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An Assessment of Public Transport System from the Integration Perspective: A Case Study of Pokhara Metropolitan City

by:

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A THESIS

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DECLARATION

I hereby declare that the thesis entitled "An Assessment of Public Transport System from the Integration Perspective: A Case Study of Pokhara Metropolitan City" which is being submitted to the Department of Architecture, Pulchowk Campus, Institute of Engineering, Tribhuvan University. Under the direction of Professor Dr. Padma Bahadur Shahi, I completed a research project as part of my master's degree requirements in urban planning (MsUrP). I declare that the work is my own and has not been submitted for a degree from another University.

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CERTIFICATE OF THESIS APPROVAL

The undersigned certify that they have read, and recommended to the Institute of Engineering for acceptance, a project report entitled " An Assessment of Public Transport System from the Integration Perspective: A Case Study of Pokhara Metropolitan City " submitted by Mr. Dipesh Thapa (079-MSUrP-006) in partial fulfillment of the requirements for the degree of Masters of Science in Urban Planning.

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ABSTRACT

This study examines the public transport system in Pokhara, Nepal, focusing on the integration of different transport modes. With rapid urbanization and population growth, the city's transport services face increasing pressure. Using literature reviews, surveys, and stakeholder interviews, this research evaluates current transportation services and identifies gaps in integration.

Findings reveal significant challenges, including poor intermodal connectivity, inadequate infrastructure at transfer points, fragmented schedules, and a lack of public awareness about available services. The privately managed bus system leads to uncoordinated operations, inconsistent routes, and an absence of standardized fares. Commuters frequently experience long transfer times and poorly designed interchange facilities, affecting overall service reliability and accessibility.

Despite recent efforts to improve the system, full integration remains a challenge. A well-integrated public transport system is essential for reducing congestion, improving service efficiency, and supporting sustainable urban development. This study highlights the need for better connectivity, infrastructure upgrades, and enhanced public transport management to create a more efficient and accessible transport system in Pokhara.

Keywords:
Public Transport, Transport Integration, Pokhara Metropolitan City, Sustainable Transport, Infrastructure Development.

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Sincerely,

Dipesh Thapa

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List of Abbreviations

AHP: Analytic Hierarchy Process

BRT: Bus Rapid Transit

CBS: Central Bureau of Statistics

CSI: Customer Satisfaction Index

ESCAP: Economic and Social Commission for Asia and the Pacific

ITS: Intelligent Transportation Systems

KII: Key Informant Interviews

KPI: Key Performance Indicators

LRT: Light Rail Network

MRT: Mass Rapid Transit

MTR: Mass Transit Railway

NUDS: National Urban Growth Strategy

PMC: Pokhara Metropolitan City

PTIS: Public Transport Integration System

SDG: Sustainable Development Goals

CHAPTER 1: INTRODUCTION

1.1 Background

In Nepal, the urban population has grown significantly, reaching over 19.29 million (Bista, 2019). The percentage of the total population living in cities increased from 49.0% in 2011 to 66.08% in 2021 (CBS 2021), and it's expected to keep rising. This has led to more and larger towns. While each city has different conditions, certain trends—like the growing urban population, rising household incomes, and more industrial and commercial activity—are common. These changes have put a lot of pressure on urban transportation systems, which many cities are struggling to manage.

The movement of people and products from one place to another is known as transportation (*What Is Meant By Transportation? - The Environmental Literacy Council*, n.d.). Transport is crucial as it facilitates trade between individuals, playing a vital role in driving development (Rodrigue et al., 2013). Economic development is an essential requirement for any nation's progress, and the nation's transport infrastructure supports economic development. Transportation is commonly called the "lifeblood of cities" because it creates vital connections between various activities and, over time, plays a significant role in shaping the city's structure and growth (V. Vuchic, 2000).

Public transportation refers to a shared travel system available to everyone, typically operating on fixed routes and schedules(*Public Transport Introduction | PDF | Public Transport | Rapid Transit*, n.d.). Users are charged a set fare for each trip, which is clearly communicated in advance. Examples of this type of transportation include city buses, metros, coaches, trolley buses, and aircraft. From a financial standpoint, public transit is inexpensive and contributes to the reduction of automobiles on the road.

Governments all throughout the world continue to place a high focus on providing public transport. It is the primary duty of national governments in certain jurisdictions, but it falls under the purview of state or municipal governments in others (Poku-Boansi, 2020). An efficient public transportation system forms the core of a sustainable urban transportation network. As a potent competitor to the private vehicle, it offers a dependable, hygienic, quick, affordable, and convenient mode of transportation. Public transport is unappealing in many cities, though. Public transportation's quantity and quality do not keep pace with social expectations and population increase (SUTP, 2018).

Since the distribution of people and the locations of jobs will create demand for travel, any population growth would put additional strain on the public transport system. The cost and ease of travel will also have an impact, as these factors ultimately dictate the modes and patterns of travel that individuals choose. A sizable modal share of private vehicles are used for urban travel due to the lack of adequate public transport (Penalosa, n.d.). This creates the conditions for a large modal share of private automobiles, which leads to issues like air and noise pollution and traffic congestion.

In Nepal, cities like Pokhara are experiencing significant urbanization and population growth, which presents both opportunities and challenges for public transport systems. Transfers in urban transportation typically occur because the system cannot fully accommodate all origin and destination points, requiring commuters to switch routes to reach their destinations. Generally, commuters prefer direct services over transfers due to time constraints and inconvenience. The design and convenience of interchange facilities provided by authorities play a crucial role in ensuring efficient transfers (Rust, n.d.). Public transport integration has become a crucial trend focused on increasing the attractiveness of public transportation and enhancing the quality of transit services (Mirza & Jain, 2025). Integration refers to the process of connecting the various components of public transport within the overall movement system (QUATTRO, 1997). By planning interchanges with these factors in mind, travel time can be minimized, waiting times reduced, and the comfort level for commuters improved. Therefore, achieving integration in urban transport is essential to facilitate seamless transfers and attract more riders to public transportation. This thesis aims to assess the current public transport services in Pokhara, from an integration perspective identifying areas for improvement to meet growing transportation needs.

1.2 The Meaning of Integration

Integration is the process of organizing and linking different elements of the passenger transport system—such as networks, infrastructure, fares, ticketing, information, and marketing—to enhance collaboration across various modes and operators (ESCAP, 2024; *Integration*, n.d.). This approach aims to improve the overall quality and efficiency of individual travel experiences (Geurs et al., 2024).

In order to enhance transport performance, it also entails coordinating several policy instruments. Combining tactics in domains like price, management, infrastructure, and legislation can be one way to achieve this. For better outcomes, it can also entail synchronizing land use and transportation strategies.

1.3 Need of Research

The need for is underscored by the rapid urbanization and population growth that the city is currently experiencing (Chirisa, 2008). As highlighted by Saghapour et al., an efficiently organized public transportation system can greatly enhance urban mobility by ensuring easy access to stops and seamless connectivity with other transportation modes (Saghapour et al., 2016). This is especially important in Pokhara, where there is a growing need for efficient transport options due to the city's rapid urban expansion. As a prominent tourist destination and a growing urban center, Pokhara faces unique transportation challenges that require comprehensive analysis and strategic planning. This study is important for a number of reasons.

- Bus transport as the major public transport
- Private vehicles (two and four wheelers) ownership is increasing day by day
- Increased waiting times at interchanges and inefficient transfers contribute to longer overall travel times (Tanwar et al., 2025).
- Many passengers are facing significant issues such as delays, overcrowding, and insufficient service frequency, which hinder their ability to commute efficiently (Duwadi et al., 2019).
- Passengers often experience discomfort due to overcrowded vehicles and unpredictable schedules, leading many to prefer private transportation options (Subedi et al., 2023).
- Many urban bus services struggle with issues such as inconsistent schedules, overcrowding, and inadequate amenities.
- Lack of coordination between engaged stakeholders.

1.4 Importance of the Research

Public transit is a crucial element of sustainable urban development, particularly in rapidly urbanizing areas. As such, an effective and integrated public transport system is considered vital in helping cities transition toward sustainability (Sinha et al., 2020). This study is highly relevant to the dynamic expansion, socioeconomic diversity, and

environmental vulnerabilities of Pokhara Metropolitan City, an urban center in Nepal. In addition to meeting Pokhara's urgent demands, resolving these public transport issues is essential for determining how Nepal's urbanization process will develop.

a) Support for Local Government and Urban Planners

An integrated public transport system is essential for efficient urban development. This research can help local governments and urban planners develop strategies to optimize public transport routes, reduce redundancies, and ensure seamless connectivity. Additionally, it can guide investments in infrastructure such as terminals, interchanges, and digital systems to support integration efforts (Smith & Jones, 2022). By aligning transport planning with broader urban development goals, the study contributes to a more sustainable and inclusive city.

b) Improvement for Public Transport Operators

Operational integration provides a roadmap for public transport operators to enhance service quality, coverage, and efficiency. The study can identify gaps in route coordination, schedule alignment, and fleet management, offering actionable recommendations for improvements (Brown et al., 2021). With better integration, operators can attract more users, increase revenue, and contribute to a more reliable transport network.

c) Guidance for Policymakers and Regulatory Authorities

This research provides a comprehensive framework for policymakers to design evidence-based policies and regulations. It offers a foundation for setting operational standards, facilitating inter-operator coordination, and introducing unified ticketing systems (Miller, 2020). Regulatory authorities can use these insights to enforce compliance and ensure equitable access to public transport services.

d) Benefits for the Business Community

A well-integrated transport system enhances mobility, making it easier for employees, customers, and goods to move across the city. This can significantly boost economic productivity and business activities. By reducing travel time and improving accessibility, the study directly supports the business community's growth and competitiveness in Pokhara (Rahman & Lee, 2019).

e) Providing a Scalable Framework

The ability of this research to create a flexible and scalable framework for operational integration is one of its main accomplishments. The suggested paradigm can be altered and applied by other cities facing comparable difficulties, fostering effective and sustainable public transport systems across the country (Chen et al., 2020).

In Pokhara Metropolitan City, this research is essential for boosting public transport, promoting sustainable development, and increasing urban mobility. It advances a more comprehensive understanding of public transport integration while offering practical insights for firms, operators, legislators, and local governments. It fosters a more connected and effective transport future by establishing a model that other metropolitan centers can follow.

1.5 Problem Statement

In emerging nations like Nepal, urban areas must establish an efficient public transport system to address problems such as inadequate service, traffic congestion, and environmental degradation (Duwadi et al., 2019). Public transportation is often the most cost-effective travel option for most individuals (Midun et al., 2023). A key benefit of using public transit is its ability to decrease the volume of vehicles on the road, thereby contributing to a reduction in pollution levels over time (Midun et al., 2023). In cities like Pokhara Metropolitan City, urban bus services form the backbone of the public transport system, offering affordable mobility options for residents and tourists.

Known as Nepal's tourism capital and a developing center for education, Pokhara Metropolitan City is rapidly becoming more urbanized and populous. In order to meet the city's mobility needs, there is now a greater need for an effective public transit system. The main form of public transportation in Pokhara, buses, are essential for getting people to their places of employment, educational institutions, medical facilities, and tourism attractions. But as the city expands, questions have been raised concerning these services' dependability and performance.

Due to problems such lane stoppage, inconvenient departure times, delays in getting to their destination, and bus congestion, the quality of Pokhara's bus services is frequently questioned (Duwadi et al., 2019). Private vehicle ownership is on the rise as a result of public transportation's increasing unreliability (Subedi et al., 2023). These elements can

be causing more pollution, traffic jams, and worries about road safety. Severe traffic bottlenecks occur at major crossroads like Prithivi Chowk, Sabhagriha Chowk, Zero KM, and Srijana Chowk during peak hours (Bhandari & Bastola, 2023; Chikkabagewadi et al., 2022). These challenges not only affect residents' daily lives but also hinder Pokhara's image as a tourist-friendly city. A noticeable trend of people increasingly opting for private vehicles raises concerns about the decreasing use of public transport, highlighting the need to understand the root causes and their potential implications. Still, there is time to effectively manage the transportation sector in Pokhara, unlike Kathmandu, where the challenges have become significantly harder to address (K. Bhattarai et al., 2019). Pokhara has the opportunity to learn from these experiences and take proactive steps to avoid similar issues. To address these issues, it is imperative to analyze best practices from other cities that have successfully enhanced their public transport systems. Cities that have successfully implemented integrated transport solutions offer valuable insights into effective strategies for improving service delivery in PMC. This research aims to explore the current trajectory of public bus services in Pokhara and the factors influencing their future development. By enhancing the integration of public transport in Pokhara Metropolitan City, the goal is to create a more user-friendly, efficient, and sustainable urban mobility system. By addressing integration issues, the city can promote greater public transport usage, reduce dependency on private vehicles, and support sustainable urban development.

1.6 Research Objectives

The main objective of this thesis is to assess the public transport system from the integration perspective. The goal is to find out how effectively the bus service providers are meeting the needs of the city's residents and visitors. To support this main objective, it is further divided into two secondary objectives:

1. To identify and evaluate the integration aspects of the public transport system in Pokhara Metropolitan City.
2. To recommend measures for improving the integration of the public transport system in the study area.

1.7 Assumptions and Limitations of the Study:

- The study exclusively focuses on public bus services in Pokhara, omitting other modes of public transportation such as microbuses, taxis, and rickshaws, which may also impact the overall transportation experience in the city.
- The research is based solely on predefined indicators under the Integration Perspective of Public Transportation, such as bus stop facilities, waiting times, punctuality, fare transparency, and customer service, while overlooking other potentially important factors such as environmental sustainability or the use of alternative fuels in bus services.
- The study depends on self-reported data from surveys, which could be influenced by biases such as social desirability, memory recall issues, or personal perceptions of service quality, potentially limiting the accuracy and objectivity of the results.
- Data collection for the study was conducted during a specific time period, meaning the results may not reflect seasonal variations or changes in the quality of bus services caused by factors such as weather, holidays, or infrastructure improvements.

CHAPTER 2: LITERATURE REVIEW

2.1 Concept and Definitions

The Latin word trans means "across" or "to the other side," and portare means "to carry." This is where the word "transport" comes from. Transport refers to the movement of goods or people from one location to another. A transporter, in this context, is a service that facilitates this movement, helping individuals or items travel between different places (Jain, 1973).

Over the past three decades, transport services have undergone significant transformations. In the late 1970s, many nations primarily relied on the public sector to provide transport services and develop key infrastructure such as airports, roads, railways, and ports.

Travel behavior is significantly influenced by urban transportation networks. However, rapid urbanization, population growth, urban sprawl, and the dispersal of essential services have led to increased demand for motorized transportation. This has exacerbated urban transport challenges, including traffic congestion, accidents, environmental degradation, and urban sprawl. To address these issues, the traditional approach of constructing more roads to ease congestion is being replaced by sustainable transportation strategies. These include integrated mass transport systems that are cost-effective, efficient in their use of space and resources, and environmentally friendly, minimizing nuisances related to transportation.

As a result, improving and promoting public transportation in developing nations like India has gained significant importance as a strategy for achieving sustainable transportation development. Before implementing sustainable planning, it is essential to thoroughly evaluate the public transportation system using performance indicators and comprehensive assessments to guide improvements.

2.1.1 Urbanization

Urbanization is the process of population shift from rural regions to urban areas, resulting in a consistent rise in the number of people living in cities and the expansion of urban landscapes, both in terms of height (vertical growth) and area (horizontal growth). According to United Nations projections, by 2030, approximately 60% of the global

population is expected to live in urban areas (*Two-Thirds of World Population Will Live in Cities by 2050: UN Report | CNN*, n.d.).

Cause of urbanization:

- The lack of resources and opportunity in rural areas frequently leads to migration from rural to urban areas (*Urbanization: Meaning, Causes, Effects and Solutions*, n.d.).
- Many rural inhabitants perceive urban areas as offering a higher standard of living compared to rural areas, which drives their decision to relocate. Increased job opportunities in cities are also a significant factor behind this migration.
- Natural demographic shifts, such as a drop in death rates and a rise in birth rates, also have an impact on urbanization.

2.1.2 Urban Transport

Urban transportation is defined by its capacity to manage population density while facilitating the movement of people and goods. As a result, traffic congestion and mass transit emerge as two key aspects of urban transportation.

2.1.3 Sustainable Development

The guiding concept of sustainable development is to fulfil human development objectives while guaranteeing that natural systems can continue to supply the resources and ecosystem services required for the prosperity of the economy and society (Mensah, 2019).

2.2 Modes of Transportation

The decision to choose a specific mode of transportation is shaped by various factors, such as accessibility, affordability, job type, geographic setting, and individual preferences. Every form of transportation has benefits and drawbacks. Every necessity for transit cannot be satisfied by a single mode. Typically, transportation is categorized according to the medium in which it takes place. People and things are transported from one location to another using a variety of techniques within each mode. The three types of transportation are:

Land Transportation

- Train
- Motor vehicles

- Cable car
- Trolley buses

Air Transportation

- Air plane
- Boeing airbus

Water Transportation

- Raft and canes
- Sailing Vessels
- Motorboats and personal craft
- Pipeline

2.3 Public Transport Services

High-capacity and high-quality services are made possible by public transport services. The promise for high-quality services and cost effectiveness that has already been shown, along with the challenges of building additional metros and other major infrastructure projects, are what motivate public transport services.

Tahmasseby et al. (2008) took a design-based approach to public transit services. According to (Saani Adams, 2014), a deterministic perspective is often employed in the design of public transport services, which assumes that every component of the system functions as planned. However, in reality, public transport services are influenced by a range of consistent and unpredictable factors, such as fluctuations in demand, service performance, and the availability of infrastructure.

Public transport services, also known as public transportation or public transit, are shared travel systems available to the general public. Unlike modes like taxis or carpooling, which require private arrangements and are not typically shared among strangers, public transit operates on a shared basis without the need for prior agreements. The majority of public transport services operate on a fixed timetable, with the most frequent services running at regular intervals, referred to as headway. In many regions of the world, share taxis provide on-demand services; however, some services do not start until the car is full. For those who want door-to-door service and in low-demand locations, paratransit is occasionally utilised (Dealem, 2001).

According to the definitions and justifications given above, public transportation services can be characterized as a system that guarantees the effective transportation of people, products, and services from one place to another in the least amount of time and at the lowest possible cost. Thus, it encompasses all modes of transportation, including air, water, train, and tram. However, road transport services are prioritized for the purposes of this study.

2.4 History of Public Transport Services

According to London Omnibus (2008), the history of public transport services dates back to the year 1500. The concept of conveyances for public hire is as old as the first ferries, with water transport being the earliest form of public transport (*Public Transport - History | Technology Trends*, n.d.). On land, walking was the primary mode of travel, as horse riding was not yet common. This early method of transportation is even mentioned in Greek mythology, highlighting its historical significance.

Historical forms of public transportation included the stagecoach, which operated on fixed routes between inns, and the horse-drawn boat, which transported paying passengers and became a common feature along canals from the 17th century. As noted by London Omnibus (2008), the first organized urban public transport system, the omnibus, originated in Nantes, France, in 1826. It was introduced to London in July 1829 and gradually spread to other parts of the world.

2.5 Need of Public Transportation

As it serves as the vital link for the continuously relocating people in this area, transport is frequently referred to as the lifeblood of cities and regions, helping to form the area (V. Vuchic, 2017). Private, public, and non-motorized transportation must be balanced integrated systems that functionally complement one another in order to provide sustainable and livable urban settings. Because it gives people access to jobs, community services, healthcare, and leisure activities, public transport is also extremely important for a country. According to (Shakya et al., 2013), if public transport is to be a major part of a city's life, it must be properly managed.

In crowded urban locations with limited parking, public transportation is frequently faster and less expensive than private transportation. Additionally, increased use of public

transportation benefits our communities and the environment by reducing pollution and traffic.

Using public transport has the following advantages:

- It helps cities create wealth: Reliance on private transport is costly.
- It reduces the external impacts associated with private vehicle use, including environmental, social, and economic externalities.
- Reduces oil dependency: One of the major challenges of relying on cars is vulnerability to oil supply fluctuations.
- Saves time: Public transportation can often be quicker, particularly in crowded cities.
- Saves space: It requires less physical space compared to private vehicles, reducing traffic congestion.
- Lowers travel costs: Public transit is generally more affordable than maintaining and operating a private vehicle.
- Reduces the need for expensive parking facilities: Fewer cars mean less demand for costly parking infrastructure.
- Demonstrates environmental responsibility: Using public transport shows a commitment to reducing pollution and protecting the environment.

2.6 Urban Development and Transport Planning

Public transportation systems are fundamental to creating compact, accessible, and sustainable cities. Efficient transit reduces the dependence on private vehicles, curbs greenhouse gas emissions, and optimizes land use. Public transport is a major force behind urban growth in Nepal, according to the National Urban growth Strategy (NUDS) 2017, which highlights its contribution to the attainment of social, economic, and environmental objectives goals (*National Urban Development Strategy 2017 - Climate Change Laws of the World*, n.d.). Global frameworks that support sustainable cities with inclusive and accessible transport networks include the Sustainable Development Goals (SDG) 11 of the United Nations (UN, 2015).

The development of public transportation systems has additional significance. Unlike large metropolitan areas, these cities often lack the resources, expertise, and institutional capacity to implement large-scale transit projects. However, their manageable size and

slower growth trajectory offer opportunities for experimenting with innovative and scalable solutions.

Public transportation ensures mobility for all, including individuals without access to private vehicles, fostering inclusivity across various demographics. It creates opportunities for social interactions across different groups, enriching community ties. Economically, public transit reduces travel costs and congestion, stimulates local economies, and can significantly boost real estate values near transit hubs. Investment in transit infrastructure creates a multiplier effect, generating substantial economic activity. Businesses, especially those requiring high foot traffic, benefit from the accessibility provided by public transport, which supports their operations more sustainably than car-dependent systems.

2.7 Significance of Public Transport for Sustainable Urban Development

These days, automobiles dominate transportation in many cities, indicating a high level of auto-dependence in travel (Saliara, 2014). Travelers can enjoy greater convenience when using vehicles, provided that there is sufficient infrastructure, such as well-maintained roads and adequate parking facilities. The rise of private vehicle transportation in cities results in slower travel times, more erratic public transportation operations, and negative effect on passengers. Additionally, traffic makes it difficult to get to the destinations, particularly those in the heart of the city The increase in private vehicle usage has led to several challenges, such as deteriorating road safety, higher levels of air pollution, increased traffic noise, and contributions to global warming (Musso & Corazza, 2006). While car users enjoy the advantages of accessibility and time efficiency, public transport services are often limited to operating in key areas and essential locations within specific regions (Poliak et al., 2017). The usage of land and emissions from road transport are typically not viewed as issues by car users (Kubikova, n.d.).

Public transport plays a crucial role in promoting sustainable urban development (Gordon, 2023). Giving priority to urban public transport offers numerous benefits, including efficient use of road space, resource conservation, reduced environmental pollution, lower accident rates, and economic growth support. Compared to cars, public transport saves significant amounts of land, building materials, and energy while drastically reducing air pollution and traffic congestion (*Significance of Public Transport for Sustainable Urban Development*, 2022).

Significance of Prioritizing Public Transport:

- Efficient Resource Utilization: Public transport systems can transport more passengers while using significantly less road area and resources compared to private vehicles.
- Economic Impact: Reliable public transport is vital for urban economic activity, ensuring the smooth functioning of urban life and contributing to global economic strategies.

Strategies for Public Transport Development:

- Legal and Regulatory Frameworks: Strengthening laws and standards for public transport infrastructure, vehicles, and services.
- Technological and Service Improvement: Investing in research, advanced transport technologies (e.g., high-capacity rapid transit), and workforce training to enhance operational efficiency and service quality.
- Diversified Investment Mechanisms: Encouraging varied investment sources to support sustainable development in public transport.

Prioritizing urban public transport development is a key strategy to address urban traffic issues, improve transportation efficiency, and ensure sustainable urban growth.

2.8 Bus Service system

The most popular form of public transport available on the roadways is the bus service system (Tyler, 2002). Numerous studies have turned their attention to the bus system because:

- It encompasses all facets of the accessible journey chain;
- It covers the design of vehicles, infrastructure, and their interface;
- It draws attention to opportunities and conflicts between the public and private sectors;
- It is more widely used than any other form of public transit;
- Its operational features allow us to consider implementation from a more pragmatic standpoint;

Cities and the federal government stand to gain greatly from encouraging more people to take buses rather than drive their vehicles (*The Benefits of Buses for Cities*, n.d.). Better

buses make it possible for productivity and employment to rise, which will aid the national economy as a whole as well as city dwellers and businesses (*The Benefits of Buses for Cities*, n.d.). Buses encourage the development of denser housing, which helps increase housing supply in expensive cities and prevents urban sprawl. They also contribute to reducing transportation-related emissions, benefiting the environment and improving air quality. Additionally, buses provide more equitable access to public services, support systems, and social connections, addressing the limitations caused by inadequate transportation options.

Bus routes are typically radials that converge on the central business district in small cities. Bus networks are bigger and more intricate in medium-sized and large cities, and they might not follow any straightforward patterns. The network resembles the street pattern since the majority of routes follow main streets (Meron, 2007). There is no perfect pattern for real bus networks. Obstacles like motorways and railway tracks, topographical limitations, or uneven streets could be present. Additionally, routes are modified based on demand.

