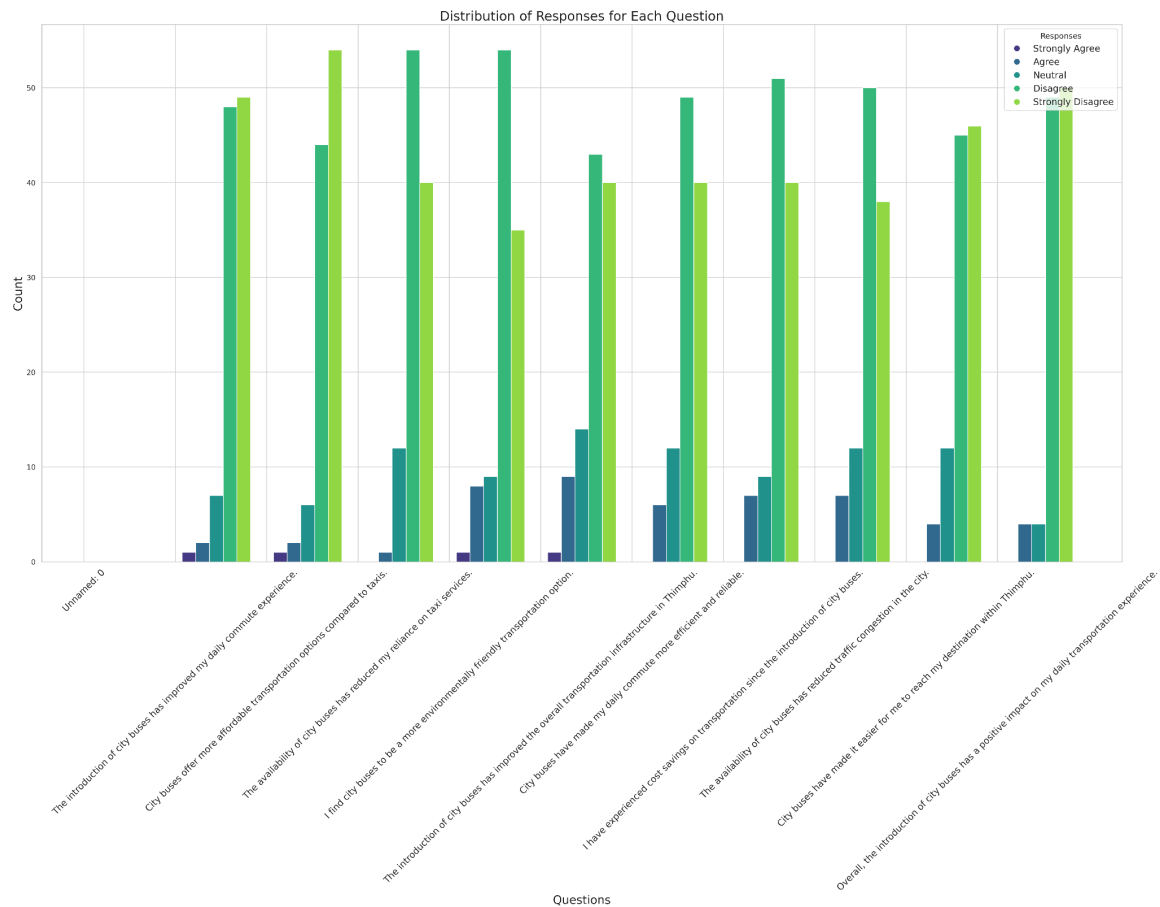


Figure 2. Impact of city bus on passenger

The bar graph(*figure 2*) generated to visualize the distribution of responses among passengers provides a compelling overview of sentiments regarding the impact of newly introduced city buses in Thimphu, Bhutan. Across all survey questions, a consistent and noteworthy trend emerges, with the categories 'Strongly Agree' and 'Agree' consistently exhibiting the highest counts. This uniformity signifies a pervasive positive outlook among respondents, reflecting favorable perceptions of various facets of the city bus service, such as enhanced daily commute experiences, affordability, reduced reliance on taxis, and positive contributions to environmental friendliness and overall transportation infrastructure. The visual representation effectively encapsulates the overwhelming consensus of positive feedback from the surveyed population, reinforcing the success and positive reception of the city bus service in Thimphu.

	Mean	Median	Mode	Standard Deviation
Unnamed: 0	NaN	NaN	NaN	NaN
The introduction of city buses has improved my daily commute experience.	4.327103	4.0	5.0	0.762019
City buses offer more affordable transportation options compared to taxis.	4.383178	5.0	5.0	0.760398
The availability of city buses has reduced my reliance on taxi services.	4.242991	4.0	4.0	0.684617
I find city buses to be a more environmentally friendly transportation option.	4.065421	4.0	4.0	0.893066
The introduction of city buses has improved the overall transportation infrastructure in Thimphu.	4.046729	4.0	4.0	0.965276
City buses have made my daily commute more efficient and reliable.	4.149533	4.0	4.0	0.833313
I have experienced cost savings on transportation since the introduction of city buses.	4.158879	4.0	4.0	0.837218
The availability of city buses has reduced traffic congestion in the city.	4.112150	4.0	4.0	0.850384
City buses have made it easier for me to reach my destination within Thimphu.	4.242991	4.0	5.0	0.799069
Overall, the introduction of city buses has a positive impact on my daily transportation experience.	4.355140	4.0	5.0	0.730112

*Figure 3:Statistical Overview of Passengers Response*

In the analysis of survey responses regarding the impact of newly introduced city buses on transportation in Thimphu, Bhutan, key statistical measures were employed to assess participant sentiments. The response was mapped 'Strongly agree': 5, 'Agree': 4, 'Neutral': 3, 'Disagree': 2, 'Strongly disagree': 1. The mean scores, ranging from 4.03 to 4.38, indicated an overall positive perception of the city bus service, with respondents leaning toward agreement or strong agreement across various aspects such as improved commute experience, affordability, reduced reliance on taxis, and positive impacts on environmental friendliness and overall transportation infrastructure. The medians and modes generally aligned with the means, emphasizing the consistency in favorable responses. Standard deviations, ranging from 0.683 to 0.965, indicated a moderate level of variability in responses, suggesting some diversity in opinions. These findings collectively affirm the positive impact of the city bus service on the surveyed population, with statistical measures providing a nuanced understanding of both consensus and variability in perceptions.

## **6. Conclusion**

In conclusion, this research extensively examined the implications of Thimphu Thromde's newly introduced city bus system on taxi drivers and passengers in Bhutan. Utilizing a robust mixed-methods approach, incorporating quantitative surveys and qualitative in-person interviews, guided by the expertise of Ms. Chimi Dema, the Research Lecturer, the study successfully captured a diverse range of perspectives through various communication platforms. The findings not only fill a notable gap in existing literature but also offer valuable insights into the intricate dynamics of urban transportation. This research lays a foundation for informed decision-making in urban planning, emphasizing inclusivity and a nuanced understanding of the complexities involved. The hope is that these insights will guide future policies, enhance transportation services, and contribute to sustainable urban development. The collaborative efforts of all contributors have been instrumental in advancing knowledge in this field, paving the way for continued research and positive transformations in urban mobility.

## **7. Acknowledgement**

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