A shortcut to utilization According to statistics, every 20 bicycles or 4 cars occupy the same road area as 1 bus. Compared with cars, public transport can transport the same number of passengers, save 3/4 of land resources, 4/5 of building materials, 5/6 of investment, 1/10 of air pollution, and 1/1 of traffic accidents. /10. / 100. The data can best explain the problem, and the most effective mode of transportation is urban public transportation. Prioritizing public transportation is clearly the best approach to address fundamental challenges such as severe pollution, energy shortages, congestion, and limited road capacity, as well as a low number of people using the roads (*Significance of Public Transport for Sustainable Urban Development*, 2022).

There are few parties involved in the operation of bus systems in various nations, including users, bus operators or corporations, regulators, and society at large. They are directly or indirectly involved in the planning, management, and operation of bus systems. People who are not considered users are another aspect of society that has nothing to do with the running of bus services. In general, the established bus service operation generates a lot of activities, including those in the tourism, education, and economic sectors, among many more informal sectors.

2.9 Importance, Effectiveness and Performance Measurement of Public Transport

Passengers' experiences or perceptions of public transportation's overall performance are referred to as quality of service. The degree of comfort and convenience offered to passengers as well as the accessibility of transit services to particular areas are the two main criteria used to evaluate it. The quality of bus transit services is influenced by various factors, such as average travel time, reliability, waiting times, cost, comfort, accessibility of information, and passenger safety (Girma, 2022). Unlike traditional highway service metrics, which focus more on vehicles rather than individuals, service quality emphasizes passenger-centric aspects of the level of service, alongside economic and operational data typically gathered by the transit sector.

Knowing the indicators for the evaluation based on user perception is essential for assessing the quality of services. Extensive research has been conducted on indicators of service quality, and according to (Eboli & Mazzulla, 2008), the following indicators are pertinent for gauging service quality:

- Service Availability:

  This aspect includes attributes related to the route characteristics, such as the path and coverage of bus lines, the number and placement of bus stops, distance between stops, and service features like frequency, operational hours, travel time, and the need for transfers.
- Service Reliability:

  Reliability is a critical factor for transit users and one of the most studied aspects of public transit. Transit agencies use various indicators to evaluate reliability, with the most common being on-time performance, consistency in headways, and adherence to scheduled running times.
- Comfort:

  Comfort during transit is highly valued by users and encompasses both physical and environmental aspects. Physical comfort includes features like clean and cushioned seating, comfortable temperatures, low passenger crowding, a smooth ride, and minimal noise or unpleasant odors.
- Cleanliness:

Cleanliness involves the condition of vehicles and facilities, such as the interior and exterior of buses, seating, windows, and shelters. Transit agencies typically clean bus interiors daily to remove litter, with more thorough cleaning performed periodically (e.g., monthly, quarterly, or annually), depending on the level of daily maintenance.

- Safety and Security:

  Safety refers to protection from accidents, while security focuses on protection from crimes or harmful behavior. This includes feeling safe from accidents during bus operations, crimes at stops or onboard, and incidents caused by other passengers. Safety and security are critical to creating a trustworthy transit environment.

- Information:

  Access to accurate and timely information is vital for passengers to plan and complete their journeys. This includes details about how to use transit services, locations of stops, transfer requirements, departure and arrival schedules, and guidance on reaching destinations. Without such information, potential users may struggle to effectively use the service.

2.10 The Concept of Public Transport Integration

The smooth coordination and operation of several public transport options within a city or region is referred to as the public transport integration system (PTIS) (Setiawan et al., 2024). The objective is to establish a cohesive, effective, and user-friendly transit system that makes it simple for people to move between various public transportation options. To accomplish this, three ideas are required: integrating transportation, offering passenger mobility services, and merging transportation connectivity.

According to (Simpson & Simpson, 2003), integration is the quick, easy, and affordable joining of services to create full passenger trips from their starting points to their destination. Timetables, tickets, and the provision of amenities like park-and-ride parking spaces, as well as specific services for the elderly or disabled, should all be incorporated into this (Real Jr, 2010). Brian Richards (2001, p. 151) emphasizes the need to enhance and increase the accessibility of public transport. Similarly, (Dewar & Todeschini, 2017) highlight that a key aspect of developing more efficient and integrated communities is leveraging various modes of public transport, ensuring each mode fulfills the role it is best suited for while maintaining seamless integration.

Non-integrated public transport systems are subject to neglect the customer needs which leads to low ridership ("SUTP Module 3f – Public Transport Integration and Transit Alliances," n.d.). There are several obstacles to use non-integrated public transport systems that can be summarized as follows: (Auerbach et al., 2009; SUTP, 2018)

- Transfer duration: considerable separations between transfer stops;
- Travel time: Inconsistent schedules and operator connections;
- Information: a confusing maze of tariff systems, or contradicting or inadequate information;
- Costs: There are rival, parallel services in some relationships;
- Comfort: For a single-trip travel, multiple tickets are required (unless there is a premium), which leads to costly fares, disorganized schedules, and no connections at transfer locations;

Therefore, the main step in making public transport systems appealing is to work towards improved integration of public transport options (in terms of physical infrastructure, fares, and timetables).

However, the following are listed as advantages of integrated transport networks by Prospects (2003):

- lowering travel times;
- lowering transportation expenses;
- lowering environmental pollutants and traffic jams;

It adds that solutions for transport integration may also increase accessibility and competitiveness and guarantee better use of various assets and modes of transportation.

These issues can be significantly resolved by integrating public transport systems (*Integrated Public Transport Systems: A Guidebook for Policymakers*, n.d.). The fundamental idea is to facilitate people's transitions between modes of transportation by offering smooth communication between them.

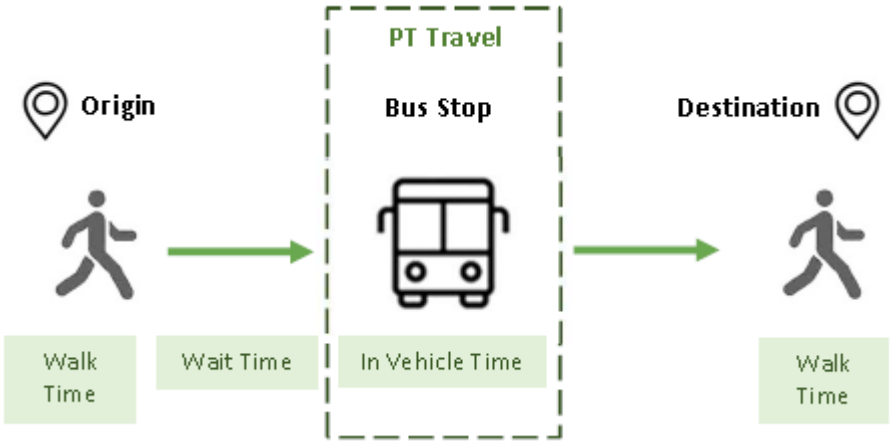

Figure 1 Various Legs of a Journey

Source: (ESCAP, 2024)

The term "integrated transport system" has been defined differently by different writers and organizations. Integrated public transport is defined as "a system that unites different transport modes and operators through coordinated organizational and planning efforts, supported by infrastructure and technology, to enhance convenience and efficiency for passengers" (ESCAP, 2024).

Increased use of public transportation offers economic, social, and environmental advantages for individuals, businesses, and the broader community, while also benefiting transport providers. Specifically, integrating public transport systems enables cities to move people more effectively and smoothly without depending on a single mode of transit. This integration can encourage a shift from private vehicles and motorcycles to public transport options.

2.11 Types of Services in Urban Transport

In general there are three options in terms of the overall service structure:

- Trunk-feeder services;
- Trunk-trunk service;
- Direct services;

- Mix of trunk-feeder services and direct services (hybrid services).

Trunk service: This type of transit connects the city's main hubs of activity, usually by bus or rail corridors. It often follows the public transport system's major corridor.

A feeder service is a type of transit that primarily serves inner cities or residential areas by picking up and dropping off passengers at a trunk transit stop.

A direct service is one that offers travel to all of the main starting points and destinations. To address the transportation demands of its residents, most metropolitan regions combine trunk, feeder, and direct services because it is typically not feasible to provide direct services to the entire city.

- Trunk – feeder services

  Feeder services utilize smaller vehicles to transport passengers from residential neighborhoods to terminals or transfer points, where they can switch to larger trunk vehicles for continued travel. While trunk cars go on dedicated lines or at major transportation hubs, feeder services may use shared lanes. The hub-and-spoke concept utilized in the airline sector is comparable to the trunk-feeder system.

2.12 Types of Integration in Urban Transport

Various scholars have addressed the idea of integrating public transport. Despite the fact that different research studies have given varying definitions of integration, they have all identified several key areas and levels of integration. The term "transport integration" appears in numerous publications and contexts. According to several researchers who conducted a thorough analysis of the transportation integration system, the concept of connectedness is a key component of transport integration. This concept encompasses various aspects, including fare integration, institutional integration, service and operational integration, and physical integration (Setiawan et al., 2024; Triana et al., 2022).

Theme of Integration: To enhance the performance of the transportation system, integration involves the strategic combination of various policy tools. Below are additional types of integration that contribute to the overall efficiency and effectiveness of the system:

Table 1 Types of Integration in Urban Transport

Type of Integration	Main Objective	Ways to achieve
Physical Integration	At mode interchanges, close proximity and convenience of access	In order to minimize the distance needed for passengers to switch modes, walkways and the surrounding area should be thoughtfully built.
Network Integration	Route coverage should be maximized, and each mode should work in tandem with the others.	Feeder services that employ Metro as a trunk route, buses, or trams/light rail. Physical integration is directly related to it.
Fare Integration	Common fare for multiple modes	Passengers may be provided a common card or ticket. This calls for cooperation from both modes' agencies.
Information Integration	Comprehensive and easy travel convenience	Make sure that passengers in both modalities have accurate and useful information. The role of ITS will be significant.
Institutional Integration	One organization can manage and make decisions with ease.	Give travelers in both modes accurate and useful information. ITS will have a significant role.

2.13 Benefits of Integrated Public Transport Systems

By linking various forms of transportation, infrastructure, and services, integration in transportation seeks to improve accessibility and mobility for both people and commodities, enabling the efficient and seamless movement of both between various locations. In order to guarantee continuous movement from door to door, transport integration incorporates organizational, technical, economic, policy, and informational principles and solutions. It facilitates the transfer of people and products and ensures a

safe, efficient, and smooth flow of people and goods from the point of origin to the destination by connecting various modes of transportation within a particular system (Solecka & Żak, 2014) .

For passengers	• Better public transit experiences that are on par with private vehicle travel. • Enhanced safety and dependability. • Shorter travel distances and expenses. • More flexibility, accessibility, and coverage while organizing travel. • Better mental and physical health. Citizens who have access to public transport walk for 8 to 30 minutes longer each day than those who do not, boosting their daily physical activity (Association, 2008).
For Transport Operators	• Promotes complementarity within the system and reduces harmful rivalry. • A rise in the use and income of public transport. • Better use of vehicles, more effectiveness, and more capacity for each mode and the system overall.
For Society	• Reduced emissions of greenhouse gases. According to some estimates, public transport might reduce harmful CO2 emissions by 37 million metric tons per year (Association, 2008) by slowing down the development in car miles driven, relieving traffic, and promoting more efficient land use patterns. • Greater road safety and quality of living. • Optimal use of scarce urban street space: On average, a bus can accommodate the equivalent passenger load of approximately 5.83 cars (Barr, 1997). • Increased social cohesiveness and inclusion: Although bad public transport affects all locals, those who are physically and socially disadvantaged frequently suffer the most.

2.14 Possible Integration Principles

Any city that wants to attain the maximum degree of integration must adhere to a set of established norms. Degree of integration in any city by using the following guidelines as a guide.

Fundamentally, the system needs to have an effective public transport system that consists of:

- All members of the public have ready access to high-frequency service.
- Well-marked, fast and simple connections;
- One ticket for multi-stage, multi-mode trips (such as train and bus);
- Real-time updates as the trip goes on;
- Integrated data for all city transport modes and external connections (including the integration of all bus and tram operators' route and timetable data);

It is essential to understand that integrating transport systems is a long-term endeavor that demands public backing, given its significant financial requirements and potential for temporary disruptions. The effectiveness of the entire initiative depends on the successful implementation of each phase.

(Westerman, 1998) introduced the Integrated Transport Planning Directive, emphasizing the importance of the planning process due to the complex trade-offs involved in aligning land use with transportation systems. He also highlighted the significance of stakeholder involvement and stated that this approach is applicable at all levels of planning, providing guidelines to encourage the implementing best practices.

Additionally, he recommended that before implementing universal ticketing systems, travelers should be given accurate and pertinent information in order to improve integration between different modes. Furthermore, he suggested that Intelligent Transport Systems (ITS) might be crucial to attaining integration.

According to studies by the English Tourism Council (ETB, 1999; ETC, 2001; Cole, 2001), the concept of the 4 I's is crucial for achieving integration within a system. They defined the integration equation as:

Information + Interchange + Investment = Integration

The development of an integrated passenger transport system may be hindered or even blocked by the absence of any one of these elements. Each component's specifics are described below.

- Information

Visitors need comprehensive and accessible travel information to navigate beyond initial transfer points to their destinations. This includes accurate and up-to-date bus and rail service details, timetables, and route planners, along with essential contacts and online mapping. Improvements are needed in signage at bus stops, rail stations, and platforms, as well as better coordination between connecting bus and rail services. Clear and user-friendly timetables, well-trained call center staff knowledgeable in route geography, and printed travel guides would greatly enhance the travel experience. These measures aim to create an integrated and efficient information system for seamless urban mobility.

- Interchanges

  Improving traveler convenience and promoting the use of public transport over private automobiles require smooth, high-quality interchange infrastructure. Clear and thorough interchange information, ease of mobility, safe parking for a range of cars, unambiguous directional signage, short walking distances, and clearly visible timetables are important requirements. Traveler satisfaction is also influenced by clean amenities, well-maintained infrastructure, left luggage facilities, and automobile rental services. In order to guarantee seamless transitions between various forms of transportation, enhance the overall travel experience, and support policy objectives for integrated mobility, efforts must be concentrated on putting these elements into practice (*Global Mobility: What It Is and Why It Matters*, n.d.).

- Investment

  Achieving traveler requirements and encouraging a shift to public transport requires strategic investment and organizational improvements. This includes enhancing the attractiveness of trains and buses through image upgrades and service quality improvements. In many cases, substantial long-term investment is needed to address the effects of prolonged underfunding. Large-scale public funding is essential to ensure the quality, reliability, and overall appeal of public transport systems, fostering sustainable modal change.

2.15 Role of Coordination for Integration Process

To accomplish common objectives, integration requires coordination. It needs to be executed at the operational, strategic, and implementation levels. In general, a top-down strategy is thought to be more successful at producing integration outcomes more quickly.

The table provided details the various stages of the planning process and the degree of coordination required during each phase.

Table 2 Role of coordination for Integration process

Stage of the planning process	Potential role of the coordination
Strategic planning	Planning and operating agencies consult with one another to define issues, needs, and potential solutions.
Implementation planning	Establishing a qualitative and quantitative method for identifying and developing projects while coordinating across government departments and geographical levels
Operational planning	Service coordination and synchronization of schedules among the different transport providers

2.16 Challenges for Achieving Integrated Public Transport

The successful implementation of policies still appears to be a significant issue, despite the fact that there are numerous planning techniques, operational strategies, policies, and aims to create integrated public transit.

A significant challenge in many cities and countries is the lack of public awareness about public transportation systems. To sustain an effective public transport network, urban transportation initiatives must foster collaboration and mutual understanding with the public, even with the presence of various state policies. Additionally, regulatory oversight is essential to ensure the integration and coordination of public transport services. It can be accomplished by a central organization that oversees and manages both dispersed operators and public transportation services. Regulatory control also requires policy documents that inform primary plan documents.

Cities and nations all over the world have institutional frameworks pertaining to public transport in metropolitan areas. These frameworks differ in how public transport is governed and run. Additionally, institutional systems differ from one location to another. Diverse planning and execution of public transport services are thus made possible by a range of institutional frameworks.

Since the 1980s, the private sector has become more involved in public transport globally, which has altered the planning and operation of public transport systems (Babalık-Sutcliffe, 2016). Privatization yields two primary outcomes. On one hand, private operators can help alleviate the financial strain on local authorities, potentially leading to more efficient, cost-effective, and profitable operations. On the other hand, the involvement of private operators often results in fragmented transportation planning and management (Babalık-Sutcliffe, 2016). This fragmentation makes it challenging to achieve integration in areas such as route alignment, fare structures, scheduling, and information systems.

In urban areas, public transportation services can be centrally managed and operated by a single authority. However, (Agarwal & Kumar, 2015) argue that these services are often fragmented across multiple institutions. This fragmentation or integration of institutions has a considerable effect on the efficiency and effectiveness of both planning and delivering public transport services.

The integration of various planning and delivery entities is linked to the planning and delivery strategies of public transport networks. Despite the differences between delivery and planning service institutions, coordination is essential for their integration. According to (Babalık-Sutcliffe, 2016), the two opposing inclinations are explained as follows: City officials have discovered that integrating all forms of public transport creates a synergy and presents a chance to increase public transport usage and, consequently, reduce the number of cars on the road. As a result, institutions and stakeholders start the process of restructuring their organizations. Nonetheless, public transport services (such as paratransit and privately operated buses) are still run by a number of agencies and organizations in the majority of Turkish cities, therefore city officials serve as coordinators. Although having a single transit authority handle all services may be more successful than a coordination organization, the latter is becoming more prevalent in today's disjointed service delivery system.

(Susnienė & Jurkauskas, 2008) suggest that private organizations in the public transport sector should explore and adopt innovative management models to ensure long-term sustainability by addressing stakeholder needs. They argue that incorporating private-sector characteristics can help public transport companies thrive and deliver successful

services (Susnienė & Jurkauskas, 2008). However, while this approach may offer benefits, the growing involvement of private operators also raises concerns about service fragmentation, as previously highlighted.

According to (Agarwal & Kumar, 2015), a lead institution must be established because public transport services are run by a number of entities with hazy definitions of their individual duties. A well-functioning lead institution can make choices through consultative processes, a clear division of responsibilities, and well-defined functions at both a spatial and functional level (Agarwal & Kumar, 2015).

These reasons demonstrate that in order to provide integrated, excellent, and effective public transport services, an institutional reorganization might be necessary. The quality of public transport systems can be evaluated based on several performance indicators, including system accessibility, travel time, reliability, service frequency, passenger load capacity, vehicle features, availability of information and support facilities, and the ability to meet mobility needs effectively. A few performance indicator-related characteristics, such as minimal operating costs for users, a minimum number of cars, and personnel without sacrificing service quality, can be used to gauge how efficient public transport systems are. According to (Sampaio et al., 2008), a proposal for institutional reorganizations can be generated using efficiency analysis.

Creating an integrated public transport system presents challenges beyond institutional issues and service fragmentation. For example, many problems stem from systemic flaws. Outdated infrastructure and technology can create barriers to seamless integration with other modes or lines, complicating efforts to achieve a cohesive and efficient transport network. For instance, the MRT system in London is outdated. Although having an established MRT backbone is a benefit, it also presents challenges, such as higher transfer times due to adaptation issues with new systems.

(V. R. Vuchic, 2010) claims that despite a number of obstacles, most big cities have made significant progress in terms of integration. There are instances where transit services that were previously independent have been incorporated into national or regional government agencies. Since the 1990s, intermodal coordination has been growing successfully, bringing with it new institutional contexts that integrate parking, pedestrianisation, and traffic control with transportation. Additionally, he highlights that

the top transportation cities, such as Stockholm, Toronto, Paris, Munich, and Portland, Oregon, all have one thing in common: they have fully integrated all public transportation providers and modes (V. R. Vuchic, 2010).

2.17 Literatures on Transport Integration Related to Research

The paper (Allard & Moura, 2016), states that there are various approaches to implementing the transport integration system, including

a. Tariff integration, which can lower user prices and improve vehicle accessibility and use by allowing a single ticket to be used to pay for several forms of transport inside a single integrated system;
b. Schedule integration involves schedule coordination between various types of transportation so that users can easily switch from one mode to another without waiting too long (Setiawan et al., 2024);
c. Information integration entails giving customers access to organized transportation data, including web applications or transportation information centers, so they may quickly locate schedules, routes, and ticket costs for different modes of transportation;
d. Network integration can expand the number of cars available and enable customers to select the most efficient routes by connecting different forms of transportation through an integrated network;
e. Institutional integration: More detailed suggestions for enhancing intramodality call for enhanced institutional capacities and, in certain situations, the establishment of completely new, independent institutions.

There are three determining aspects in realizing a transportation integration system:

- Physical,
- Operational
- Institutional.

The indicators affecting the connectivity and transport integration system's success are known through a literature review of these three factors.

2.17.1 Physical Integration

Physical or infrastructure integration, according to (Miller, 2004), refers to tangible modifications such the construction of interchanges or transfer points and the integration of new routes. The design, placement, and amenities of stops, stations, and transfer

centers are all included in this. Additionally, it facilitates the coordination of vehicle movements to guarantee safe transfers devoid of human-vehicular collisions.

To enhance accessibility and connectivity within the intermodal transit system for all users, efforts focus on streamlining transfers, ensuring smoother movement, and minimizing disruptions. This is achieved through thoughtful system planning, including well-designed stations, clear pedestrian pathways, and convenient station facilities (Saliara, 2014).

As it is closely linked to accessibility, transportation, and infrastructure—all of which are explicitly evaluated as part of the physical integration assessment—the physical component is a component of the realization of transportation connectivity.

2.17.2 Operational Integration

To ensure efficient, uninterrupted, and seamless services, the transit system must be planned and coordinated with minimal disruptions in time and space. This concept is referred to as operational integration. It involves synchronizing timetables across different modes and routes, facilitating smooth transfers, providing comprehensive service information, implementing consistent pricing, and offering user-friendly ticketing systems. According to Richards, passengers often find interchanges to be the least appealing aspect of public transportation (Yiu Kwok Kin, 2005). Key indicators of operational integration include information and communication technology (ICT), time efficiency, cost and payment systems, ticketing processes, scheduling coordination, and location accessibility.

2.17.3 Institutional Integration

An important prerequisite for developing a well-integrated public transport system is empowering an independent metropolitan authority with the authority to enforce a comprehensive set of service standards (C. Nash, 1988). To overcome the divisions between modes and services provided by different agencies, collaboration must be ensured by a neutral overarching organization that consolidates the diverse roles, responsibilities, and jurisdictions of the involved operators at multiple levels. This established authority must define clear objectives for the system while balancing the financial interests of operators with the needs and expectations of public transport users (Rivasplata et al., 2012).

The institutional aspect utilizes indicators such as organizational structure, contractual arrangements, execution approaches, competition regulations, and specific challenges related to different modes of transport. The unique agreements and contracts that guarantee the stakeholders' interest and dedication to the system's operation are referred to as organizational integration.

The indicators used to evaluate the implementation of transport integration are shown in the table below.

Table 3 Indicator of Integration Transport

Aspects	Indicator	Related Literature
Physical	Infrastructures	(Solecka & Żak, 2014), (Saliara, 2014)
	Accessibility	(Pourramazani & Miralles-Garcia, 2023)
Operational	Location/Route	(Jiang et al., 2022)
	Schedule and Time	(Allard & Moura, 2016), (Jiang et al., 2022)
	Fare and Ticket	(Takahashi, 2017), (Triana et al., 2022)
	Digital Payments	(Solecka & Żak, 2014)
	Information on Routes, Schedules, and Transfer Points	(Allard & Moura, 2016)
Institutional	Institutional Design	(Allard & Moura, 2016)
	Implementation Methods	(Allard & Moura, 2016)
	Competition Law	(Allard & Moura, 2016)
	Contractual Issues	(Allard & Moura, 2016)

Research by (Setiawan et al., 2022) emphasizes the importance of regional development conditions and the critical role regulators play in overseeing the transportation sector, while also revealing the challenges and constraints in implementing a Public Transport Integration System (PTIS). Key obstacles include regulatory linkages, coordination issues, and limited jurisdictional authority. The study suggests that strengthening the role of regulators and fostering collaboration with public transport operators are essential steps toward creating a cohesive transport system that effectively meets the travel needs

of the community. Depending on their unique requirements, resources, and difficulties, cities and nations make different efforts to integrate their transportation systems. Long-term planning, financial commitment, and cooperation from several parties are frequently needed.

2.18 Review of Other Related Studies

In this section attempt has been made to review the relevant studies done by other researcher related to case study area and topic previously. This includes review of articles, dissertations and other reports.

A research on the planning, creation, and evaluation of sustainable local transport networks was carried out in 1989 by Henson and Essex. The study aimed to explore the relationship between urban areas and transportation systems, with a specific focus on street design and transportation networks. The architecture of local networks and the impact of individuals using various means of transport are of particular interest. Researchers have come to the conclusion that urban growth is influenced by transportation. The density of development has a significant impact on how often and how people travel. If density and network characteristics are more closely correlated, then transport policy may focus on other goals, such preventing crime or promoting architectural beauty. To enhance the quality and sustainability of urban environments, policies related to design, density, and transportation models must be distinct yet coordinated, ensuring they work in harmony. There must also be a focus on measuring the effectiveness of street networks (Henson & Essex, 2003).

Gyanwali conducted a study in 1996 to assess the condition of roads in Pokhara. The study aimed to evaluate the current state of roads in the Pokhara Sub-metro Municipal Corporation. Based on the findings, the researcher concluded that the pressure from overloading vehicles on the roads should be managed by constructing additional roads to enhance their durability. Furthermore, it was recommended that better-conditioned vehicles be promoted to help preserve the environment of Pokhara (Gyanwali, 1991).

In 1963, Upadhaya conducted a study on transportation in Nepal, aiming to examine the challenges and opportunities within the country's transport sector. On the basis of findings, researcher conducted that the topographical condition of the country, negligence of government, lack of finance, technicians and proper equipment are the problems of

transport in Nepal. The researcher also concluded that road transport is the sole means of connecting villages and transporting goods between them. Given the topographical features of the country, road transport will be highly beneficial for the nation (Upadhaya, 1993).

Pradhan has conducted a study on transport and communication in Nepal in 1964. The researcher pointed that mountains, lack of modern equipment and extreme scarcity of capital are the major barriers to transport. On the basis of the findings, researcher conduced that national market can only be developed with transport system connecting all the important places and the market of all the places. So, the development of good system of transportation is the lifeline for the economic development of the country (Pradhan, 1997).

Dogra conducted a study on transport in India in 2008 with the objective to analyze the problem and prospect of transport in India. On the basis of findings, researcher conducted that the topographical condition of the country, negligence of government, lack of finance, technicians, proper allocation of resource and proper equipment are the problems of transport in India.

Rijal (2014) had conducted a research on transportation, Cost and Profit Management problem in Nepal A case study of Prithvi Rajmarga Bus Sanchalak Samitte. His study focused on analyzing capacity utilization and profitability of Pokhara-Kathmandu Mini-Micro Buses (Psd, n.d.). The research examined financial statements spanning five years. The major findings are as follows:

The contribution margin is lower because the company's variable costs account for a bigger share of total costs than fixed costs. Payroll, fuel, insurance, maintenance, cellphone charges, depreciation, and daily food expenses are only a few of the company's significant fixed and variable costs. The business has no plans to cut expenses. Effective cost-control strategies and programs are lacking. The primary power to fix prices is the board of directors, which also directly affects the cost per passenger. The Prithvi Rajmarga Bus Sanchalak Samittee does not properly divide costs into controllable and non-controllable, or fixed and variable. The administration and bus workers do not properly coordinate. The capacity of the Prithvi Rajmarga Bus Sanchalak Samittee has not been used. Fuel, insurance, maintenance costs, cellphone charges, depreciation, daily

food expenses, and salaries and wages are just a few of the company's significant fixed and variable costs.

(Duwadi et al., 2019) conducted a study examining passenger satisfaction and the operational effectiveness of the public transportation system in Pokhara, Nepal. According to the report, various bus services performed exceptionally well in various areas of service provision. In order to improve passenger happiness, the study underlined how crucial it is to maintain or raise the existing performance level. Jain et al. (2020) suggest a way to assess public transport systems from the viewpoints of the city, operators, and passengers. The study highlights the necessity of thorough assessment to enhance current systems, especially in environments with limited resources, such as developing nations. When the approach was used in Bhopal, it yielded insightful information for management decision-making in public transit.

Four key performance indicators (KPIs), along with twenty-nine micro-indicators, were utilized to assess the efficiency of public transportation in Kathmandu, Nepal (Mishra, 2022). The study identified several areas requiring improvement, such as employee misconduct, overcrowding, and passenger discomfort during peak hours. It underscores the importance of continuous monitoring and benchmarking to enhance the effectiveness of public transport systems.

(Ahasan & Kabir, 2019) assess the Dhaka public transport system's performance in five areas: network efficiency, cost efficiency, utilization efficiency, system efficiency, and service efficiency. According to the study, problems like traffic congestion are preventing the current system from functioning effectively. It makes recommendations for long-term fixes, such as installing metro tracks and bus rapid transit and enhancing infrastructure and administration.

(Tiwari et al., 2023) assessed the significance of several elements in Kathmandu's public transport system using a technique known as fuzzy-AHP. According to the survey, the most crucial element was vehicle safety. Enhancing customer satisfaction with public transport services is possible with the help of this data (Echaniz et al., 2020).

According to Agarwal and Kumar (2015), a lead institution must be established because public transport services are run by a number of entities with hazy definitions of their

respective responsibilities. A strong lead institution is capable of making decisions through inclusive and consultative processes, supported by a clear allocation of responsibilities and well-defined roles at both spatial and functional levels.

These points highlight that achieving integrated, high-quality, and efficient public transport services may necessitate institutional restructuring. The performance of such systems can be evaluated based on factors like accessibility, travel time, reliability, service frequency, passenger load capacity, vehicle quality, availability of information and support facilities, and the ability to meet mobility needs effectively. A few performance indicator-related characteristics, such as minimal operating costs for users, a minimum number of cars, and personnel without sacrificing service quality, can be used to gauge how efficient public transport systems are. According to Sampaio et al. (2008), a proposal for institutional reorganizations can be generated using efficiency analysis.

(V. R. Vuchic, 2010) claims that despite a number of obstacles, most big cities have made significant progress in terms of integration. There are instances where transit services that were previously independent have been incorporated into national or regional government agencies. Since the 1990s, intermodal coordination has been growing successfully, bringing with it new institutional contexts that integrate parking, pedestrianisation, and traffic control with transportation. Additionally, he highlights that the top transportation cities, such as Stockholm, Toronto, Paris, Munich, and Portland, Oregon, all have one thing in common: they have fully integrated all public transportation providers and modes (V. R. Vuchic, 2010).

In conclusion, there are successful examples from throughout the world despite the numerous obstacles to providing integrated public transit systems. Despite challenging circumstances, some cities have managed to sustain integrated public transport systems for decades. By studying these successful cities, valuable insights can be gained into the effective implementation of integrated public transport systems.

2.19 Some Examples of Public Transport Integration

2.19.1 Planning Integrated Public Transport Systems

Transportation and land use are closely linked. Travel patterns are fundamentally impacted by the location and layout of spatial development. The choice of land use is also influenced by the location and features of important transportation infrastructure.

- **Ahmedabad, India**

As of 2021, Ahmedabad, the largest city in Gujarat, is India's sixth-largest metropolis, with a population exceeding 7 million and an area of 488 square kilometers. Recognized as India's first UNESCO World Heritage City, Ahmedabad has a rich history of urban planning. The city's planning framework is guided by the Gujarat Town Planning and Urban Development Act (GTPUDA) of 1976, which outlines a three-tier planning process. This includes the creation of a Development Plan (DP) to establish a broad framework for growth across municipal boundaries, the implementation of Town Planning Schemes (TPS) for land readjustment to facilitate urban development, and the preparation of Local Area Plans (LAP) to allocate land for public purposes.

Ahmedabad is renowned for its well-structured ring-radial road network, which serves as a prime example of effective public transport integration. The city's public transportation system includes the Ahmedabad Municipal Transport Services (AMTS), the Bus Rapid Transit System (BRTS), and the Ahmedabad Metro, operated by the Gujarat Metro Rail Corporation Limited (GMRCL) (*Constitution*, n.d.). These systems collectively provide extensive bus and metro services, catering to approximately 650,000 to 700,000 daily bus passengers, accounting for around 8% of the city's public transport usage in 2022. The metro system, on the other hand, serves an average of 50,000 passengers daily. The alignment of bus ways and metro routes is strategically designed to prioritize mobility and reduce congestion, offering road users enhanced services and facilities. The transit network adheres to the complete street concept, ensuring dedicated right-of-way for efficient and seamless transportation.

2.19.2 Public Transport Modes

- **Seoul, Republic of Korea**

Seoul's urban transport system has continuously evolved in response to economic growth and the increasing demand for transportation. Until 1945, surface trams were the dominant mode, serving over half of the city's population. However, trams were abolished in 1968, and public buses took over as the primary transport method. While the population in the central area of Seoul has been declining since 1992, suburban areas in the metropolitan region have continued to grow. To address the growing transport needs, Seoul introduced a new bus system in 2004, where buses are color-coded—blue, green, red, and yellow—based on their routes, making it easier for passengers to identify their

destinations. The city is also divided into eight distinct zones, which are indicated by the bus's numerical designation, simplifying navigation.

The T-Money card, Seoul's transportation payment system, goes beyond being a simple fare card, facilitating transfers between different transport modes and offering fare discounts. The city's public transport system is integrated by connecting urban railways and expressways, addressing regional travel needs. The Seoul Metropolitan Government (SMG) controls the bus companies, treating them as public utilities to maintain consistent service. However, the strict regulations governing bus routes, fare structures, vehicle numbers, and service frequencies make it difficult for bus operators to adjust and improve services. This control also risks an imbalance in transport modes, potentially leading to greater reliance on private vehicles.

- **Mumbai, India**

The public transport systems of Mumbai, which include the suburban rail, metro, monorail, and bus, are used by 67% of commuters. Brihanmumbai Electricity Supply and Transport Undertaking (BEST) is in charge of running the bus service. The BEST fleet, which consisted of 3,228 buses in May 2023, served 3.3 million passengers every day. This fleet includes 406 electric single-decker buses, 45 diesel double-decker buses, 2 electric double-decker buses, 2,250 CNG vehicles, and 525 diesel single-decker buses. The maximum number of people that electric AC midi buses can accommodate is 33.

2.19.3 Operational Strategies

Every trip on public transit involves multiple legs. Services must function in a way that maximizes efficiency, taking into account the origins and destinations as well as the characteristics of the people going between them.

- **Thiruvananthapuram, India**

In 2021, Thiruvananthapuram (Trivandrum), the capital of Kerala in southern India, had a population exceeding 2.7 million. The city's public transportation system was operated by the Kerala State Road Transport Corporation (KSRTC), the Kerala Urban Road Transport Corporation (KURTC), and private operators, with approximately 1,000 buses servicing 650 routes. KSRTC, which managed 90% of the fleet, had been providing city and suburban bus services in Trivandrum for five decades. Despite covering 88% of the city area and 89% of the population, the system experienced a decline in ridership in

recent years. Challenges such as a lack of integrated planning, mismatched urban and suburban services, centralized routes, low population coverage despite high-frequency operations, and inefficient data management contributed to these issues. Historical route structures led to overlapping services and operational inefficiencies.

To address these problems, the Kerala government, with funding from the GIZ SMART-SUT project, commissioned the Centre for Research Development Foundation (CRDF) at CEPT University in 2019 to conduct a study titled "Route Rationalization and City Bus Improvement." The study proposed several reforms, including the separation and reorganization of city and suburban services, the introduction of new circular routes, the termination of most suburban services at the city limits, and the extension of select suburban routes to the city center. Additionally, the study developed the E-TRAM (ETM-based Tool for Route Analysis and Monitoring) to monitor and evaluate route performance, aiming to enhance the efficiency and effectiveness of Trivandrum's bus system (*E-TRAM Tool | CEPT Research and Development Foundation*, n.d.).

The Thiruvananthapuram City Circular bus service was consequently introduced in 2021, spanning all of the city's main districts and providing high frequencies at 15-minute intervals during rush hour. In order to provide passengers on radial/trunk routes with transfer points, the buses run through interchanges. The KSRTC also established a distinct company, SWIFT, which runs long-distance services, in order to lower operational losses. By doing this, the organization is gradually raising the city's bus services to the level of those in other countries.

- **Bogota**

Bogotá, the capital and largest city of Colombia with a population of 6.77 million and covering an area of 1,587 square kilometers, boasts an efficient Bus Rapid Transit (BRT) system called Transmilenio. This system serves both trunk and feeder services, with 470 articulated buses, each carrying up to 160 passengers, and 300 standard feeder buses with a capacity of 90 passengers. Transmilenio also features well-designed, closed terminals that facilitate easy transfers between services. Passengers can use a single ticket to transfer between the main and feeder services. With an average travel distance of 16 km, Bogotá’s key corridors are well-connected by the BRT system.

Apart from the Transmilenio, Bogotá has four primary public transport options: the BRT system, informal or illegal (also known as pirate) services, spun-off services, and traditional bus services. Through fare-based competition, Transmilenio faces off against the conventional bus service, which is run by private operators.

- **Singapore**

Prioritizing city-wide planning is the first approach of Singapore, an island city-state with 5.6 million (2016) residents and a total area of 710.2 square kilometers (Wang and Yeh, 1993). Standard and small buses are among the flexible and local services offered by the transit system, which also includes a permanent, quick, and comfortable electric train. In Singapore, buses and trains are seamlessly connected. The high-density urban development surrounding transit stations is credited with this model's effectiveness. In Singapore's urban structure design, major and minor sub-center nodes are established at high densities where light rail lines and radial and circumferential mass transport lines intersect.

Because most of the city's activities are centered within walking distance of stations, making it simple to get there on foot or by transport, integrated development around stations has been successful.

Singapore uses an effective pricing mechanism to control traffic congestion. It was the world's first city to implement electronic road pricing for congestion charge and the area licensing scheme. A vehicle quota system and other ownership levies keep car prices high.

- **Hong Kong**

With almost 7 million residents, Hong Kong is one of the world's most densely populated areas. The city boasts a highly efficient public transportation network, seamless integration of land use, and stringent regulations on private vehicle usage. Given its geographical limitations, scarce land resources, and the risk of significant traffic congestion with increased car dependency, Hong Kong’s urban planning has prioritized the development of compact, mixed-use hubs. These hubs are designed to ensure that most daily necessities are within walking distance. The Mass Transit Railway (MTR)

system now serves as the primary link between these nodes, minimizing the reliance on private cars or overcrowded buses for longer commutes.

Hong Kong's traffic management strategy prioritizes efficient land use and transit integration in addition to making the most of the current road network rather than increasing road capacity to promote automobile use. The average traffic speed increased from 20 km/h in 1979 to 24 km/h in 1988 and 26 km/h in 1991, demonstrating the effectiveness of this strategy (Kam, 1993).

About 90% of all passenger trips in Hong Kong are made via public transport, making it the most popular mode of transportation in the city (*Transport Department - 5 CO-ORDINATION OF DIFFERENT TRANPSORT MODES*, n.d.). The primary source of trunk lines is the heavy metro system, which transports a large number of people at a low marginal cost and with minimal environmental impact. Light rail transit (LRT) and buses are also significant sources of trunk services.

2.19.4 Interchanges

There are multiple decision points as the traveler reaches the station, where they can choose between various trip-related tasks like purchasing a ticket, waiting, boarding, and disembarking from the aircraft. The different kinds of spaces found in interchanges are essential to maintaining both the efficient running of the transportation system and the smooth movement of passengers.

- **Purabaya Intercity Bus Terminal, Surabaya, Indonesia**

With almost 3 million residents, Surabaya is Indonesia's second-biggest metropolis. In addition to five commuter train lines and other unofficial transit options, the majority of the city's residents rely on bus services for public transportation. The city has been served by the Suroboyo Bus system since 2018. It may be identified by its bright red buses and its unique fare payment method, which lets customers pay for their tickets with PET plastic bottles. After Beijing's subway launched this technology in 2014, Surabaya became the second city in the world to adopt it.

The Purabaya Intercity Bus Terminal is a notable example of a contemporary and effective transportation hub within the bus network. It makes switching between urban, suburban, and intercity buses easy for passengers. With a total of 577,820 arrival buses

and 575,794 departure buses, the terminal handled 16,151,715 arrivals and 16,071,055 departures in 2016. With a mosque, bus information services, ticket booths, waiting places, kiosks, dining options, restrooms, and two-story departure halls, the station is well-equipped. Ten city bus bays and twenty-five intercity and suburban bus bays are connected by a flyover. Juanda International Airport is roughly 20 minutes away, and there is also an agent for the Indonesian National Maritime (Pelni). Southeast Asia's biggest bus station is the Purabaya station.

2.19.5 Data and Digital Applications

Around the world, urban public transit systems are using digital technologies more and more. These programs facilitate the seamless integration of fares, services, information sharing, and several other elements that comprise public transportation systems.

- **Sydney, Australia**

Sydney's "30-minute city" is a key component of the Greater Sydney Commission's and Transport for New South Wales' Metropolitan Plan. This initiative aims to improve connectivity inside and between Greater Sydney's 34 key centers by increasing the frequency of public transport services to metropolitan centers. Residents will eventually be able to access to key city sites (work, school, shopping, health, and leisure activities) in less than 30 minutes, regardless of their mode of transportation.

Data is a key component of the 30-minute city's planning. To better understand the city's traffic flows, Big Data from Sydney Metro's Opal Smart Cards and general transit feed characteristics are being used to determine the movement trajectories of both private and public vehicles. Over 850 million data points were gathered as a result of these methodologies, and they have now been made accessible for quick analysis through a variety of visualization techniques, such as clustering, point clouds, heat maps, and animations. The results of this study show that transport agencies can use open-source Big Data visual analytics on a wide scale to plan route management and make cities more livable. The city's post-pandemic rehabilitation and resilience will be strengthened by its close proximity to the centers of Greater Sydney. Additionally, there are opportunities to invest in public transportation connections for new towns and concentrate employment and services in industrial regions and centers close to where people reside.

2.19.6 Integrating Fare Systems

- **Surat, India**

Surat started a revolutionary journey in 2014 to create a strong and all-encompassing bus system, which included a High Mobility Corridor (HMC), a City Bus system (CBS), and a Bus Rapid Transit (BRT) system. Sitilink, a special-purpose vehicle created by the Surat Municipal Corporation, runs all public transport networks. For both single and multi-modal trips, the city uses a single ticketing and fee system that is based on the distance travelled. The city's transit system is segmented into phases, but the fare stays the same regardless of transfers.

In use is a complete Automated Fare Collection System (AFCS). Tripod-Fare Gates are installed at BRTS stations and terminals, where off-board fare collecting is carried out. The ICICI Bank-managed open-loop Smart Card, also referred to as the Surat Money Card, serves as the payment method. These cards are reloadable with credit, debit, or cash, making them versatile. Although cash purchases can also be made with barcoded paper tickets, digital payment options are becoming more and more common throughout the city.

2.19.7 Institutional Integration

The findings indicate that the Government of Queensland views partnerships between the public and private sectors as crucial in transport planning. TransLink integrates rail, bus, and ferry services, offering unified ticketing, service, and information. Brisbane enhances bus services by expanding busways and transit lanes to better integrate with rail and ferry services, and new rail tracks and stations are under construction or being upgraded. Co-ordination among public transport modes is essential for a successful integrated system, with fares based on the number of zones a passenger crosses. The experiences of Singapore and South-east Queensland demonstrate that effective public transport integration requires cooperation, co-ordination, and partnerships. Both governments have focused on upgrading services through integration, including unified tickets, information, and services. The rail system remains vital, but the importance of feeder bus services is equally recognized. Significant improvements in the bus system have been made to support this integration. Furthermore, the integration of public transport with land development and other planning initiatives has improved connectivity and accessibility. Since the introduction of TransLink, patronage in South-east Queensland has

significantly increased due to better service and more affordable trips. Comparing these integrated systems to Hong Kong's, it is evident that cities like those in Australia and Singapore have more intensively developed systems, offering valuable lessons for Hong Kong's future direction in public transport service.

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2.20 Learning's From the Best Practices

Planning feeder services for integration with trunk services involves several steps, including identifying areas with the highest potential transit use and determining appropriate routes. Feeder services are intended for secondary routes that still need reasonably high frequency and scheduled services but have lesser passenger or demand than the main trunk service. These routes usually serve inner-city commercial districts or suburbs where it is necessary to connect several branches of the mass transit system.

Feeder routes should be designed to transport passengers from trunk service terminals to various branches. The routes should ideally start or end within 500 meters of the trip's origin or destination. They can follow loop designs, as seen in Singapore for shorter routes, or have open-ended designs, as exemplified by Bogotá.

Integrated transport networks in places like Singapore and Hong Kong were not initiated on a single platform. Real integration was instead accomplished by means of a concerted effort and close collaboration between operators and transport authorities. Singapore effectively adopted a methodical strategy to multimodal travel, leveraging government investment and state-of-the-art public transport infrastructure (MRT and LRT). Because of its dense population and easy access to public transport, Hong Kong already boasts a well-developed infrastructure. However, further improvements in interchanges will continue to enhance its transport system.

Table 4 Factors of Integration in Case Study Cities

Factors for Integration	Where it is done	How it is done
Institutional Structuring	Bogota and Singapore	Transmilenio provides free transfers between its feeder and trunk lines in Bogota. Since the LTA is in charge of overseeing all transportation regulations in Singapore, transfers are organized well to minimize commuter discomfort.
Interchange Design	Singapore	Transfers take place in a closed setting, with a large portion of activities taking place within walking distance of stations and stations being easily accessible by foot or public transportation. In Singapore, 65 percent of commuters walk to and from the transit hubs. The walkways are always kept clean and safe.
Fare Structuring	Seoul	T-Money is a transport cad in Seoul. When switching to a mass transit method to go to your destination, you can get the fare discounts.
Land use - transport Integration	Hong Kong	There was enough demand for transport systems since Hong Kong provided high-density regions along the transit station. Every station has a variety of land uses, offering

Factors for Integration	Where it is done	How it is done
		commuters a wide range of amenities. Businesses raise money for the transportation company at the retail level, where the vertical level of integration takes place.
Network Design	Singapore	LRTs are intended for residential areas, while heavy tracks are intended for high-density routes. In order to supplement those services, the bus services will serve as feeder routes.
Bicycle – bus integration	Bogota	There is almost no non-compliance with Bogotá's ramped pedestrian bridges, which function fairly effectively. Among its salient characteristics are its 2.5-meter width, visual appeal, cleanliness, and well-maintained facilities.

Insights from Other Integration Principles

- Using a single ticket system for all or most public transport options has several benefits for passengers. It shortens the time needed to switch between modes.
- Passengers' comfort and ease are increased by real-time information regarding the transportation system both on and off board.
- Even those with physical disabilities can access stations more easily because to their barrier-free design.
- Passengers' efforts during transfers are greatly influenced by the locations of stations in multi-transport systems. The transfers could be made between various modes or between on-grade modes (using interchange cross platforms could be helpful).
- When a transfer is necessary, passengers should be avoided in order to prevent obstructing normal traffic.

2.21 Institutions and Governance in Public Transport Services

2.21.1 Constitutional Provisions in Nepal

The Constitution of Nepal, under Article 51 (Policies of the State), Paragraph (h), Sub-paragraph 14, outlines comprehensive directives for the development and management of the transportation sector. It emphasizes enhancing investment to improve infrastructure and services while ensuring simple, easy, and equal access to transportation for all citizens, including marginalized groups. The Constitution prioritizes the safety,

systematic regulation, and disabled-friendly design of transport systems to create inclusive mobility solutions. Additionally, it advocates for the promotion of public transportation and the regulation of private vehicles to reduce congestion, pollution, and fuel dependency. Environment-friendly technologies, such as electric and non-motorized transit, are also encouraged, aligning with Nepal's commitment to sustainability and global climate agreements. These provisions provide a robust framework for fostering equitable, efficient, and environmentally conscious transportation development across the country.

2.21.2 National Transport Policy, 2001 in Relation to Urban Transport

The National Transport Policy, 2001 emphasizes the need for a public transportation system that is affordable, safe, reliable, comfortable, pollution-free, and accessible. It underscores the importance of developing transport infrastructure in alignment with urban development master plans, with central-level facilitation supporting locally implemented projects. By prioritizing public transit systems, the policy aims to address the growing challenges of urban mobility, ensuring that transportation services cater to the needs of all citizens, including marginalized and low-income groups. This approach aligns with broader urban planning goals to create inclusive and sustainable cities.

By combining land use planning with transport development, the policy's working strategies concentrate on preserving traffic density and movement within each urban area's carrying capacity. It includes measures such as separating cycle lanes, relocating essential utility services away from roads and footpaths, and designating core city areas as non-motorized zones. Environmentally friendly transit solutions, including solar, electric, or gas-powered vehicles, are encouraged alongside capping vehicle ownership, imposing parking charges, and setting specific standards for urban vehicles. For Kathmandu Valley, the policy emphasizes long-term planning to develop and expand its transport infrastructure and services, reflecting a comprehensive approach to urban mobility management.

2.21.3 The Urban Area Public Transport (Management) Authority Act, 2022

The Urban Area Public Transport (Management) Authority Act, 2022 is a landmark legislation in Nepal aimed at addressing the growing challenges of urban mobility through systematic public transport management (Nepal, 2024). The Act establishes an

independent authority responsible for planning, regulating, and overseeing urban public transportation systems. It emphasizes the development of sustainable, efficient, and accessible public transit, including integrating environmentally friendly technologies such as electric buses and non-motorized transport. The Act mandates coordinated efforts among federal, provincial, and local governments to ensure inclusive urban transit services, particularly for marginalized and low-income populations. Additionally, it includes provisions for setting service standards, optimizing routes, regulating fares, and promoting private-sector involvement through public-private partnerships (PPPs). By focusing on modern transit solutions, the Act seeks to enhance urban livability, reduce traffic congestion, and mitigate environmental impacts in Nepal's rapidly growing cities.

2.21.4 Other Plans/Programs for Transport Improvement

In order to address important concerns such the absence of a strong institutional and legislative framework and the limited ability of institutions and personnel to plan and govern urban areas, the National Urban Development Strategy 2017 lays out specific goals. Additionally, it suggests tactics such as the establishment of a Special Purpose Vehicle (SPV) with municipalities owning equity shares for the execution of major infrastructure projects. It also recommends testing out major projects like Bus Rapid Transit (BRT) systems.

The Public Transport Code of Conduct, introduced in 2010, was designed to ensure public transport provides a safe, accessible, and convenient experience, particularly for women, children, and individuals with disabilities.

2.21.5 Legal Instruments for Transport Management

Transport management in Nepal operates under a multi-tier governance framework, with responsibilities distributed across the federal, provincial, and local levels. This decentralized structure enables each level of government to address specific transportation needs and challenges while aligning with overarching national policies and goals. The legal instruments guiding transport management are tailored to ensure the systematic regulation, operation, and development of transport systems at each level of governance.

Federal:

- Motor Vehicle and Transport Management Act, 1993

- Motor Vehicle and Transport Management Rules, 1997
- Urban Area Public Transport (Management) Authority Act, 2022
- Standards, Directives, Work-Procedures formulated by the Federal Government

Provincial:

- Provincial Motor Vehicle and Transport Management Acts
- Provincial Motor Vehicle and Transport Management Rules
- Provincial Transport Operation & Management Boards (Order)
- Standards, Directives, Work-Procedures formulated by the Provincial governments

Local:

- Local Motor Vehicle and Transport Management Acts
- Local Motor Vehicle and Transport Management Rules
- Standards, Directives, Work-Procedures formulated by the local governments

CHAPTER 3: METHODOLOGY

The process of attempting to better understand the interactions of people, space, location, and environment is known as research. It is an ongoing process of investigation and learning (*What Is Learning? Definition, Process and Types » PIECE — WITHIN NIGERIA*, n.d.). According to (Mikkelsen, 2005), research is the process of producing knowledge by using inquiry to find answers to questions. A cohesive collection of rules and processes that can be utilized to analyze a situation or phenomena is what (Kitchin & Tate, 2013). p. 6) describe as it is. Every study has certain aims and objectives. The methodology is chosen based on the goals. A researcher uses a specific technique to create, evaluate, interpret, and present data by incorporating all scientific procedures.

The theoretical framework establishes the foundation of a research project's technique (Sen, 2016). Practice, methodology, and theory are all closely related (Kitchin & Tate, 2013). Methodology is a meso-level theoretical construct that enables researchers to convert their theoretical and philosophical presumptions into data, according to Warf (2006, p. 486). Discussions of the research methodology employed in this study are included in this chapter.

This chapter outlines the research methodology employed in this study, exploring the research framework and the philosophical approach guiding the process to meet the study's objectives. It covers the study's context, sample design, measurement strategy, data collection methods, and data analysis techniques, all of which are detailed to support the presentation of the research finding.

3.1 Research Methodology

The study collected and analyzed data using a mixed-method technique. To get thorough information about the Study Area, primary and secondary data sources, as well as quantitative and qualitative methods, were used. Surveys, interviews, and field trips to various public transportation lines and pertinent government officials were all part of the primary data collection process. Reports, literature studies, and statistical information from governmental organizations and business associations were examples of secondary data sources.

3.2 Research Paradigm

According to (REO, 2020), research is the systematic analysis and study of data and sources in order to establish facts and derive new conclusions. Researching is not a simple task. The researcher's paradigm, or theoretical framework, greatly influences the precise definition of study. Understanding and expressing our fundamental beliefs about the nature of reality, what can be learnt about it, and the methods used to get this knowledge are crucial for researchers. These foundational beliefs constitute what is known as research paradigms. Many people have defined paradigm in their own way.

According to Thomas Kuhn, a paradigm is the set of underlying presumptions and conceptual framework that serve as the foundation for research and advancement in a field of study. On the other hand, a paradigm, in the words of Patton (1990), is a world view, a broad perspective, and a method of deconstructing the complexity of the actual world. From a research perspective, Guba and Lincoln's concept also appears to be the most appropriate. According to (Guba & Lincoln, 1994), a paradigm is a foundational system or worldview that directs the researcher and shapes basic ontological and epistemological viewpoints in addition to the methods chosen.

According to Brad Wray (2011), a research paradigm refers to a set of shared assumptions and perspectives among researchers about how problems should be approached and addressed. This study aligns with the pragmatic paradigm, which emphasizes the active resolution, questioning, and interpretation of reality. Pragmatism acknowledges its limitations and complementary nature, allowing for the use of diverse methodologies. By embracing a mixed-methods approach that combines qualitative and quantitative data, pragmatism allows for a more thorough and nuanced understanding of the complexities inherent in public transportation systems. Given the complexity of urban transport networks, where several stakeholders and a wide range of elements interact, this strategy is especially pertinent (Bochel & Duncan, 2007). To gain a deeper understanding of reality, mix approaches combine quantitative and qualitative data. Pragmatism emphasizes contact with reality rather than its representation or conception.

Key informant interviews are a major component of this qualitative investigation. Nevertheless, it also includes quantitative data obtained from collecting, evaluating, and combining the findings of passenger surveys carried out as part of the examination of the

Study Area and Local Community's bus routes. Gaining information and comprehension of the interactions between the passenger and transport systems is the aim of the study. By emphasizing useful results, the study seeks to guide policy choices that can improve Pokhara's public transport system.

3.3 The Ontology

Richards (2003) defines ontology as "the nature of our beliefs about reality." Researchers may make implicit assumptions about reality, its existence, and what can be learnt about it. This ontological dilemma forces a researcher to look into the nature of reality, as Patterson (2002) states in "A singular, verifiable reality and truth [or] …. Socially constructed multiple realities" (Rehman & Alharthi, 2016).

Ontology, in this context, refers to the nature of reality concerning public transportation systems in Pokhara. It posits that the public transport landscape is shaped by both tangible elements, such as infrastructure and vehicles, and intangible factors, including social perceptions and cultural attitudes towards public transport. This duality aligns with a constructivist ontological stance, suggesting that the realities of public transportation are socially constructed through interactions among users, policymakers, and service providers (Mehta, 2014).

3.4 The Epistemology

The study of "the nature of knowledge and the process by which knowledge is acquired and validated" is known as epistemology (Gall et al., 1996). What constitutes valid knowledge for the ontological premise is the subject of epistemology. Using a mixed-methods approach, this study combines qualitative insights from stakeholder interviews with quantitative data from surveys. Conversely, epistemology deals with the process of gaining knowledge about this reality. The research employs an exploratory approach that combines qualitative methods (such as interviews and focus groups) with quantitative surveys to gather data on commuter experiences and preferences. This mixed-methods strategy reflects an understanding that knowledge is constructed through both subjective experiences and objective measurements (Nakarmi & Singh, 2019). The study seeks to identify not only the operational challenges faced by public transport users but also their perceptions and expectations regarding service improvements. By integrating these

perspectives, the research aims to provide a holistic view of public transportation in Pokhara.

3.5 Basis for Pragmatic Paradigm

Examining the social and natural aspects of the world is aided by research paradigms. The way scientists answer the three fundamental questions of ontological, epistemological, and methodological issues can be used to identify research paradigms (Rehman & Alharthi, 2016). The researcher's beliefs will reflect the way the research is designed, how data is both collected and analyzed, and how the research results are presented (Lub, 2015). Determining viewpoints, completing the course of action, and supporting the research process all depend on identifying a paradigm.

Everything may be reduced to a single reality that can be identified, measured, and understood, according to the positivist paradigm. According to positivists, knowledge should be produced impartially, untainted by the prejudices of participants and researchers (Park et al., 2020). According to (Rehman & Alharthi, 2016), positivists use a dualism and objectivity model in which the researcher and participants are kept apart in order to reduce bias in the study. This paradigm is not appropriate because the research is social science based and cannot be conducted in a controlled environment.

Post-positivists hold that there is a reciprocal influence, in contrast to the logical positivist movement, which holds that the scientist is autonomous and apart from the research (Keyter, 2016). Although scientific procedures are used here, the concept of truth is altered, and reality is not extracted as a single reality. Quantitative post-positivist research, like positivist research, is concerned with theoretically grounded observations (Krauss, 2005). This paradigm is inappropriate because the research does not follow scientific methodology and is not grounded in any theory.

Interpretivists argue that individuals' understanding of their world is shaped by their personal perceptions and experiences. Central to this paradigm is the belief that reality is socially constructed (Pervin & Mokhtar, 2022). Given that the research topic involves multiple perspectives and knowledge is shaped by the participants and stakeholders involved, the interpretive paradigm is well-suited for analyzing qualitative data derived from interactions between the researcher and relevant institutions. Unlike studies

requiring controlled environments or experiments, this research focuses on exploring socially constructed realities and diverse viewpoints.

According to transformative researchers, social justice and marginalized peoples were not sufficiently addressed by the interpretive/constructivist research methodology (Mackenzie & Knipe, 2006). This paradigm is not applicable because the research does not address such a problem.

The 'what' and 'how' of the research problem are the concerns of pragmatic researchers (Grix, 2004). There is no one philosophy or reality that pragmatics is devoted to (*Philosophical Worldview - RESEARCH METHOD*, n.d.). A pragmatic paradigm is used in research when two or more paradigms are used. Since a mixed-method approach will be used for the research, both quantitative and qualitative data were gathered and examined. A more comprehensive understanding of the characteristics pertaining to the public transport system and integration was made possible by quantitative data, which included numerical information such as statistics and regression analysis from survey results. Conversely, qualitative data included observations, interviews, and conversations that enabled in-depth investigation and insights from public transportation system stakeholders, hence this paradigm is adopted.

3.6 The Methodology

Research in common parlance refers to a search for knowledge (Patel & Patel, 2019). Research can alternatively be described as a methodical, scientific search for relevant data on a particular subject (Redman & Mory, n.d.). In actuality, research is a kind of artistic scientific investigation. The Advanced Learner's Dictionary of Current English defines research as "a careful investigation or inquiry especially through search for new facts in any branch of knowledge" (*Chapter 1 Research Flashcards | Quizlet*, n.d.; *(PDF) Research Methodology*, n.d.). Redman and Mory describe research as a "systematized effort to gain new knowledge (Redman & Mory, n.d.).

The methods and processes used to collect and examine data regarding a particular study topic are referred to as research methodology (Sreekumar, 2023). It is a procedure whereby researchers use certain research tools to plan their investigations in order to accomplish their goals. Research design, data collection techniques, data analysis techniques, and the general framework in which the study is carried out are all important

components of this methodology (Sreekumar, 2023). The methodology part of a scientific article outlines the many choices made regarding these strategies and explains why they are the best fit for resolving the study problem. A thorough approach guarantees the legitimacy and dependability of the results. The decision between the three main categories of research methodologies—qualitative, mixed, and quantitative—depends on the goals of the study (Sreekumar, 2023).

Methodology is the study of how and what techniques can be applied to learn (McCombes, 2022). The techniques used to gather, look at, and evaluate data are referred to as the methodology. This study employs both qualitative and quantitative research methods.

A flexible approach to addressing research-related problems is appropriate in pragmatism. Pragmatism holds that rather than concentrating on a single best approach to problems, there are a variety of strategies that can be employed to address them more successfully and get to the root of them. According to pragmatics, there are several realities rather than simply one.

The pragmatism paradigm approaches issues from both interpretivist and post-positivist viewpoints. This research paradigm recommends a mixed-method approach to study in light of this. A mixed-method approach states that in order to give a thorough examination of the current public transport system, this type of research will include both qualitative and quantitative research methods. Because it enables a more nuanced knowledge of passenger experiences, operational efficiencies, and economic ramifications, this methodology is especially well-suited for tackling complex urban mobility difficulties (Creswell & Clark, 2017).

3.7 Data Collection Techniques

Data will be gathered through direct on-site observations, checklists, and images; detailed field notes will document everything observed, heard, or experienced. Semi-structured and open-ended interviews will be conducted through focus groups and individual discussions, involving direct questioning of both the public and relevant authorities. Open-ended survey questions will be used to gain deeper insights into respondents' perspectives on public transportation and its impact on their daily lives. These methods collectively serve as the primary sources of data for the study.

An essential secondary data source is gathering information that already exists, such as text, photos, audio or video recordings, etc. Examining public transit policy documents is also essential. For information on routes, schedules, and policies, the appropriate government agency was contacted. A case study could be another significant source of data for the investigation. A survey of pertinent international examples that can offer direction on how to approach the research question were conducted.

Quantitative Methods

Quantitative data will be collected through structured surveys administered to passengers using various public transport routes in Pokhara. The survey will include questions regarding service frequency, travel times, passenger satisfaction, and demographic information. This method aligns with previous studies that utilized passenger flow analysis to evaluate public transit systems (Midun et al., 2023). Statistical analysis will be performed to identify patterns and correlations within the data, enabling the identification of key performance indicators (KPIs) related to service efficiency and user satisfaction.

Additionally, secondary data from local transportation authorities, such as ridership statistics and operational performance metrics, will be analyzed. This quantitative component will provide a solid foundation for understanding the current state of public transportation in Pokhara and identifying areas for improvement.

Qualitative Methods

Through semi-structured interviews and focus groups with important stakeholders, such as transportation operators, local government representatives, and everyday commuters, qualitative methodologies will be used to supplement the quantitative data. These interviews will investigate opinions regarding the quality of public transport services, obstacles to using them, and recommendations for enhancements. Prior studies have demonstrated the importance of qualitative insights in comprehending the social dynamics pertaining to urban transport networks (Berta et al., 2018).

To find recurring themes and insights that can guide policy suggestions, the qualitative data will be subjected to a thematic analysis. This method enables a more thorough investigation of user expectations and experiences than may be possible with just quantitative surveys.

Integration of Methods

During the analysis phase, quantitative and qualitative findings will be integrated, and the outcomes of both approaches will be contrasted and compared to derive thorough conclusions regarding Pokhara's public transport system. By offering several viewpoints on the same problem, this triangulation improves the research's validity (Bochel & Duncan, 2007). The study intends to create practical recommendations that tackle the issues found while taking advantage of chances to improve public transport services by combining the knowledge gained from the two approaches.

3.8 Research Methods

A mixed-methods approach will be used in this study to assess the operational framework and quality of urban bus services in Pokhara Metropolitan City. We'll use the following techniques:

3.8.1 Literature Review

A thorough literature review will be carried out to collect existing knowledge on urban bus service performance, customer satisfaction, and the operational frameworks of public transportation systems. This review will encompass academic articles, government reports, and case studies from comparable urban environments. The goal is to identify key performance indicators and theoretical frameworks that will guide the assessment of bus services in Pokhara.

3.8.2 Observation

Observation is a widely recognized method in urban planning research for gathering real-time data about physical infrastructure and human behavior(Carmona, 2021). Field observations were conducted along predefined routes within Pokhara Metropolitan City. With an emphasis on the current state of public transport in Pokhara, the procedure involved documenting the degree of integration among various public transport systems. Key elements assessed included bus stop conditions, vehicle availability, passenger boarding and alighting behavior, and service frequency. Visual and field-based observations allowed researchers to capture real-time conditions and assess operational practices.

3.8.3 Questionnaire Survey

Surveys are a primary method for collecting quantitative and qualitative data from a target population, especially in transportation research (Litman, 2017). In this study, a structured survey was developed using Kobo Toolbox, focusing on integration themes such as travel satisfaction, ticket affordability, route connectivity, and waiting times. A comprehensive understanding of public opinion and operational shortcomings was ensured by this procedure, which made it possible to gather both qualitative and quantitative data.

The surveys were conducted on buses, at stops, and among key stakeholders such as drivers and operators. A statistically representative sample size was selected to ensure that the findings could be generalized across the public transport network. Digital tools like Kobo Toolbox enhanced the efficiency and accuracy of the data collection process.

The survey is conducted using a random sampling technique. Additionally, a wide variety of passengers in the study area are represented among the selected respondents. Quantitative information about passenger demographics, travel habits, satisfaction levels with different areas of service (such as comfort and dependability), and variables influencing their mode of transportation will all be gathered through the survey. Their opinions on the problems with public transit are derived. The questionnaire aids in comprehending the various aspects of public transit.

Sample Size

The sample size is determined using the Corchan equation (1963) with a 10% precision and a 95% confidence level. The sample strategy takes into account every passenger who travels throughout the course of the three survey days.

$n = \frac{z^2 * p * (1-p)}{e^2}$ (Dwivedi et al., n.d.)

Where, n = required sample size

z = Z-score corresponding to the desired confidence level (for 95% confidence level, $Z \approx 1.96$)

p = Estimated proportion of an attribute that is present in the population. (50%)

N = Total population size of passenger

e = desired margin of error (precision), expressed as a proportion (e.g., 0.10 for 10%)

Calculate the sample size n

$$n = \frac{1.96^2 * .5 * (1-.5)}{0.10^2}$$

n = 96.04

Since the sample size n should be a whole number. Therefore, n= 97

3.8.4 Stakeholder Mapping

Stakeholder mapping is a collaborative process that involves research, debate, and discussion, drawing from multiple perspectives to identify and define a key list of stakeholders. Before the mapping is done, it is very necessary to identify stakeholders and then work out their power, influence and interest which means developing good understanding of stakeholders. It is because the position that is allocated to a stakeholder on the grid shows you the actions you need to take.

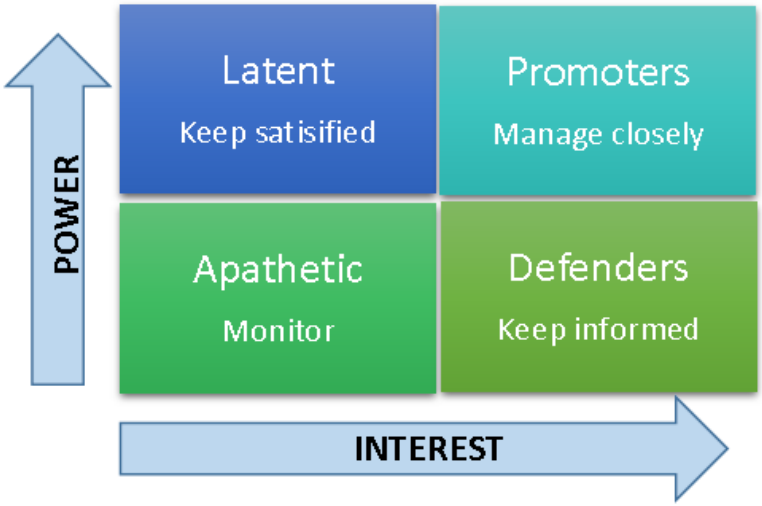

Figure 2 Stakeholder Mapping Indicator

Stakeholder mapping is done on the power interest grid Stakeholder mapping can be completed in four phases: The first one is identifying which means listing of relevant organization and people. The second step is analyzing which means understanding stakeholders' perspective and interests. The third step is mapping to categorize and allocate position of the stakeholder in the power interest grid and the last step is prioritizing to visualize the relationships to objectives and other stakeholders.

In fig. 2, Apathetics are the stakeholders who have less interest as well as less power and they need to be monitored. Focus should be made to increase the level of interest in apathetics. Defenders are the stakeholders who have less power but high level of interest

and they should be keep informed about the issues regularly as they can be helpful with the project. Latents are the stakeholders who are less interested but have high power and they should be keep satisfied and efforts should be made to increase interest in them regarding the project. And lastly are the promoters who are highly interested as well as are highly powerful and they should be managed closely and keep fully engaged. Stakeholder mapping helps to determine whose interests should be taken into account while executing a project or while formulating plans and policies.

3.8.5 Key Informant Interviews

One qualitative research technique for examining in-depth viewpoints from experts and stakeholders is key informant interviews (Totawar & Prasad, 2016). For this study, semi-structured interviews were conducted with government officials, urban planners, public transport operators, and public people. These interviews provided insights into institutional challenges, policy gaps, and integration opportunities in the public transport system.

Although the questions were open-ended, participants could go into further detail about their thoughts and experiences. Consent was obtained before audio recording the interviews, which were then transcribed for theme analysis. According to (Bryman, 2016), KIIs are valuable for uncovering systemic issues that may not emerge from surveys or observation alone.

3.8.6 Secondary Data Collection

Secondary data collection involves analyzing existing datasets and documents to supplement primary data (Chih-Pei & Chang, 2017). Secondary data for this study came from academic research articles, government publications, transportation agency statistics, and municipal reports. This contained information on past development trends, fare regulations, and route structures.

Secondary data provided a contextual background for the study and helped validate primary findings. Such data also allowed for comparative analysis with transport systems in similar urban contexts, as advocated by Handy (2002). The triangulation of primary and secondary data enhanced the robustness of the research findings.

Table 5 Data Collection Methods

Method	Process	How it was conduct
Observation	To understand present situation of public transport in above defined routes.	Survey and study done with visual and field observation based on different parameters.
Survey	To comprehend a collection of people's general traits or viewpoints.	A list of questions was prepared in Kobo toolbox and survey was conducted on public buses, stops and concerned people.
Key Informant Interview	To obtain a thorough grasp of thoughts or perceptions regarding a subject.	Ask open-ended questions aloud to participants in focus groups or one-on-one interviews.
Secondary data collection	To analyze data from different publications and reports that can't be accessed first-hand.	Using resources like committee reports, governmental organizations, and research groups to explore and gather pre-existing datasets.

3.8.7 Data Analysis

Both quantitative and qualitative techniques are used to analyze the gathered data. To determine the Customer Satisfaction Index (CSI) and find relationships between service characteristics and passenger satisfaction, statistical analysis were done on the survey data. For the proper analysis, the gathered replies were coded and categorized in SPSS program. Questionnaires with response errors or missing values were eliminated prior to data analysis. Statistical methods such as descriptive statistics, Cronbach's alpha test, ANOVA, t-test, Friedman test, and Tukey test were used to analyze the survey data. Key insights about operational issues and areas for development will be extracted through thematic analysis of qualitative data gathered from observations and interviews.

- Descriptive Analysis

  The results were described using descriptive statistics (mean and standard deviation). The respondents' level of inclination towards the specific public transit element was

ascertained using the mean values. The statistics by which the whole answer varied from the mean values were also ascertained using the standard deviation.

- Correlations

  Correlations assess the strength and direction of the relationship between two or more variables (*Correlations: A Comprehensive Guide to Different Measures of Correlation □ | by Manoj Das | Medium*, n.d.). The Pearson correlation coefficient (r) is commonly used for continuous, normally distributed variables, ranging from -1 (perfect negative) to +1 (perfect positive), with 0 indicating no relationship. Other types of correlations include Spearman's rank and Kendall's Tau, which are suitable for ordinal or non-linear data.

- Normality Tests

  Normality tests determine whether data follows a normal distribution, which is important for many statistical methods (McLucas, 2024). Common tests include the Shapiro-Wilk test, Kolmogorov-Smirnov test, and Anderson-Darling test. If the p-value from these tests is below 0.05, it suggests a significant deviation from normality, which may require non-parametric tests for further analysis. Visual tools like Q-Q plots can also help assess normality.

  - Kolmogorov-Smirnov Test:

    Compares the sample data with a reference normal distribution. It is more general and can be used for different distributions, not just the normal.

3.8.8 Limitations

A list of the research's limitations is as follows:

- Some survey participants might not have told the truth or might have given answers that were deemed acceptable by society.
- Low survey and interview response rates cast doubt on the data's representativeness. A small sample size affects the findings' generalizability and the capacity to make more comprehensive inferences.
- The study's comprehensiveness is constrained by the limited time available for data gathering and analysis.

3.8.9 Research Logic

A researcher's thinking becomes more critical and practical when conducting research if they are knowledgeable with logic. Differentiating between good and bad thinking, or

between sound and wrong reasoning, is the aim of logic. Logic is both a science and an art (Maloney & Bacon, 2009). Logic is the study, development, and organization of the ideas and techniques that can be used to distinguish between good and bad thinking. Going from a premise to a conclusion is logical. Clarifying what logic is and its importance is crucial when studying it. The four categories of research logic are abductive, retroductive, inductive, and deductive (Uprety, 2024). Deductive research, on the other hand, begins with a hypothesis and tests it. It is employed, particularly in quantitative research, to verify the current theory. To arrive at general findings or theories, inductive inquiry begins with detailed observations of patterns and regularities and preliminary hypotheses. Inductive reasoning provides the likely truth, which could result in erroneous conclusions. When we are unable to visit the location, we employ retroductive reasoning. It combines inductive and deductive reasoning. Take the creation of planets, for example. Abductive research, in contrast to deductive and retroductive thinking, creates scientific explanations of social life by drawing on the language and meanings used by social actors as well as their behaviors. This strategy requires us to be self-measuring tools.

A combination of inductive and abductive logics are used, depending on the goals of the investigation. Inductive reasoning is a method of making deductions or conclusions. A rigorous method for advancing the social sciences is to use the meanings and interpretations, intentions, and justifications that individuals employ on a daily basis. In our case study, we employ both inductive and abductive reasoning, as we serve as the primary measurement tool for the area under investigation. Through the questionnaire survey, several observations and facts are gathered, which require careful analysis and interpretation before determining the most plausible explanation for these findings.

3.8.10 Research Ethics

The term "ethical considerations in research" refers to a set of guidelines that govern research practices and methodologies. Research involving humans typically aims to explore real-world events, investigate potential solutions, analyze behaviors, and improve lives in various ways. Ethical principles play a crucial role in both the research topic and the methods used. Ethics can be broadly divided into two main categories: deontological and teleological ethics (Benlahcene et al., 2018). The teleological approach focuses on

the outcomes of actions, while the deontological approach is centered on adherence to rules or duties.

When conducting research, we take deontological ethics into account since we ethically put our methodology before our end result. To avoid disrupting people's workdays, we conducted our survey in a courteous and considerate manner. The survey was conducted without any form of intimidation or discrimination based on race, ethnicity, sexual orientation, gender, religion, disability, age, or any other characteristic. Since this was a social survey, we considered the rights of participants to be protected, the need to maintain scientific integrity, and the enhancement of research validity.

3.8.11 Research Validity and Reliability

Using quantitative data, regression analysis was utilized to assess hypotheses regarding the connection between consumer happiness and public transportation's overall performance. Since both methods were used to address the issues, narrative analysis was conducted on the qualitative data once the relationship had been established.

Based on narrative analysis, which also includes secondary data analysis, key informant interviews, and self-observation. In this approach, triangulation was employed to examine and verify the acquired data. Following the successful validation of the data, the results were analyzed and integrated, and ultimately a conclusion and recommendations were made.

Prior to the study, a pilot test was conducted to verify the validity of the questionnaire designed to carry out this investigation. The questions that were deemed complex were changed in light of the suggestions and comments. The items' adaptation from the body of existing literature served as the foundation for their content validity.

A reliability test is a method used to assess the consistency or stability of a measurement tool or research method (*What Is: Reliability Analysis - LEARN STATISTICS EASILY*, n.d.). It evaluates how reliably a test or instrument produces consistent results over time or across different observers or conditions. There are several types of reliability tests, including:

- Cronbach's Alpha is a measure of internal consistency used to assess the reliability of a test or scale. It ranges from 0 to 1, with higher values indicating better reliability. A value of 0.7-0.8 is considered acceptable, while values above 0.8 indicate good reliability (*What Is Cronbach's Alpha And How Is It Calculated To Measure The Internal Consistency Of A Scale Or Test? Can You Provide Examples Of Its Application In Research Studies?*, n.d.). It helps determine if a set of items consistently measures the same underlying concept. A low value suggests that the items may not be aligned, and revisions may be needed.
- R-Square (R^2)

  R-Square (R^2) is a measure of how well the independent variables explain the variation in the dependent variable in a regression model. It ranges from 0 to 1, with values closer to 1 indicating a better fit, meaning the model explains a higher proportion of the variability in the data.
- Regression

  Regression is a statistical method employed to examine and model the relationship between a dependent variable and one or more independent variables (*Regression Regression Is a Statistical Method Employed to Examine and Model the Relationship between a Dependent Variable and One or More Independent Variables.*, n.d.). It aids in forecasting the value of the dependent variable based on the values of the independent variables (*Predicted Value of a Dependent Variable | CFA Level 1*, n.d.).
- Coefficients, Multicollinearity, and VIF
  - Coefficients represent the change in the dependent variable for a one-unit change in an independent variable.
  - Multicollinearity refers to high correlation among independent variables, which can lead to unreliable coefficient estimates.
  - Variance Inflation Factor (VIF) quantifies how much the variance of a regression coefficient is inflated due to multicollinearity (*Variance Inflation Factor (VIF)*, n.d.). High VIF values (above 10) indicate problematic multicollinearity that may require addressing.
- Hypothesis Testing

  The examination of potential connections between previously developed variables is the focus of this section. The researcher used the Friedman test, ANOVA, and t-test to assess the hypothesis for this aim. This sections deals with the analysis of possible

relationships between prior formulated variables. For this purpose, the researcher tested hypothesis conducting t-test, ANOVA and Friedman test.

- T-test

  Under t-test, one sample t-test has been carried out. In this study, there is no any direct dependent and independent variable, where the value of dependent variable is determined by the values of independent variables. The researcher is trying to identify whether the variables are significant in the development of corporate bond market or not. So, here is no possibility of computing correlation and regression to test the relationship. In this situation, the appropriate tool is one sample t-test, which is used to test whether independent variables are significant in making investment decision by investors in bond market or not.

- ANOVA

  Analysis of variance (ANOVA) is a statistical technique used to assess whether there are significant differences between the means of two or more groups. ANOVA compares the means of different samples to evaluate the effect of one or more factors (Kim, 2014). Here, ANOVA was used to test the relationship between the variables such as age and other independent variables, income level and other independent variables, saving and other independent variables etc. When the independent variables, saving and other independent variables etc. When the relationship between such variables are significant, further Tuckey test is conducted to know the relationship in depth

CHAPTER 4: STUDY AREA

4.1 Overview

The second-biggest city in Nepal, Pokhara, is conveniently situated and serves as the starting point for the Annapurna trek circuit in the Himalayas. One of the most popular tourist sites in Nepal, the city developed up around the Phewa Lake. Covering 464 square kilometers and housing 140,459 households, it is the largest metropolitan area in Gandaki Province, (Census 2021).

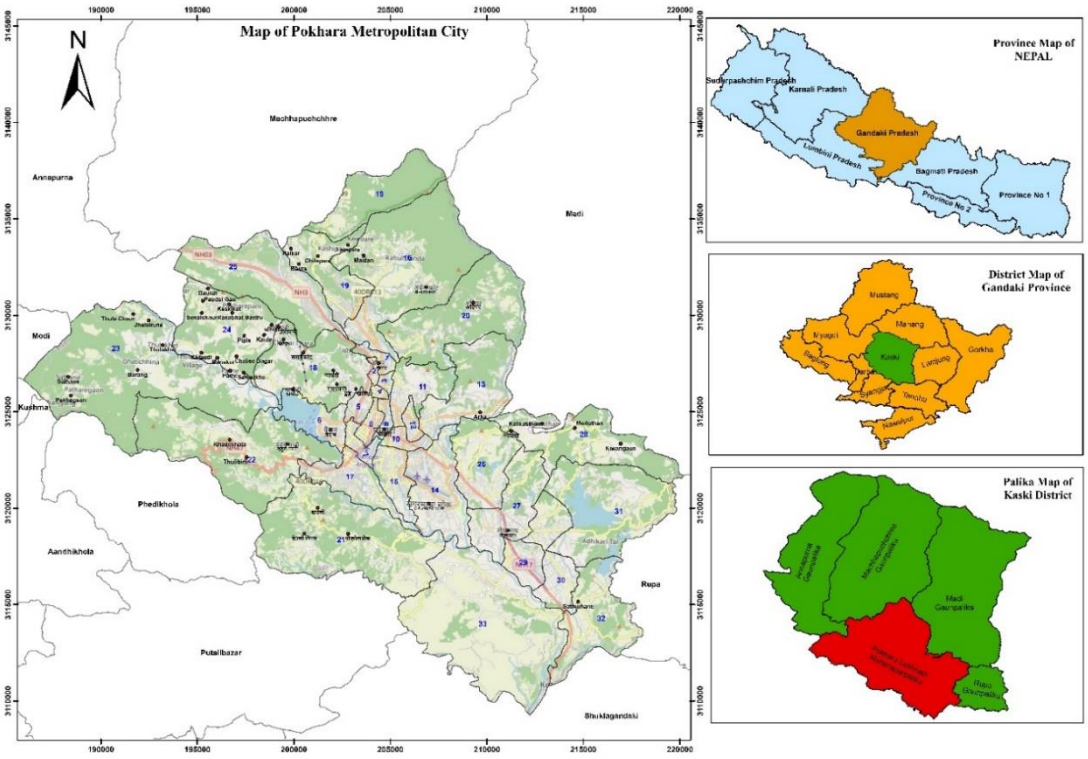

Figure 3 Location Map of Study Area

In 2016, Lekhnath Municipality and some other villages were combined with Pokhara Sub-Metropolitan City to become PMC. There are 33 administrative wards in PMC, which are divided into core, peripheral, and rural areas. The old city of Pokhara and the center of Lekhnath are located in the core area (12 of 33 wards). There is no legal significance to the division of areas into core, outer, and rural areas; it is merely done for the purpose of making service planning easier (World Bank, 2020). The distribution of PMC's wards and different zones is shown in the following diagram.

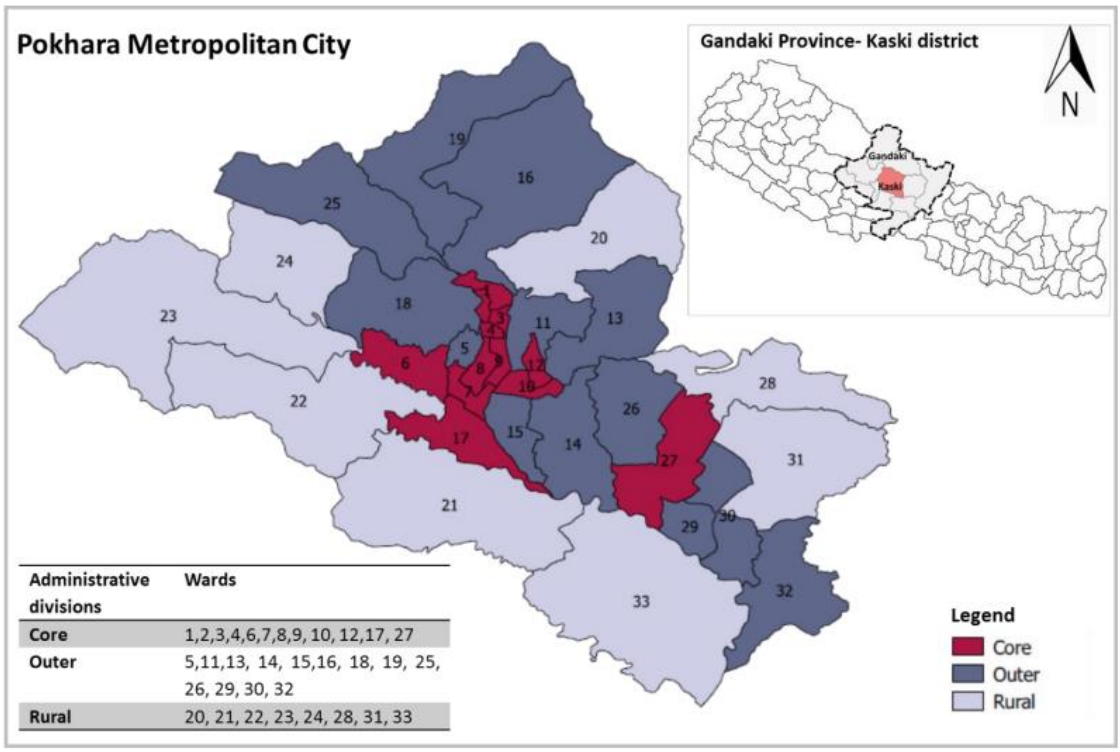

Figure 4 PMC wards and administrative divisions to plan for services

Source: (World Bank, 2020)

Pokhara's population grew by 85,000 after Pokhara Sub-Metropolitan City combined with Lekhnath Municipality and a few village development committees in 2073 (2016). Pokhara is popular among mountaineers and a paragliding destination. In Pokhara, paragliding has grown in popularity, as seen by the 133% increase in tourists from 8,999 in 2015 to 21,017 in 2018. The need for infrastructure and effective service delivery has grown as a result of the population growth brought on by mergers and tourist inflows.

4.1.1 Demographic Characteristics

Pokhara Metropolitan City is home to 513,504 residents, with a gender distribution of 48.2% males and 51.8% females. The city has a population density of 1,106 individuals per square kilometer, highlighting its increasingly urban nature.

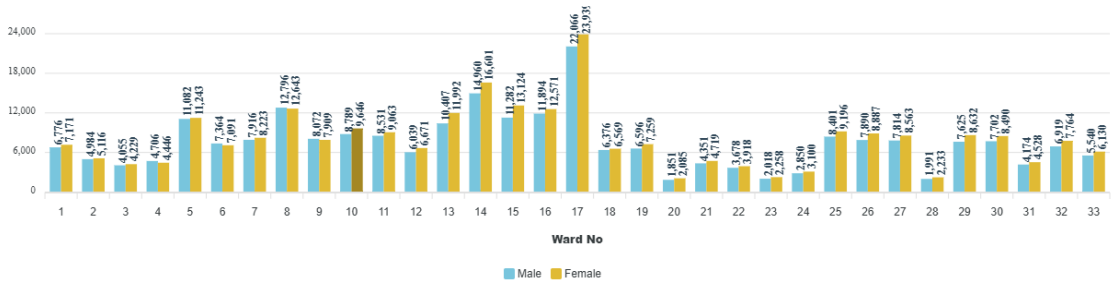

Figure 5 Ward Wise Population Distribution

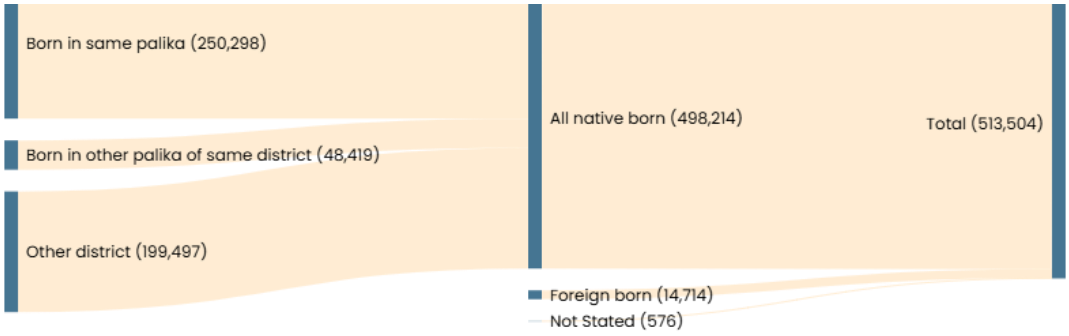

Figure 6 Migration Data in Pokhara Metropolitan City

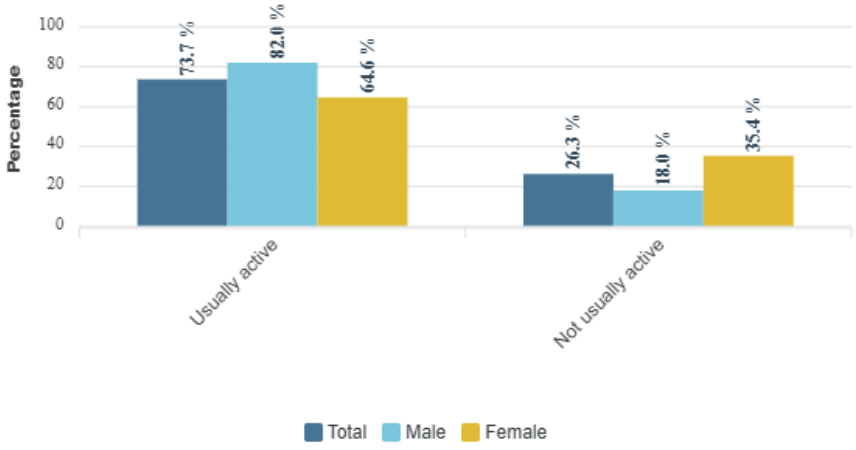

Figure 7 Economically Active Population

4.1.2 Trend of Urban Growth

In Nepal, cities like Pokhara are experiencing significant urbanization and population growth, which presents both opportunities and challenges for development.

Figure 8 Population Growth Trend in Pokhara Metropolitan City

Source : (*Pokhara (Metropolis, Nepal) - Population Statistics, Charts, Map and Location*, n.d.)

The table illustrates land-use changes from 1990 to 2020 across different categories, measured in square kilometers. Built-up areas have increased significantly, from 15.78 km² in 1990 to 37.3 km² in 2020, indicating urban expansion. Conversely, agricultural land has decreased steadily, from 223.23 km² in 1990 to 213.85 km² in 2020. Water bodies experienced a slight fluctuation, reducing initially but rising to 13.71 km² by 2020. Open spaces showed a notable decline, from 3.15 km² in 1990 to 1.1 km² in 2020. Forest areas have also decreased, dropping from 202.91 km² in 1990 to 191.33 km² in 2020. Sand/gravel areas saw a minor increase, while grassland sharply declined from 5.59 km² in 1990 to 2.55 km² in 2020. These changes reflect increasing urbanization and a shift away from natural and agricultural landscapes.

Table 6 Land cover statistics between 1990 and 2020 in Pokhara Metropolitan City

Land-use types	1990 (km2)	2000 (km2)	2010 (km2)	2020 (km2)
Built-up areas	15.78	17.54	26.15	37.30
Agricultural Land	223.23	235.07	226.80	213.85
Water Bodies	11.59	9.73	12.46	13.71
Open Spaces	3.15	1.20	1.46	1.10
Forest	202.91	197.66	189.43	191.33
Sand/Gravel	0.99	2.09	5.34	4.40
Grassland	5.59	0.95	2.60	2.55
Total	**463.24**	**464.24**	**464.24**	**464.24**

Source : (D. Bhattarai & Lal, 2021)

4.2 Public Transport in Pokhara

The settlement, which was only reachable on foot until the late 1960s, was thought to be even more magical than Kathmandu. After the Siddhartha Highway was finished in 1968, tourism took over, and the city expanded quickly (Horner, 2025). Lakeside, the neighborhood around Phewa Lake, has grown to become one of Nepal's main tourist destinations. In Nepal, particularly in Pokhara, the largest city in the country, public transportation, including buses, minibuses, and micros, is a widely used mode of transport. The privately operated public transport system serves both the city of Pokhara and its surrounding townships and villages (Midun et al., 2023). Pokhara's public transport system was established in 1970 AD.

Pokhara boasts a vast network of privately run public transit that serves the city, surrounding townships, and other villages. The public bus transportation services in and around Pokhara Valley are primarily operated by private businesses, including Pokhara Mahanagar Bus Bebasaya Samiti (green, brown, and blue buses), Mama Bhanja Transport (blue buses), Bindabashini Samiti (blue buses), Phewa Bus Bebasaya Samiti (mini micros), and Lekhnath Bus Bebasaya Samiti (green and white buses) (Lakes et al., n.d.). The public transportation system mainly consists of local and city buses, micros, micro-buses, and metered taxis (Horner, 2025; “Pokhara,” 2025). There are 20 routes for

the buses and vans and taxi has no prescribed routes. There are around 1200 taxis operating daily in the valley. Public transportation system of Pokhara is operated 365 days a year. Public transportation system in Pokhara has given employment opportunities to 2000 peoples directly and generating indirect employment to hundreds of people working in repairs and maintenance, administration and more (Office Record of Professional Associations of Public Vehicle Owner)(*1 Public Transportation System in Pokhara1 | PDF | Public Transport | Fare*, n.d.).

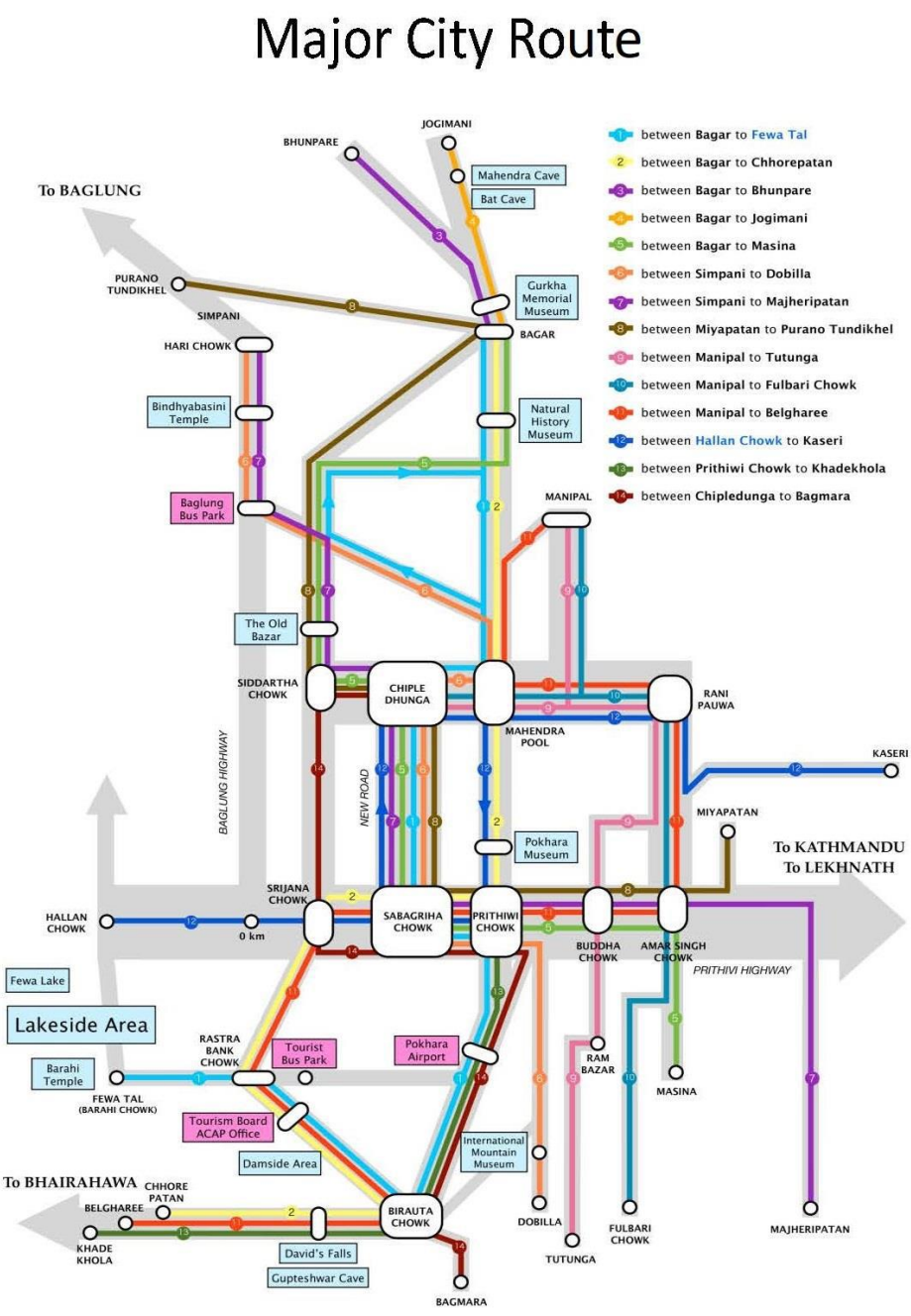

Figure 9 Major Public Transportation Route of Pokhara

4.2.1 Buses

Pokhara City Bus Service, Begnastal Pokhara Yatayat, City Micro Bus Service and Prithvi Bus Service are the central local public transportation service providers on this area. And there are respective routes determined for the respective bus service providers in the city. Therefore, the travel expenses for all four service providers are necessary in order to travel throughout the city. The relevant bus service providers provided the information.

4.3 Selected Route for Study

Two Routes from Pokhara City Bus Service and one Route from Lekhnath Pokhara Bus Service were selected for study.

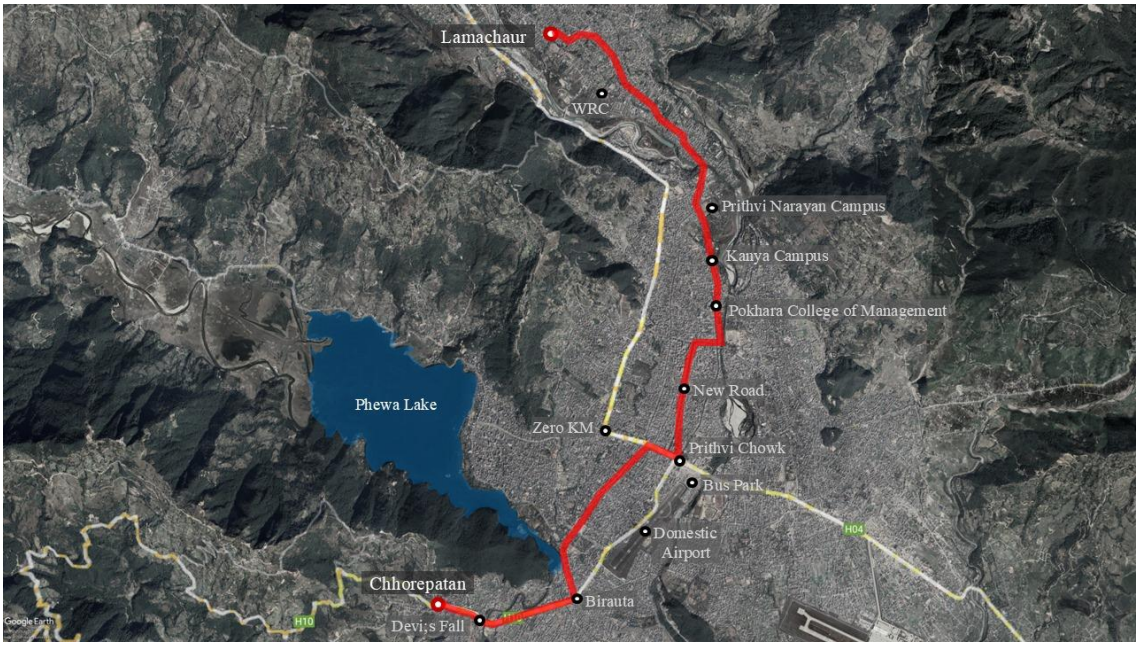

Figure 10 Public Bus Route from Lamachaur to Chhorepatan

4.3.1 Lamachaur-Chhorepatan Route

The Lamachaur-Chhorepatan Route is one of the routes selected which is 12.7kms, for this study due to its significance in connecting major urban areas of Pokhara Metropolitan City. This route links several densely populated and commercially active areas, including New Road, Bagar, and Chipledhunga, which are among the busiest locations in Pokhara. These areas serve as hubs for various economic, social, and administrative activities, contributing to the city's dynamic urban fabric. Additionally, the route is crucial for providing access to key educational institutions such as the Western Regional Campus

and Pokhara College of Management, which cater to a large number of students and faculty members.

Also, according to study by (Midun et al., 2023), an average passengers of 58 during peak hour and an average of 54 during off peak hour were studied along the route. It highlights the importance of this route amongst the other studied route. The combination of residential, commercial, and educational activities along this route highlights its importance in the overall public transport network of Pokhara.

4.3.2 Begnas Lake to Fewa Lake Route Section

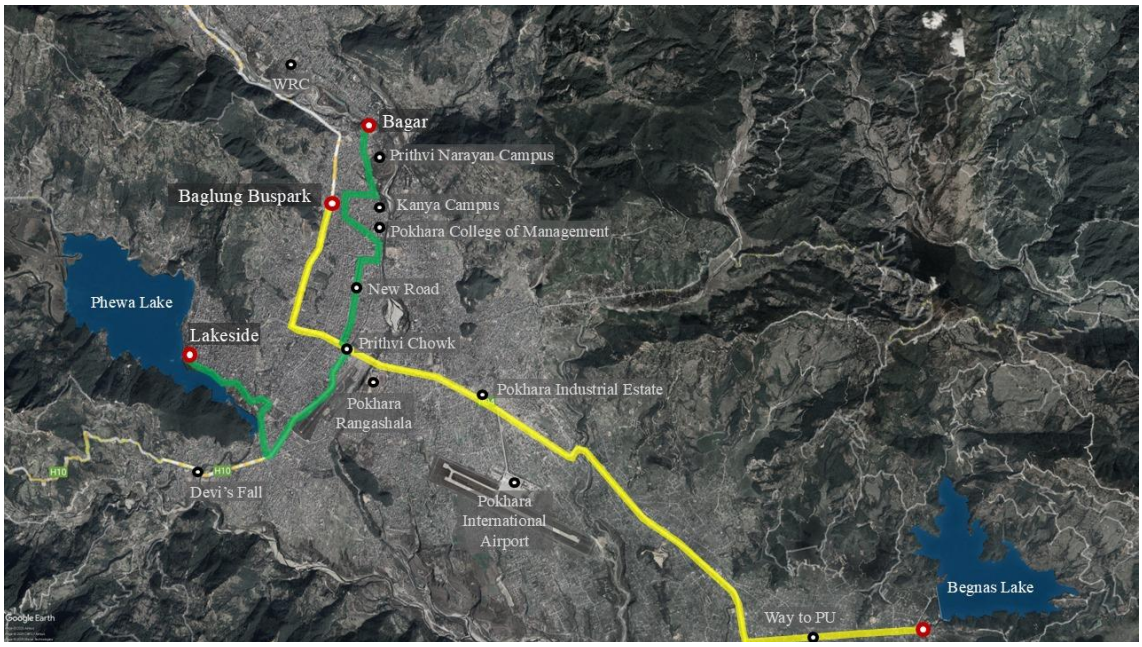

Figure 11 Begnas Lake to Fewa Lake Road Section

This 19.3 km section traverses the northern part of Pokhara, connecting key locations such as Mustang Chowk, Prithiv Chowk, Bus Park, Industrial Area, International Airport, Budi Bazar, Talchowk, and Sesuwa. Due to its wide passenger catchment area, this road segment has a significant demand for transport. The road segment goes alongside the lakes of Fewa and Begnas, two of Pokhara's most popular tourist destinations. It passes via the International Airport and incorporates a section of the Prithvi Highway. As a result, a wide variety of travellers are anticipated to use this route, including those looking for amusement as well as those travelling for leisure. Since there are two distinct public bus routes along this road segment—the Fewa Lake to Bagar Route and the Begnas Lake to Baglung (Bindabasini) Buspark—public buses are run by Pokhara Yatayat and Begnastal Pokhara Yatayat, two transportation service companies.

CHAPTER 5: FINDINGS AND ANALYSIS

5.1 Finding and Analysis from Passenger Questionnaire Survey

The public transport system in Pokhara Metropolitan City plays a vital role in the daily mobility of residents and commuters. Understanding its efficiency, accessibility, and integration is crucial for assessing its overall impact on the city's transportation network. In order to accomplish this, a systematic questionnaire was created and distributed to a specific population, guaranteeing a thorough assessment of all public transportation-related factors.

The survey encompassed key dimensions of public transport, including physical integration, network efficiency, fare system, and information accessibility. The primary focus was to assess user satisfaction, challenges faced, and potential areas for improvement. A Four-Point Likert Scale, ranging from "strongly disagree" to "strongly agree," was utilized to assess respondents' perceptions and experiences as part of the descriptive statistical analysis of the collected data.

Surveys are a primary method for collecting quantitative and qualitative data from a target population, especially in transportation research (Litman, 2017). In this study, a structured survey was developed using Kobo Toolbox, focusing on integration themes such as travel satisfaction, ticket affordability, route connectivity, and waiting times. This approach ensured a comprehensive understanding of public opinion and operational shortcomings by enabling the collection of both qualitative and quantitative data.

The surveys were conducted on buses, at stops, and among key stakeholders such as drivers and operators. A statistically representative sample size was selected to ensure that the findings could be generalized across the public transport network. Digital tools like Kobo Toolbox enhanced the efficiency and accuracy of the data collection process.

The survey gathered responses from a total of 145 individuals in Pokhara Metropolitan City.

A. Section 1:General Information

- Gender

The survey included 86 male respondents, accounting for 59.31% of the total sample, and 59 female respondents, making up 40.69%. This indicates a relatively balanced representation of genders, reflecting diverse perspectives on public transport usage. However, survey participants range in age from 16 to 85. Age was regarded as a crucial consideration when selecting survey respondents since it reveals the age range of those responding and explains why an individual's age frequently determines their level of expertise and understanding of a topic or subject.

- Age

  The majority of respondents (71.72%, or 104 individuals) were aged between 21 and 40 years, highlighting that the primary users of public transport belong to the active working-age group. Another 20.69% (30 individuals) were aged ≤20 years, representing students and younger commuters, while only 7.59% (11 individuals) were over 40 years old, indicating lower reliance on public transport among older residents.

- Profession

  Students formed the largest group among respondents, comprising 49.66% (72 individuals). Private sector employees made up 21.38% (31 individuals), while housewives represented 11.03% (16 individuals). Other professions accounted for 9.66% (14 individuals), and civil servants comprised 8.28% (12 individuals). This distribution demonstrates that public transport serves a diverse range of occupational groups, with students being the most frequent users.

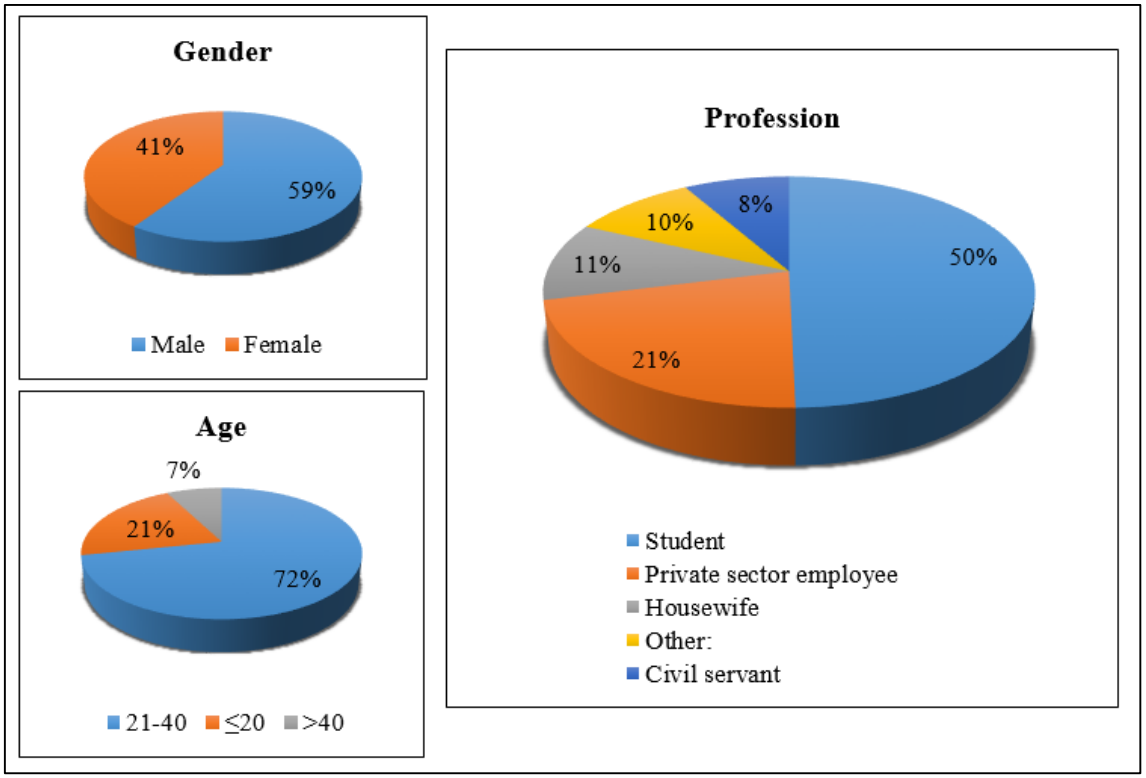

Figure 12 Gender, Age and Profession of Respondents

- Most common trip Purpose

  Among respondents, 40.69% (59 individuals) primarily used public transport for school or university commutes. Another 26.90% (39 individuals) cited work or business as their main trip purpose, while 24.83% (36 individuals) used public transport for social activities, shopping, or refreshment. A smaller group, 7.59% (11 individuals), indicated other purposes. These findings underscore the multifaceted role of public transport in facilitating daily life activities.

- Frequency of Public Transport Use

  Public transport usage patterns revealed that 39.31% (57 individuals) used it daily, indicating regular dependence on the system. An additional 30.34% (44 individuals) used it occasionally, while 23.45% (34 individuals) reported weekly usage. Only 6.90% (10 individuals) rarely relied on public transport, showing varying levels of reliance among different population segments. This frequency data highlights the regular dependence of a significant portion of the population on public transportation services.

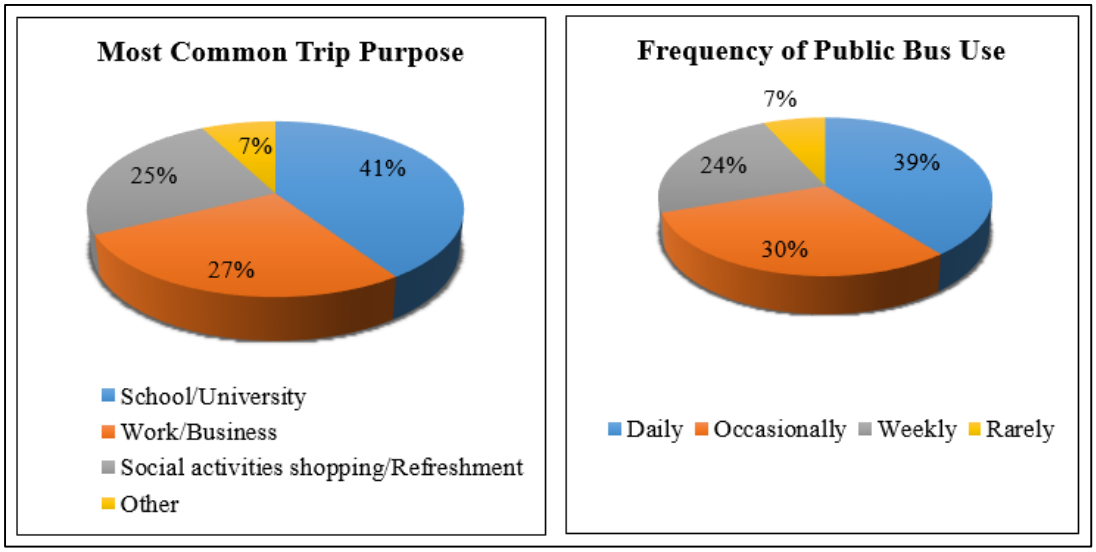

Figure 13 Most Common Trip Purpose and Frequency Data

5.1.1 Physical Aspects of Integrated Transport

The physical aspects of an integrated transport system are fundamental to ensuring efficiency, accessibility, and comfort for passengers. The information gathered via surveys, key informant interviews, observations, and secondary sources regarding Pokhara's public transport systems' accessibility and infrastructure is covered in detail below.

A. Infrastructure

The survey conducted among public transport users reveals significant dissatisfaction with the infrastructure of bus stops:

- 49.66% of respondents rated bus stop infrastructure as poor, showing that nearly half of the respondents believe the infrastructure is inadequate.
- Only 1.38% of respondents considered the infrastructure excellent, highlighting the extreme deficiency in public transport facilities.
- 26.21% of respondents reported traveling more than 10 minutes to reach a bus stop, indicating a lack of evenly distributed transport facilities across the city.

The results suggest that bus stops are not conveniently located or well-maintained, forcing many passengers to either walk long distances or use other means of transportation to reach the nearest bus stop.

B. Accessibility

Survey findings highlight serious accessibility concerns:

- 42.07% of respondents can reach a bus stop within 5 minutes, indicating reasonable accessibility in some areas.
- However, 8.28% of respondents require more than 15 minutes to reach the nearest bus stop, which reflects poor accessibility, particularly in suburban and peri-urban regions.
- Many respondents raised complaints about poorly planned transfer points, which increase travel time and create inconvenience.

The survey results show that while some parts of Pokhara are well-served, other regions face severe transport accessibility issues.

5.1.2 Operational Aspects of Integrated Transport

For a public transport system to be reliable and efficient, operational factors are essential. The commuter experience is directly impacted by scheduling, fare collecting, digital payments, location and route coverage, and the accessibility of travel information. A thorough analysis based on surveys, key informant interviews, observations, and secondary data is provided below.

A. Location/Route

- 42.76% of respondents find route coverage adequate, meaning that nearly half of the passengers feel the system meets their needs.
- 35.86% report only partial coverage, indicating that more than one-third of the population struggles with poor accessibility to public transport.
- Long waiting times at transfer points were a common complaint, highlighting the inefficiency of current route planning.

B. Schedule and Time

- 55.86% of respondents wait 5-10 minutes at transfer points, while 17.24% experience waits of 10-20 minutes.
- Many passengers expressed frustration over long waiting times, particularly when transferring between different bus lines.

C. Fare and Ticketing

- 64.83% of respondents consider fares unaffordable, indicating that public transport costs are a financial burden for many users.

- 59.31% report dissatisfaction with fare transparency, meaning passengers often do not understand how fares are determined.
- Many passengers demand a standardized fare structure that eliminates random price variations.

D. Digital Payments

- 81.38% of respondents support digital payments, showing a strong demand for modern fare collection methods.
- Many passengers suggested contactless payment options, including QR codes and mobile apps.

E. Information on Routes, Schedules, and Transfer Points

- 57.24% of respondents find it difficult to access reliable information on routes and schedules.
- Many passengers rely on word of mouth or informal sources to figure out bus timings and connections.

5.2 Finding and Analysis from Observations

5.2.1 Physical Aspects of Integrated Transport

A. Infrastructure

Observations in Pokhara's public transport system indicate that bus stops are poorly developed, lacking essential amenities such as:

- Shelters: The majority of bus stops lack shelters to shield riders from the elements and the sun. Passengers are impacted by this in severe weather.
- Seating: There are no designated seating areas at many bus stops, which makes it difficult for elderly passengers, pregnant women, and people with disabilities to wait comfortably.
- Lighting: Many bus stops do not have adequate lighting, making them unsafe at night. This also increases the risk of accidents, theft, or harassment, particularly for female passengers.
- Encroachment: Vendors and illegally parked vehicles occupy footpaths and waiting areas near bus stops. This not only obstructs passenger movement but also creates chaotic conditions where people struggle to board buses efficiently.

- Absence of Designated Bus Bays: The lack of clearly marked bus bays means buses stop randomly along the roadside, causing unnecessary traffic congestion and making boarding or alighting dangerous.

These infrastructural deficiencies contribute to poor user experiences, making public transport inconvenient and unreliable.

B. Accessibility

The distribution of public transport system in Pokhara is highly uneven, leading to disparities in service availability:

- High-Density Commercial Areas: Locations such as New Road and Lakeside have frequent bus stops due to high passenger demand. These areas serve as commercial hubs, attracting a large number of daily commuters.
- Suburban and Peri-Urban Areas: In contrast, residential and suburban areas receive far fewer transport services. Many passengers from these areas struggle to access public transport conveniently.
- Poorly Planned Transfer Points: Passengers often need to transfer multiple times to reach their destination, leading to longer commute times and increased travel costs.
- Lack of Accessibility for Special Needs Passengers: There are no ramps, wheelchair-accessible platforms, or designated seating for disabled passengers, making it difficult for individuals with mobility impairments to use public transport.

5.2.2 Operational Aspects of Integrated Transport

A. Location/Route

The majority of bus routes are concentrated in commercial corridors such as New Road, Lakeside, and Prithvi Chowk, where there is a high demand for transport.

- In contrast, peripheral residential areas lack adequate public transport services. Commuters in these areas often have to walk long distances or take multiple transfers to reach their destination.
- Routes are not well connected, making certain destinations difficult to reach without switching buses multiple times.
- Some locations, such as the Pokhara International Airport, have limited bus routes, forcing travelers to rely on taxis or private vehicles.

B. Schedule and Time

- Buses in Pokhara do not follow strict schedules. Instead, they operate on rotational shifts, leading to high variability in arrival times.
- Due to traffic congestion, bus delays are frequent, especially during peak hours.
- Buses often wait 15-20 minutes at bus stops to pick up more passengers, further delaying the overall schedule.

C. Fare and Ticketing

- Fare collection is inconsistent, with some conductors charging extra fees during peak hours, holidays, and rainy days.
- There is no centralized system for ticket pricing, leading to discrepancies in fare collection.
- Students and elderly passengers struggle to access discounts, as many bus operators refuse to honor reduced fares after 5/6 PM and on Saturdays.

D. Digital Payments

- Cash transactions dominate despite previous attempts to introduce smart card payments.
- A previous bus card system failed due to transaction mismanagement.
- Many passengers prefer digital payments to avoid cash-handling issues and disputes over fare changes

E. Information on Routes, Schedules, and Transfer Points

- Lack of clear signage at bus stops and transit hubs leads to confusion.
- Many passengers struggle to find reliable information about bus routes, schedules, and transfer points.

5.2.3 Institutional Aspects of Integrated Transport

A. Institutional Design

- The public transport system in Pokhara is primarily managed by private operators, who operate independently with minimal government regulation.
- No centralized authority oversees public transportation, leading to fragmentation and inconsistency in service quality, fare structures, and operational standards.
- Private transport committees control routes, fare collection, and service schedules, but lack standardized policies or enforcement mechanisms.

- The absence of a public transport regulatory authority has resulted in poor infrastructure maintenance, fare fluctuations, and route inefficiencies.

B. Implementation Methods

- Transport policies in Pokhara are mostly reactive rather than proactive, meaning that issues are addressed only after they arise, rather than through long-term strategic planning.
- There is no structured approach to infrastructure development, route planning, or digitalization, resulting in service gaps and inefficiencies.
- Many transport issues, such as traffic congestion, poor scheduling, and lack of infrastructure, remain unaddressed due to the absence of long-term transport policies.

C. Competition Law

- There is no structured competition regulation for public transport services in Pokhara.
- Unregulated competition leads to service disparities, where some routes are over served while others are underserved.
- Some bus operators engage in price manipulation, especially during peak hours or special events, due to the lack of fare regulation.
- The absence of competition laws allows monopolistic practices, where certain private operators dominate specific routes, limiting fair competition and service efficiency.

D. Contractual Issues

- Public transport contracts in Pokhara are often informal, leading to operational inefficiencies and service inconsistencies.
- Transport operators and buses do not have formal agreements with the municipality, allowing arbitrary changes in fare, schedule, and service quality.
- The lack of binding contracts prevents long-term infrastructure investment, as private operators do not have security over their operations.

5.3 Stakeholder Mapping

In stake holder mapping, as described earlier in methodology the stakeholder's characteristics were divided on the basis of power and interest. The figure below shows

the vertical axis denoted the power whereas the horizontal denotes the interest. With these axes concluded four outcomes that are:

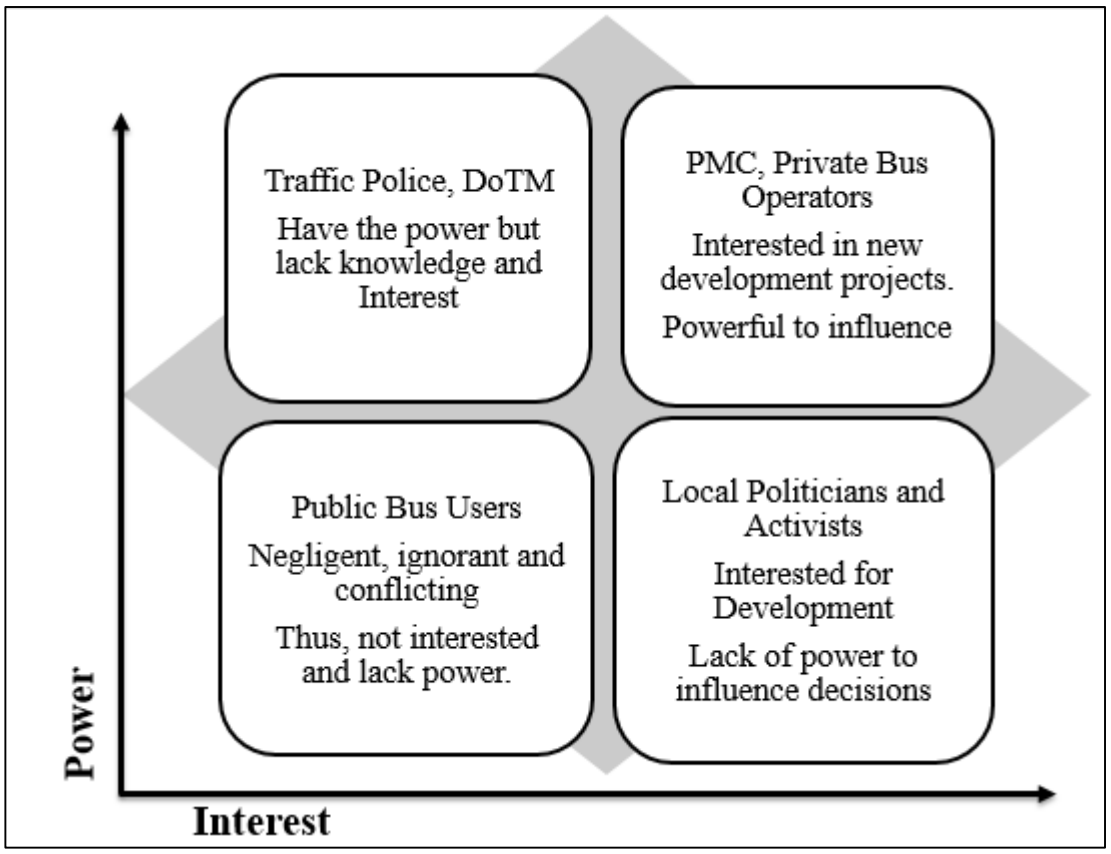

Figure 14 Stakeholder Mapping

- Latents

Latents are stakeholders with considerable authority in the public transport system but have limited awareness or active involvement in improving its integration. This group includes the the Ministry of Physical Infrastructure and Transport (MoPIT) Nepal, the Gandaki Provincial Government, the Traffic Police (Nepal Police, Pokhara Division), and the Department of Transport Management (DoTM) Nepal. These entities regulate urban transport policies, enforce traffic laws, and oversee permits and vehicle registration. However, their lack of proactive engagement in service integration and ensuring seamless connectivity for users often results in inefficiencies. With the right involvement, they could drive meaningful improvements through policy reforms and regulatory oversight.

- Apathetics

Apathetics are stakeholders with little interest and minimal influence over the integration of the public transport system. This category primarily includes public transport users such as daily commuters (students, office workers, laborers, etc.), tourists, persons with disabilities (PWDs), senior citizens, and women passengers. While they depend on public transport for mobility, they generally lack the collective power to influence decision-making. Their concerns—such as accessibility, reliability, and safety—often go unheard unless advocacy groups intervene. Due to their limited participation in policy discussions, they frequently experience service gaps that could be addressed through better stakeholder engagement and community involvement.

- Promoters

Promoters are highly engaged stakeholders who actively contribute to the public transport system's operations and development, though they may not have direct decision-making authority. This group includes Pokhara Metropolitan City (PMC) and public transport unions and associations (e.g., Pokhara Yatayat Pvt. Ltd, Pokhara Begnas Yatayat Pvt. Ltd, private bus and microbus operators. These stakeholders help shape service provision and innovation in the transport sector. PMC is responsible for urban development and infrastructure, while private bus operators are essential players in daily operations. They have the power to influence policies and are interested in new development projects that benefit their operations and the city's transport network. This group is pivotal in implementing significant changes, making them critical allies in efforts to modernize and optimize the transport system.

- Defenders

Defenders are stakeholders who are highly invested in enhancing the public transport system but lack the authority to enforce significant changes. This group Local Politicians and Activists. While they are deeply interested in development and advocating for better transport policies, they lack the power to directly influence decision-making. This group is motivated by social concerns and urban growth but faces limitations in terms of authority. To enhance their impact, it is important to provide them with greater tools and access to decision-making processes. Collaboration between Defenders and Promoters can help bring about necessary reforms, ensuring that their efforts can effectively contribute to the transformation of the public transport system.

5.4 Finding and Analysis from Stakeholders

5.4.1 Physical Aspects of Integrated Transport

A. Infrastructure

- Public Transport Operators' Perspective: Transport operators acknowledged that the lack of adequate investment in bus stop infrastructure is a significant problem. They stated that efforts were made in the past to improve bus stops, but most structures were removed due to road expansion projects.
- Traffic Police Office Opinion: In order to lessen traffic, the Traffic Police Office stressed the necessity of designated bus stops and enhanced infrastructure. Officers noticed that a lack of designated bus bays causes more traffic disturbances and disorganized boarding.
- Municipal Officials: Authorities from the municipality admitted that bus stop infrastructure has been neglected for a long time and that future urban transport plans should prioritize this issue.

B. Accessibility

- Transport Operators: Public transport operators admitted that accessibility remains a major issue, but they attribute the problem to a lack of municipal planning and investment. They prioritize profitable routes over service coverage, leading to poor accessibility in less densely populated areas.
- Municipality Officials: The Pokhara Green Transport Project was introduced as a potential solution to accessibility issues. Municipal officials state that the project aims to improve transport connectivity by redesigning transit routes and increasing coverage to underserved areas.
- Traffic Authorities: Officials from the Traffic Police Office highlighted that poor accessibility leads to increased private vehicle usage, worsening congestion in urban areas.

5.4.2 Operational Aspects of Integrated Transport

A. Location/Route

- Transport Operators: Routes are designed based on profitability rather than passenger demand, leading to over-service in profitable areas and poor coverage in less populated regions.

- Municipal Authorities: The municipality aims to expand routes to underserved areas, with plans to introduce new transport corridors in suburban zones.
- Traffic Police Officials: Poorly designed routes contribute to traffic congestion in key areas where too many buses operate on the same roads.

B. Schedule and Time

- Municipal Officials: They acknowledge scheduling inconsistencies and blame the lack of real-time tracking systems.
- Bus Operators: They claim that unpredictable traffic conditions affect schedule adherence, making fixed schedules difficult to implement.
- Traffic Police: Highlight that unregulated stopping behavior by bus operators contributes to unnecessary delays.

C. Fare and Ticketing

- Transport Operators: Justify fare fluctuations based on fuel price changes and peak-hour demand.
- Municipality Officials: Exploring fare standardization policies to ensure consistent pricing.
- Traffic Police: Recognize that lack of regulation allows conductors to charge inconsistent fares.

D. Digital Payments

- Transport Operators: Cite past failures in digital payment implementation, mainly due to lack of proper financial management.
- Municipality Officials: Acknowledge the importance of digital payments but have not yet developed a concrete implementation plan.

E. Information on Routes, Schedules, and Transfer Points

- Transport Operators: Depend on Facebook pages and informal word-of-mouth communication rather than official transport information systems.
- Municipal Officials: Recognize the need for structured information systems and digital tools to enhance passenger convenience.

5.4.3 Institutional Aspects of Integrated Transport

A. Institutional Design

- Municipality Officials: The Pokhara Green Transport project has been proposed as a solution to the lack of government oversight. This initiative aims to introduce a government-managed transport model, ensuring better regulation and accountability.
- Transport Operators: Many private operators oppose full government intervention, fearing loss of control and profitability. However, they acknowledge that better regulation could improve service consistency.
- Traffic Police Officials: Highlighted that poor institutional oversight contributes to uncontrolled congestion, chaotic bus operations, and frequent rule violations.

B. Implementation Methods

- Municipality Officials: Acknowledged that transport planning is short-term and lacks strategic vision. They claimed that efforts are being made to introduce comprehensive transport strategies.
- Transport Operators: Highlighted that existing policies do not support long-term investments in the sector, making sustainable improvements difficult.
- Traffic Police: Emphasized the need for better traffic management policies, particularly regarding public transport route organization.

C. Competition Law

- Municipality Officials: Acknowledged that the absence of competition laws has led to operational inefficiencies and pricing irregularities. They suggested the need for fair competition laws to regulate fare structures and ensure balanced route distribution.
- Transport Operators: Some operators support competition regulation but argue that excessive government intervention could reduce profits.
- Traffic Police: Highlighted that service disparities are caused by the lack of a proper licensing and regulatory framework, leading to poor service in less profitable areas.

D. Contractual Issues

- Municipality Officials: Acknowledged the absence of standardized contracts, stating that formal agreements should be introduced to ensure service quality and fare consistency.
- Transport Operators: Expressed concerns that binding contracts might limit their operational flexibility, but admitted that structured agreements could improve service reliability.
- Traffic Police: Stressed that unregulated contracts contribute to operational inefficiencies and inconsistent service standards.

5.5 Analysis

5.5.1 Descriptive Analysis

This section presents the descriptive analysis of the data gathered through the questionnaires during the study. Descriptive statistics is the study of statistically characterizing the main elements of data collection. Descriptive statistics can be used to logically simplify large amounts of data pertaining to these variables. For this purpose, respondents were provided with "Four-Point Likert Scale" questions, for example ranging from "strongly disagree" to "strongly agree," and scored from 1 to 4.

Descriptive Statistics

Physical Integration	N	Mean	Std. Deviation
Time taken to reach the nearest public transport stop	145	1.92	0.97
Rate the infrastructure at bus stops/stations	145	2.23	0.70
Waiting time at transfer point	145	2.05	0.77
To transfer between different public transports modes	145	2.34	0.61

- Since it is closer to the lower end of the Likert scale, the mean value (1.92) for the time it takes to go to the closest public transport stop shows that respondents typically find it less time-consuming.
- The infrastructure at bus stops/stations has a mean score of 2.23, suggesting that respondents rate it as below average, implying a need for improvement in aspects like shelter, seating, lighting, and accessibility.
- Waiting time at transfer points has a mean of 2.05, indicating that passengers experience moderate delays while transferring between different transport services.

- The ease of transferring between public transports modes scored 2.34, which is slightly higher but still suggests some difficulties in seamless transit.

Network Integration	N	Mean	Std. Deviation
Transfer between buses to complete trip	145	2.10	0.70
Reliability (Punctuality of buses according to schedule)	145	2.40	0.78
Customer service (Cleanliness, Seat comfort, Behaviors of Bus staffs)	145	2.21	0.74
Safety and security (Safety against crimes on buses)	145	2.37	0.78
Overall Satisfaction (Reliable, Comfort and Safety)	145	2.37	0.77

- The mean score of 2.10 for transfers between buses suggests that multiple transfers are often required, which could be inconvenient for passengers.
- Punctuality of buses received a mean score of 2.40, indicating that bus schedules are not highly reliable.
- Customer service (2.21 mean) reflects moderate dissatisfaction with aspects like cleanliness, seating comfort, and the behavior of staff.
- Safety and security concerns received a mean of 2.37, suggesting that passengers feel moderate levels of security but still find room for improvement.
- Overall satisfaction (2.37 mean) aligns with the scores for reliability and safety, suggesting that while some aspects are acceptable, there is still significant dissatisfaction with the system.

Fare integration	N	Mean	Std. Deviation
Issues with fare payments	145	2.28	0.96
Are you with the transparency of fare calculations	145	2.24	0.66

- The mean score of 2.28 for issues with fare payments indicates that some passengers face challenges such as unclear pricing, inconsistent fares, or difficulties in payment.
- The mean score of 2.24 for fare transparency suggests that respondents do not find the fare system highly transparent, leading to possible dissatisfaction.

Information integration	N	Mean	Std. Deviation
Is it to find information about public transport routes, schedules, and transfer points	145	2.20	0.67
Rate the clarity and availability of information provided	145	2.39	0.68

- The mean score of 2.20 for ease of finding transport information suggests that passengers struggle to obtain necessary travel information.
- The clarity and availability of public transport information scored 2.39, indicating that information is not always clear or easily accessible.

5.5.2 Reliability Test

Reliability Statistics

Variable	Cronbach's Alpha
Physical integration	0.26
Network integration	0.73
Fare integration	0.58
Information integration	0.73

The reliability test was conducted to assess the internal consistency of the items measuring various integration factors in the study. Cronbach's Alpha was used as the reliability measure, with values above 0.7 considered good, values between 0.5 and 0.7 considered acceptable, and values below 0.5 indicating poor reliability.

- Physical Integration (Cronbach’s Alpha = 0.26)

  The Cronbach’s Alpha for physical integration is well below 0.5, indicating poor reliability. This suggests that the items used to measure physical integration are not consistent and may not align to capture the same underlying concept. Therefore, it was excluded from the study due to its unreliability. Possible reasons for this low reliability could include poorly designed items, measurement errors, or diverse participant perceptions.

- Network Integration (Cronbach's Alpha = 0.73)
  With a Cronbach's Alpha of 0.73, network integration demonstrates good reliability. This indicates that the items measuring this variable are consistent and effectively represent the concept of network integration, making it a reliable variable for analysis.
- Fare Integration (Cronbach's Alpha = 0.58)
- The reliability score for fare integration falls in the acceptable range (0.5–0.7), indicating moderate internal consistency. While it is not as strong as network integration, it is still considered sufficiently reliable for inclusion in the study.
- Information Integration (Cronbach's Alpha = 0.73)
  Similar to network integration, information integration also has a Cronbach's Alpha of 0.73, indicating good reliability. This score suggests that the items consistently measure the intended concept, making it a valid variable for further analysis.

The reliability test shows that network integration, fare integration, and information integration have acceptable to good reliability, with Cronbach's Alpha values above 0.5, making them suitable for inclusion in the study. However, physical integration, with a Cronbach's Alpha of 0.26, is not reliable and was therefore excluded from further analysis to maintain the study's integrity and accuracy.

Regression

R	R Square	Adjusted R Square	Std. Error of the Estimate
.215	.046	.040	.969

The regression analysis shows that fare accounts for 4.6% of the variance (R Square = 0.046) in usage frequency, meaning that 95.4% of the variance is explained by other factors such as service quality, accessibility, or personal preferences. The R-value of 0.215 indicates a weak positive correlation between fare and usage frequency. The adjusted R Square of 0.040 confirms that the explanatory power remains low even after adjusting for model complexity. Additionally, the standard error of the estimate (0.969) indicates moderate variability, suggesting that the predicted values for usage frequency may deviate from actual values by approximately 0.969 units on average, highlighting the need to explore additional factors for better prediction accuracy.

ANOVA

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	6.50	1.00	6.50	6.93	0.01
Residual	134.16	143.00	0.94		
Total	140.66	144.00			

An ANOVA table is used to test the overall significance and applicability of the regression model. The F-value of 6.93 and a p-value of 0.01 indicate that the model is statistically significant at the 5% level of significance ($p < 0.05$). This confirms that the independent variable (fare) has a measurable impact on the dependent variable (usage frequency). The regression sum of squares (6.50) reflects the explained variance, while the residual sum of squares (134.16) represents the unexplained variance. Since the model is significant, fare can be considered a relevant factor in predicting usage frequency.

Coefficients

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics
	B	Std. Error	Beta			VIF
(Constant)	1.36	0.28		4.92	0.00	
Avg_Fare	0.31	0.12	0.22	2.63	0.01	1.00

The coefficient table highlights the relationship between fare and usage frequency. The unstandardized coefficient (B = 0.31) indicates that for every one-unit increase in fare, usage frequency increases by 0.31 units. The beta value (0.22) confirms that fare has a positive and significant impact on usage frequency, with a t-value of 2.63 and p-value of 0.01 ($p < 0.05$). Additionally, the Variance Inflation Factor (VIF = 1.00) shows no multi-collinearity between fare and usage frequency. This means that fare is an independent predictor, and the model results are reliable.

5.5.3 Correlations

Variables	Correlation	Overall Satisfaction
Gender	Pearson Correlation	-.029
	Sig. (2-tailed)	.733
	N	145

Variables	Correlation	Overall Satisfaction
Age	Pearson Correlation	.086
	Sig. (2-tailed)	.303
	N	145
Profession	Pearson Correlation	.115
	Sig. (2-tailed)	.169
	N	145
Most common trip purpose	Pearson Correlation	.166
	Sig. (2-tailed)	.046
	N	145
Frequency of Public Transport Use	Pearson Correlation	.168
	Sig. (2-tailed)	.043
	N	145

The correlation test shows relationship between general characteristics of respondents i.e. gender, age, profession, most common trip purpose, frequency of public transport use and overall satisfaction in terms of reliability, comfort and safety. From the correlation table it can be seen that only 2 variables i.e. most common trip purpose and frequency of public transport use have significant correlation with overall satisfaction as it has sig value less than 0.05 while other variables do not have significant relationship.

Variables	Correlation	Frequency of Public Transport Use
Network	Pearson Correlation	0.14
	Sig. (2-tailed)	0.10
	N	145.00
Fare	Pearson Correlation	0.22
	Sig. (2-tailed)	0.01
	N	145.00
Information	Pearson Correlation	-0.05
	Sig. (2-tailed)	0.52
	N	145.00

The correlation analysis examines the relationship between integration factors (network, fare, and information) and frequency of public transport use. The Pearson correlation coefficient (r) indicates the strength and direction of the linear relationship between these variables (*Pearson Correlation and Linear Regression*, n.d.). A significance value (Sig.) less than 0.05 suggests a statistically significant relationship, while values greater than 0.05 indicate no significant correlation.

- Network Integration (r = 0.14, p = 0.10)

  The Pearson correlation coefficient for network integration is 0.14, indicating a weak positive relationship with the frequency of public transport use. However, with a p-value of 0.10 (p > 0.05), this relationship is not statistically significant, meaning it could be due to chance and is not a reliable predictor of transport frequency.

- Fare Integration (r = 0.22, p = 0.01)

  Fare integration shows a weak but statistically significant positive correlation with frequency of public transport use (r = 0.22, p < 0.05). This suggests that as fare integration improves, the frequency of public transport use tends to increase. The significant relationship indicates that fare integration plays an important role in influencing public transport usage.

- Information Integration (r = -0.05, p = 0.52)

  Information integration has a very weak negative correlation with public transport frequency (r = -0.05), indicating no meaningful relationship. The p-value of 0.52 (p > 0.05) confirms that this relationship is not statistically significant, suggesting that information integration has little to no impact on how frequently public transport is used.

The correlation analysis shows that among the three integration factors, only fare integration has a statistically significant positive correlation (p < 0.05) with the frequency of public transport use, indicating its relevance in influencing usage. In contrast, network and information integration do not show significant relationships, suggesting that these factors may have less impact on transport frequency in this context.

ANOVA

Fare structure and profession

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1.45	4.00	0.36	1.60	0.18
Within Groups	31.61	140.00	0.23		
Total	33.06	144.00			

ANOVA results for fare structure and profession show that the F-value is 1.60 with a p-value of 0.18 (p > 0.05). This indicates that there is no statistically significant relationship

between profession and fare structure. The between-groups sum of squares (1.45) is much smaller compared to the within-groups sum of squares (31.61), suggesting that any observed differences in fare structure across different professions are likely due to random variation rather than a meaningful effect of profession.

Fare Structure and Age

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	0.71	2.00	0.36	1.57	0.21
Within Groups	32.35	142.00	0.23		
Total	33.06	144.00			

ANOVA results for fare structure and age reveal an F-value of 1.57 with a p-value of 0.21 ($p > 0.05$), indicating that age does not have a significant impact on perceptions of fare structure. The between-groups sum of squares (0.71) is relatively small compared to the within-groups sum of squares (32.35), which confirms that age differences do not contribute significantly to variations in how fare structure is perceived.

Digital payment and Age

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	4.79	2.00	2.40	19.82	0.00
Within Groups	17.18	142.00	0.12		
Total	21.97	144.00			

ANOVA results for digital payment and age indicate a statistically significant relationship ($F = 19.82$, $p < 0.05$). The between-groups sum of squares (4.79) is considerably higher compared to previous tests, suggesting that age plays a meaningful role in influencing digital payment usage. This significant result indicates that age affects preferences or behavior regarding digital payments, with younger and older age groups likely showing different patterns in their adoption of digital payment methods.

Digital Payment and Profession

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	6.10	4.00	1.52	13.45	0.00
Within Groups	15.87	140.00	0.11		
Total	21.97	144.00			

ANOVA results show a statistically significant relationship ($F = 13.45$, $p < 0.05$). The between-groups sum of squares (6.10) is relatively high compared to the within-groups sum of squares (15.87), indicating that profession strongly influences the use of digital payment methods. Different professional groups may have varying access, familiarity, or preferences regarding digital payment systems, resulting in significant differences in their adoption and usage.

5.5.4 Tests of Normality

Physical integration	Kolmogorov-Smirnova		
	Statistic	df	Sig.
Time taken to reach the nearest public transport stop	0.25	145.00	0.00
Rate the infrastructure at bus stops/stations	0.27	145.00	0.00
Waiting time at transfer point	0.30	145.00	0.00
To transfer between different public transports modes	0.34	145.00	0.00

The Kolmogorov-Smirnov test for physical integration variables indicates that none of the data is normally distributed, as the p-values are all less than 0.05. The test statistics range from 0.25 to 0.34, suggesting significant deviation from a normal distribution. Variables such as time taken to reach the nearest public transport stop (0.25), infrastructure rating at bus stops (0.27), waiting time at transfer points (0.30), and ease of transferring between modes (0.34) reflect highly skewed or clustered responses. This non-normality suggests that participants may have polarized experiences regarding these physical integration aspects, with some facing extreme challenges while others report satisfactory conditions.

Network integration	Kolmogorov-Smirnova		
	Statistic	df	Sig.
Do current public transport routes cover key destinations	0.28	145.00	0.00
transfer between buses to complete trip	0.26	145.00	0.00
Reliability (Punctuality of buses according to schedule)	0.29	145.00	0.00
Customer service (Cleanliness, Seat comfort, Behaviors of Bus staffs)	0.26	145.00	0.00
Safety and security (Safety against crimes on buses)	0.25	145.00	0.00
Overall Satisfaction (Reliable, Comfort and Safety)	0.28	145.00	0.00

The Kolmogorov-Smirnov test for network integration variables also shows no normal distribution, with p-values less than 0.05 for all questions. The test statistics range from 0.25 to 0.29, indicating strong deviation from normality. Variables like route coverage of key destinations (0.28), reliability and punctuality of buses (0.29), and safety and security (0.25) show that responses may be clustered at extremes, suggesting highly varied user experiences. For example, some users might find routes and schedules reliable, while others experience frequent delays and lack of coverage for important destinations.

Fare integration	Kolmogorov-Smirnova		
	Statistic	df	Sig.
Current fare structure affordable	0.42	145.00	0.00
Issues with fare payments	0.25	145.00	0.00
Are you with the transparency of fare calculations	0.33	145.00	0.00
Digital payment options	0.50	145.00	0.00

For fare integration, the Kolmogorov-Smirnov test reveals statistically significant non-normal distributions across all variables, with high test statistics ranging from 0.25 to 0.50. The variable digital payment options (0.50) shows the greatest deviation from normality, suggesting a highly polarized response. Other variables, such as affordability of the current fare structure (0.42) and transparency of fare calculations (0.33), reflect

diverse opinions and likely indicate that perceptions of fare structure and payment methods are inconsistent among respondents.

Information integration	Kolmogorov-Smirnova		
	Statistic	df	Sig.
Is it to find information about public transport routes, schedules, and transfer points	0.31	145.00	0.00
Rate the clarity and availability of information provided	0.27	145.00	0.00

The Kolmogorov-Smirnov test for information integration also shows non-normal data, with p-values less than 0.05. The test statistics for the ease of finding information about routes and schedules (0.31) and the clarity and availability of information (0.27) highlight significant deviations from normality. This suggests that responses are not evenly distributed, possibly reflecting difficulties in accessing reliable public transport information or inconsistencies in the quality and availability of information provided.

The Kolmogorov-Smirnov tests for all integration factors—physical, network, fare, and information integration—confirm that none of the data is normally distributed ($p < 0.05$). This non-normality indicates that the responses are likely skewed or clustered, reflecting diverse user experiences and perceptions.

5.6 Discussion

The purpose of the study was to assess Pokhara Metropolitan City's public transport system's integration, focusing on three major aspects: physical, operational, and institutional integration. The findings from surveys, observations, and key informant interviews indicate that significant gaps exist in infrastructure, scheduling, regulatory oversight, and commuter satisfaction. These inefficiencies contribute to longer travel times, accessibility issues, and a lack of trust in public transport services. The analysis highlights the challenges faced by passengers and the structural deficiencies that hinder an integrated and seamless transport experience.

Table 7 Summarize Table of Discussion

Aspects	Indicator	Discussions
Physical	Infrastructures	The physical infrastructure of Pokhara's public transport system is severely inadequate. This includes poorly located and poorly maintained bus stops, lack of basic amenities such as seating, shelters, and proper lighting. Survey data and observations support these findings, with most respondents rating bus stop facilities poorly. The absence of regulated bus stops and encroachment by vendors exacerbate congestion and safety risks.
	Accessibility	Accessibility remains a major issue, with significant disparities between central and suburban areas. Around 26% of respondents have to travel more than 10 minutes to reach a bus stop, and those in less densely populated areas experience poor access. Furthermore, the lack of disability-friendly infrastructure further limits access.
Operational	Location/ Route	Route coverage is insufficient, with many peripheral areas underserved. Most routes focus on high-traffic commercial zones, leading to inefficiencies in serving residential areas. This contributes to reliance on alternative transport modes like private vehicles.
	Schedule and Time	Scheduling is a significant challenge, with buses not following fixed timetables. Delays are frequent, especially during peak hours, and long waiting times at transfer points further reduce the reliability of the system. Passengers express frustration with the unpredictability of bus arrivals.
	Fare and Ticket	Fare collection is highly inconsistent, with passengers reporting unclear pricing and frequent adjustments based on peak hours or other factors. This issue is made worse by the dissatisfaction with the transparency of fare calculations. The affordability of fares remains a key concern, especially in light of the low service quality.
	Digital Payments	Despite strong demand for digital payment options, past attempts at implementing Smart Metro Cards have failed due to poor execution and management. The lack of digital payment systems hampers the system's efficiency and convenience for passengers.

Aspects	Indicator	Discussions
		There is a clear need for modern, cashless payment options to improve fare collection.
	Information on Routes, Schedules, and Transfer Points	Information dissemination is poor, with passengers struggling to find accurate and timely details on routes and schedules. The absence of real-time updates and clear signage contributes to confusion and inefficiency, making commuting more inconvenient.
Institutional	Institutional Design	Institutional weaknesses are at the core of Pokhara's transport issues. The absence of a regulatory authority and the fragmentation of the transport system lead to inconsistencies in services, pricing, and planning. Public-private coordination remains poor, with limited government intervention.
	Implementation Methods	Transport policies and planning are often reactive, with a lack of strategic foresight. The absence of a structured approach to urban transport planning exacerbates the challenges faced by the system.
	Competition Law	The lack of competition regulation allows monopolistic practices to persist, leading to inequalities in service distribution. This lack of regulatory oversight contributes to poor service quality in less profitable routes and increases inefficiencies in the system.
	Contractual Issues	The absence of formal contracts between government and operators results in operational inefficiencies, as changes to routes, fares, and service standards are made without regulation or accountability. This limits long-term investment and improvement.

Discussion Summary:

Physical Aspects:

Pokhara's public transport infrastructure is severely lacking, with poorly developed bus stops, lack of seating, shelters, lighting, and accessibility, especially for the disabled. This has been confirmed through observations, survey data, and interviews. The lack of well-located, well-maintained bus stops and infrastructure negatively affects passenger experience and discourages use.

Operational Aspects:

Operational inefficiencies are evident in route coverage, scheduling, fare collection, and digitalization. Routes are concentrated in commercial hubs, and suburban areas are underserved. Scheduling is unreliable, with significant delays and long waiting times. Fare collection is inconsistent, and there is a demand for digital payment systems, which have previously failed due to poor implementation.

Institutional Aspects:

The lack of a centralized transport authority leads to fragmented operations and insufficient regulatory oversight. There is no formal contract between the government and private operators, resulting in inconsistent service quality and fare practices. The system operates reactively rather than strategically, with slow progress on long-term projects like the Pokhara Green Transport project.

The study highlights critical gaps in physical infrastructure, operational efficiency, and institutional governance, all of which impact the overall integration of public transport in Pokhara. The poorly maintained bus stop infrastructure, inadequate route coverage, unreliable scheduling, fare inconsistencies, and absence of government regulation collectively contribute to a disorganized and inefficient transport system. The findings suggest that without structured urban transport policies, centralized regulatory oversight, and digital modernization, the city's public transport will continue to face challenges in reliability, accessibility, and commuter satisfaction.

CHAPTER 6: CONCLUSION AND RECOMMENDATION

6.1 Conclusion

This study assessed the public transport network of Pokhara Metropolitan City from the perspective of integration according to the three prime objectives of establishing the dimensions of integration, their implementation assessment, and recommending improvement strategies. Through the critical review of the literature and effective case studies, the prime dimensions of integration were identified to make the study feasible within the study area. These dimensions formed the systematic framework to ascertain the degree to which the public transport network meets the needs of the residents and tourists.

The findings reveal that significant gaps exist in infrastructure, service coordination, and regulatory oversight, which hinder the efficiency and reliability of public transport in Pokhara. Physical shortcomings, such as inadequate bus stops lacking shelters, seating, and proper signage, create inconvenience for passengers, while long distances to bus stops and extended transfer waiting times reduce accessibility. Operational inefficiencies, including poor route planning, irregular timetables, and a lack of digital services such as real-time tracking and cashless payment systems, contribute to an unreliable and inefficient service. Institutional weaknesses, particularly the absence of a coordinating authority, result in fragmented operations, unregulated fare structures, and monopolistic control by private operators, leading to inconsistencies in service quality.

Despite these challenges, the study highlights significant opportunities for improvement. The transportation network should be upgraded and improved simultaneously. It is time to make a difference to Pokhara's public transport system. The direction is to launch integration to achieve seamless mobility at all levels. We cannot expect that integration would reduce car ownership and road congestion within a short time but in the long run, this could be achieved as a result of significant improvements in the service quality of our public transport system. Public transport would then be more attractive by increasingly improved accessibility, connectivity, convenience and affordability to passengers.

6.2 Recommendations

In rapidly urbanizing areas, such as in Pokhara, the need for an integrated and well-managed transport system is even more pressing. By implementing strategic reforms in infrastructure, operational efficiency, and institutional management, Pokhara can develop a well-integrated and commuter-friendly transport network. Addressing the identified gaps will not only enhance accessibility and service reliability but also contribute to economic growth, reduced congestion, and sustainable urban mobility. With better coordination among stakeholders and the adoption of structured integration measures, Pokhara can move towards a modernized and efficient public transport system that meets the city's growing mobility demands. The following recommendations outline key strategies to improve public transport efficiency, accessibility, and sustainability.

A. Physical Integration

- Developing well-designed public bus stops and transit facilities is crucial for improving the efficiency and accessibility of public transport. These facilities should include shelters, seating, lighting, and digital information boards for better convenience and safety. Additionally, dedicated bus lanes, parking for feeder services, and accessibility features like ramps and tactile paving can foster an inclusive transit environment.

- Park and ride facilities for bicycles are worth expanding. More parking spaces for vehicles and bikes should be provided near stations or main transport hubs. Prioritizing non-motorized transport infrastructure, such as pedestrian pathways and cycling lanes, can complement public transport and reduce dependence on private vehicles. This is not only good for health but also attract more people to use public transport.

B. Operational Integration

- Efficient transportation operations require seamless integration between different public bus routes. Well-planned interchanges at key transit nodes can facilitate smooth passenger transfers, reducing travel time and inconvenience. Implementing coordinated scheduling, route optimization, and real-time tracking can improve service reliability and minimize congestion. Additionally, bus priority measures such as signal preemption and dedicated lanes can enhance operational efficiency. A well-

connected transport network with minimal transfer time and easy route navigation will significantly boost ridership.

- Service quality of bus is a public big concern. Operators should take adequate and effective measures to maintain their service in an acceptable manner and to ensure adequate choice of modes and safety. Speedy improvements to be made on the quality of public transport services should be given priority. The government has responsibility to continuously monitor the performance of public transport system.

- Also the driving attitude and safety concepts of public bus drivers are of great concern to the public. Their frequent or even occasional careless driving behaviour leads to accidents and creates danger to the public. The government needs to enforce laws and rules to regulate their behaviour. This should not only warn those misbehavior drivers but also maintain safe environment to the public. The government should also closely observe their operation to maintain service quality.

- Integration aims to provide a more affordable public transport system to passengers. Although a large scale of fare deduction cannot be anticipated within a short period, fare should be kept at a reasonable level. The introduction of combined zoning calculation of fares can avoid duplicate charge and introduce a fair fare.

- Leveraging advanced technology in public transport management can enhance service efficiency and user experience by implementing an Intelligent Transport Management System (ITMS).

Table 8 Benefits of Intelligent Transport Management System (ITMS)

Aspects	For Organizations (Operators & Monitoring Authority)	For Commuters & Passengers
Real-time Monitoring of Buses	- Allows operators to track bus locations in real-time. - Enables quick responses to delays, accidents, or service interruptions.	- Provides passengers with up-to-date information on bus locations. - Reduces wait times and helps commuters plan their journeys effectively.

Aspects	For Organizations (Operators & Monitoring Authority)	For Commuters & Passengers
Predictive Scheduling	- Uses data to predict demand and optimize bus scheduling. - Helps to allocate buses during peak hours, ensuring coverage. - Reduces scheduling inefficiencies.	- Ensures availability of buses during high-demand periods, reducing overcrowding. - Improves punctuality, helping passengers travel at the right time with fewer delays.
Automated Fleet Management	- Streamlines fleet management with automated tasks like scheduling maintenance and optimizing bus allocation. - Ensures better resource management and utilization.	- Leads to more reliable buses, fewer breakdowns, and better-maintained vehicles. - Reduced delays due to better fleet coordination.
Optimize Resource Allocation	- Maximizes resource use (buses, drivers) efficiently. - Reduces operational costs by eliminating unnecessary delays and operational inefficiencies.	- Provides consistent service, reducing waiting times and offering reliable travel options. - More effective travel routes with less congestion
Development of App System	- Provides a digital platform for operators to manage and optimize their fleet and schedule. - Facilitates real-time communication with passengers for updates and alerts.	- A dedicated app allows passengers to track buses in real-time, get route information, check schedules, and make digital payments. - Enhances user experience with features like trip planning, alerts, and mobile payment.

By integrating these features into a comprehensive Intelligent Transport Management System (ITMS) with a supporting app system, the transportation network becomes more responsive, efficient, and user-friendly for both operators and passengers.

C. Institutional Integration

- A great deal of public consultation is needed on the subject of public transport system if the government is determined to benefit all people in this field. Public consultation is essential to open communication with communities to address their concerns about public transport planning. The government must share their views and opinions with the public and to strike a balance between planning and consultation.

- The government should make more attempts to support participation in addition to encouragement. It should perform a coordinator role to motivate and develop a cooperation platform between different public transport operators. Experiences from Singapore and Australia indicate that their governments endeavor to develop a platform of collaboration and cooperation between different operators in order to fulfill the aims of integration.

- Institutional frameworks must be tailored to support integrated transport and urban development initiatives. Strengthening collaboration between transport authorities, urban planners, and local governments can facilitate coordinated decision-making and policy implementation. Establishing a transport regulatory body to oversee planning, operations, and infrastructure development can streamline governance and resource allocation. Furthermore, aligning transport policies with land use planning strategies can ensure that urban expansion is supported by efficient mobility systems, reducing congestion and improving overall urban livability.
- Pokhara Metropolitan City should act as the leading agency in managing and overseeing the local public transport system, especially after the establishment of federalism in Nepal. As the local government now holds significant authority and responsibility, it is essential for Pokhara Metropolitan City to take the lead in coordinating efforts, ensuring that public transport initiatives are effectively integrated into the city's broader urban planning and development goals. This can help in creating a more cohesive and efficient transport network that meets the needs of all citizens.

By implementing these measures, Pokhara can transition towards a well-integrated, accessible, and efficient public transport system that meets the mobility needs of its residents and visitors. A structured approach to integration will enhance commuter experience, reduce congestion, promote sustainability, and support the city's long-term urban development goals.

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APPENDIX 1 - OBSERVATIONS

This chapter focuses on the research conducted in the field to collect data. It primarily discusses field observations conducted along predefined routes within Pokhara Metropolitan City. Key elements assessed included bus stop conditions, vehicle availability, passenger boarding and alighting behavior, and service frequency.

A. Lamachaur - Chhorepatan Route

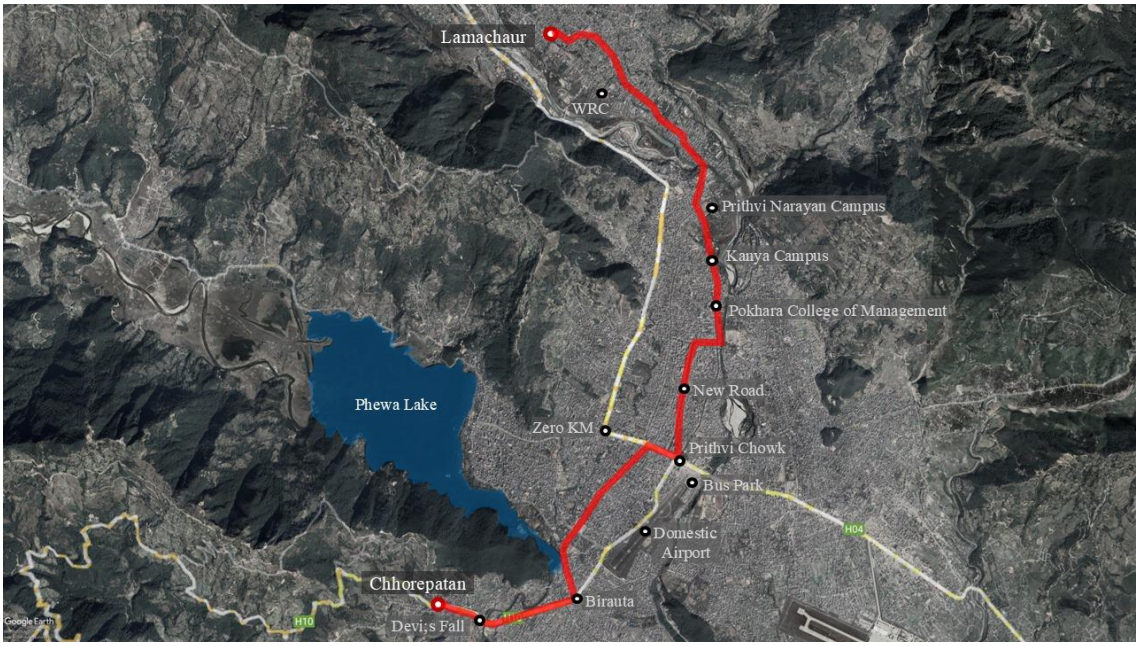


Figure 15 Public Bus Route from Lamachaur to Chhorepatan

Figure 16 Bus Stand at Lamachaur

The field study was conducted on the public transportation route from Lamachaur to Chhorepatan. The findings revealed several shortcomings in the infrastructure and service delivery. At Gaurikhor (bus parking stand at chhorepatan), there were no fixed bus stops, with buses parked randomly along the roadside. The area lacked basic facilities for passengers, such as shelters or seating arrangements, leaving commuters exposed to the elements. Despite the absence of structured stops, 7-8 buses serving different routes, including Chipledhunga-Bagar-Lamachaur, Lamachaur-

Newroad-Bagar, and Chipledhunga-Birauta-Chhorepatan, were observed operating in this area, managed under the Pokhara City Bus service.

Buses departed and arrived frequently, with an average interval of five minutes. For instance, buses were recorded at 12:05 PM, 12:10 PM, and subsequently every 5-10 minutes. Passenger waiting times ranged between 5 to 10 minutes during the observation period. Each bus had a seating capacity of 37, with two designated seats for women,

Figure 17 Bus Stations

disabled individuals, and senior citizens. The fare was NPR 60 for regular passengers, while cardholders paid NPR 30.

The journey began at 12:50 PM, with notable stops such as New Road (8 minutes), Sabhagrihye Chowk (5 minutes), and Srijana Chowk (2 minutes). A traffic jam was encountered at Ratna Chowk, highlighting congestion issues along the route. The bus reached Chhorepatan at 1:40 PM, where similar infrastructure inadequacies were observed. Buses were parked along the Siddhartha Highway without designated stops or facilities for passengers.

B. Fewalake to Begnas Lake Road Section

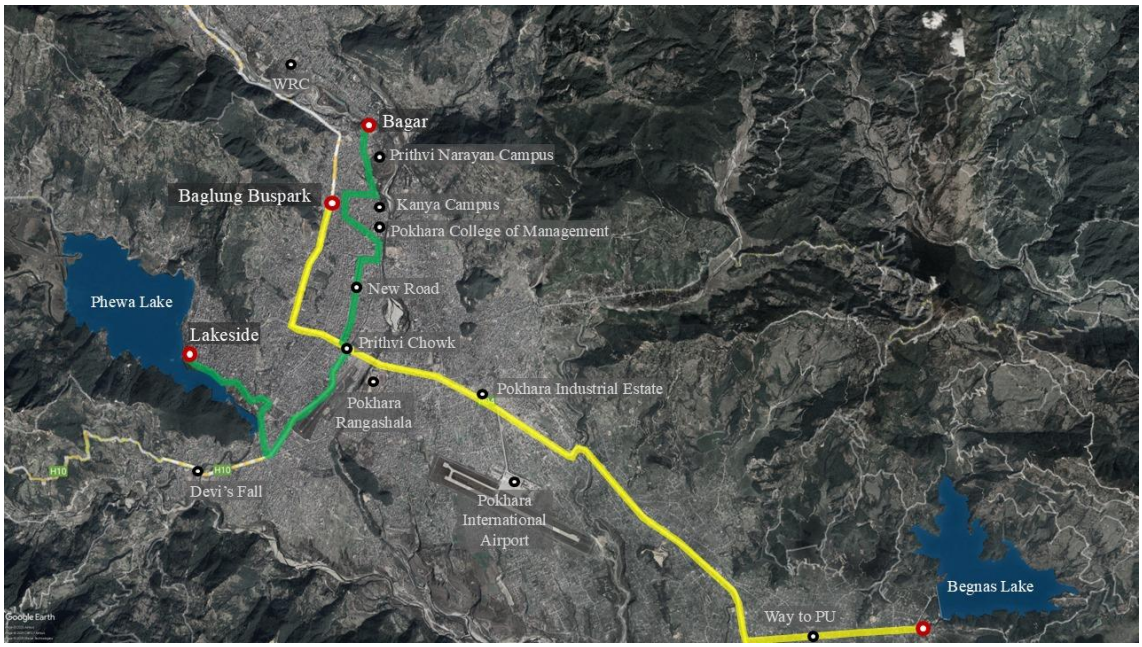


Figure 18 Public Bus Route from Fewa Lake to Bagar

- **Fewalake – Bagar Route**

The field study at Phewa Bus Stand highlighted the disorganized nature of public transportation and the lack of basic infrastructure. The bus stand accommodated 6-7 buses, along with private vehicles such as taxis and cars. Approximately 12-13 taxis were observed operating at the stand. Various routes were served, including Chipledhunga-Mahendrapul-Bagar, Phewa-Bagar-Mahendrapul, and Chipledhunga-Naagdhunga-Phewatal. Despite its location near a significant landmark like Fewa Lake, the bus stand lacked proper infrastructure and facilities for passengers.

The Pokhara City Bus system operates with buses departing every five minutes, maintaining a high frequency. However, a lack of a proper bus stand and seating facilities for passengers was evident, leaving commuters without basic comfort and

Figure 19 Bus Stand at Fewa Lake

convenience. While the site provides access to a public toilet—likely due to its proximity to Fewa Lake, a renowned tourist attraction—other essential facilities, such as shaded waiting areas, organized boarding zones, and clear signage, are noticeably absent. A bus departing for Bagar via Mahendrapul began its journey at 12:05 PM. It reached Prithivi Chowk at 12:33 PM, Chipledhunga at 12:46 PM, Mahendrapul at 12:49 PM, and finally arrived at Bagar at 1:00 PM. Along the route, there were notable stops at Adalat, Birauta, and Gandaki University. A brief waiting period of 5 minutes was observed at a main road stop.

Figure 20 Public Toilet at Fewa Bus Stop

At Prithivi Chowk, a transit point for many passengers, there was a walking distance of 5 minutes to switch buses to travel Begnas Lake area. However, the transit point lacked essential facilities such as shaded waiting areas or seating, leaving passengers without protection from adverse weather. This lack of amenities underscores the inadequacy of the public transportation system in meeting commuter needs.

C. Begnas Lake to Bindabasini Buspark

The field study on the route from Begnas Lake to Bindabasini Buspark, operated by Begnas Pokhara Yatayat, revealed key insights into the operational patterns and infrastructure of the service. At Begnas Bus Stand, five buses were on standby, with departures recorded at 3:00 PM and 3:10 PM. The journey from Begnas Lake included a stop at Anarsingh Chowk at 2:03 PM, and buses maintained consistent departures, such

as at 1:42 PM, 1:44 PM (reaching Bindabasini at 2:53 PM), and 1:46 PM (reaching at 3:17 PM). This reflects a regular schedule with intervals of around 2-3 minutes between departures.

Figure 21 Begnas Yatayat Bus

At Prithivi Chowk, a critical transit point, one bus was observed on standby while another arrived and departed within approximately 5 minutes. Recorded departures included 5:03 PM and 5:08 PM, with the bus reaching Prithivi Chowk at 5:18 PM. waiting times at this stop were observed to be around 5 minutes, indicating efficient handovers between buses.

At the Pokhara Baglung Buspark, infrastructure was relatively better, with 5-6 buses on standby and toilet facilities available for passengers, which is an improvement compared to other transit points lacking amenities. However, the overall infrastructure along the route, including at major stops like Prithivi Chowk and Begnas Stand, still lacks adequate facilities such as proper seating, shaded waiting areas, and organized boarding zones.

Figure 22 Begnas Bus Stop and Under Construction Road

D. Other Observations

- **Traffic Lights**

Traffic lights were operational at only two major junctions in Pokhara—Srijana Chowk and Prithivi Chowk. These junctions are among the busiest in the city, handling significant traffic flow throughout the day.

Figure 23 Traffic Signal at Srijanachowk

However, the operation of these traffic signals appeared to be ineffective due to frequent violations by both motorists and pedestrians. Drivers were often observed disregarding the red light and moving forward, causing chaotic traffic movement at these intersections.

Pedestrians, too, seemed to pay little attention to the signals, crossing the road as they pleased, which added to the disarray. Despite the presence of traffic lights, the junctions remained heavily congested during peak hours. The signals, which are intended to bring order and safety, were unable to fulfill their purpose, leading to confusion and potential safety hazards.

Figure 24 Traffic Signal at Prithivi Chowk

- **Footpaths**

Footpaths were observed in key urban areas of Pokhara, particularly along roads in the city's central business districts and major markets. These pathways provide dedicated space for pedestrians, enabling safer and more organized movement in high-traffic zones.

However, as the observation moved away from the main market areas, the presence of footpaths diminished significantly. Suburban and rural areas lacked proper walkways, forcing pedestrians to walk along the edges of busy roads.

Figure 25 Footpaths at Fewa Bagar Route

In areas where footpaths were present, they were often wide enough to accommodate pedestrian traffic. However, these walkways were not always in good condition. Broken sections, uneven surfaces, and encroachments by vendors or parked vehicles were

Figure 26 Footpaths at Fewa Lake and Bindabasini Buspark Area

common. This made the footpaths less functional and inconvenient for pedestrians, particularly the elderly or those with mobility issues.

Footpaths near popular market areas like Chipledhunga and Mahendrapul were often overcrowded, as they were shared by pedestrians and small vendors. Temporary stalls and pushcarts occupied significant portions of the pathways, leaving little room for pedestrian movement. The lack of footpaths in non-urban areas further highlighted the disparity in pedestrian infrastructure. Roads leading to suburban regions lacked any designated pedestrian space, compelling people to walk alongside vehicles. This was particularly concerning in areas with narrow roads, where the risk of accidents was higher.

- **Cycle Lanes**

A dedicated cycle lane was observed in the New Road area, an important commercial hub in Pokhara. The presence of this lane was a positive step toward promoting cycling as a mode of sustainable transport. However, the cycle lane was frequently used for parking vehicles, which defeated its purpose. Cars and motorbikes parked along the cycle lane left little to no room for cyclists, forcing them to merge with regular traffic on the road.

Figure 27 Cycle Lane at New Road Area

The cycle lane itself was well-marked and clearly distinguishable from the main road. However, the lack of enforcement regarding its usage rendered it ineffective. Cyclists were rarely seen using the lane, as it was consistently occupied by parked vehicles. Encroachments were not limited to parked vehicles. In some instances, shopkeepers and street vendors extended their businesses onto the cycle lane, further obstructing its use.

This added another layer of inconvenience for cyclists and contributed to the general inefficiency of the infrastructure.

- **Parking**

The issue of parking was a recurring observation across various locations in Pokhara. Vehicles, including private cars and motorcycles, were frequently seen parked along the sides of roads. This practice was especially noticeable in busy areas, contributing to congestion and limiting the space available for moving traffic. One specific area of concern was the vicinity of the Municipality Office, where the same parking problem was observed. Since the Municipality Office lacked its own designated parking facility, visitors and employees resorted to roadside parking, further exacerbating the issue in this area.

Roadside parking was a common sight across Pokhara, particularly along major roads and intersections. Vehicles, including private cars, motorbikes, and even buses, were often parked on the sides of roads. This practice significantly reduced the effective width of the roads, creating congestion and slowing down traffic. The issue was most prominent in commercial areas such as Chipledhunga, Mahendrapul, and Prithivi Chowk, where both pedestrian and vehicular traffic were high.

The availability of paid parking facilities was found to be minimal. Only a few paid parking zones were observed across the city, and they appeared insufficient to meet the demand, especially in densely populated areas. This scarcity of formal parking options forces drivers to rely on informal parking arrangements, often occupying public roads or any available open spaces.

Figure 28 Public Bus Parked at Rented Space

Roadside parking also encroached on pedestrian spaces, particularly in areas where footpaths were narrow or non-existent. Vehicles parked along the

edge of the road often blocked footpaths, forcing pedestrians to walk on the road. Even public buses were seen parked on private properties rented for parking purposes. An example of this was noted in the Bagar Buspark, where public buses utilized privately rented spaces for parking. This not only inconvenienced pedestrians but also increased the risk of accidents.

In some areas, buses and taxis were observed parking along the roadside while waiting for passengers. This further added to the congestion, as these vehicles often occupied significant portions of the road. The absence of proper waiting zones for public transport vehicles contributed to this issue.

- **Road Construction**

Figure 29 Under construction Road from Talchowk to Begnas Lake

The road section from Prithivi Chowk to Begnas was under construction during the observation period, creating several challenges for commuters. The construction work led to roadblocks and diversions, significantly increasing travel times. Vehicles were forced to navigate through uneven and narrow sections of the road, making the journey uncomfortable and time-consuming.

Loose gravel and uneven surfaces were common along the construction zone, posing safety risks for both vehicles and pedestrians. Two-wheelers, in particular, faced difficulties maintaining balance on the uneven road. Pedestrians walking along the edges of the road were also at risk of slipping or falling due to the poor condition of the pathways.

The construction work lacked proper signage or warnings, which added to the confusion for commuters. There were no clear indicators of detours or alternative routes, leaving drivers to navigate through the construction area without guidance. This often resulted in traffic jams and further delays.

Public transport vehicles, including buses, were also affected by the construction. Delays in reaching transit points and longer travel times impacted their schedules, causing inconvenience to passengers. The lack of temporary measures to ease traffic flow during construction exacerbated the challenges. The observations along this route underscored the effect of road construction on daily commutes.

APPENDIX 2 - QUESTIONNAIRE SURVEY

A. Questions for Data Collection:

An Assessment of Public Transport System from the Integration Perspective (Pokhara Metropolitan City)

Section 1: General Characteristics of Respondents

1. What is your gender?
   - Male
   - Female
   - Others
2. What is your age group?
   - ≤20
   - 21-40
   - >40
3. What is your profession?
   - Student
   - Civil servant
   - Private sector employee
   - Housewife
   - Other
4. What is your most common trip purpose?
   - School/University
   - Work/Business
   - Social activities shopping/Refreshment
   - Other
5. What is the frequency of your Public Transport Use?
   - Daily
   - Weekly
   - Occasionally
   - Rarely

Section 2: Physical Integration

6. How much time is taken to reach the nearest public transport stop from your residence?
   - Less than 5 Minutes
   - 5-10 Minutes

- 10-15 Minutes
- More than 15 Minutes

7. Rate the infrastructure at bus stops/stations (well-located, easily accessible, shelters, seating, and lighting):
   - Very Poor
   - Poor
   - Good
   - Excellent
8. How much time do you typically spend waiting at transfer points?
   - Less than 5 minutes
   - 5-10 minutes
   - 10-20 minutes
   - More than 20 minutes
9. How convenient is it to transfer between different public transports modes?
   - Very inconvenient
   - Inconvenient
   - Convenient
   - Very convenient

Section 3: Network and Operational Integration

10. Do current public transport routes cover key destinations (workplace, schools, and markets)?
    - Yes
    - No
    - Partially
11. How often do you have to transfer between buses to complete your trip?
    - Never
    - Once
    - Twice or more
12. Rate public transport on the following factors and attributes:
    - Very dissatisfied
    - Dissatisfied
    - Satisfied

- Very Satisfied

12.1. Reliability (Punctuality of buses according to schedule)

12.2.Customer service (Cleanliness, Seat comfort, Behaviors of Bus staffs)

12.3.Safety and security (Safety against crimes on buses)

12.4.Overall Satisfaction (Reliable, Comfort and Safety)

Section 4: Fare Integration

13. Do you find the current fare structure affordable?
    - Yes
    - No
14. Have you ever faced issues with fare payments, such as lack of clarity or discrepancies?
    - Frequently
    - Occasionally
    - Rarely
    - Never
15. How satisfied are you with the transparency of fare calculations for public transport?
    - Very dissatisfied
    - Dissatisfied
    - Satisfied
    - Very satisfied
16. Do you think digital payment options (e.g., mobile apps, cards) should be implemented for public transport?
    - Yes
    - No

Section 5: Information Integration

17. How easy is it to find information about public transport routes, schedules, and transfer points?
    - Very difficult
    - Difficult
    - Easy
    - Very easy
18. Rate the clarity and availability of information provided:
    - Very Poor
    - Poor

- Good
- Excellent

Section 6: Suggestions

19. In your opinion, what are the most important improvements needed in the public transport system?
20. Please provide any additional comments or suggestions regarding public transport in Pokhara.

B. Data Collected:

Surveys are a primary method for collecting quantitative and qualitative data from a target population, especially in transportation research (Litman, 2017). In this study, a structured survey was developed using Kobo Toolbox, focusing on integration themes such as travel satisfaction, ticket affordability, route connectivity, and waiting times. This approach enabled the gathering of both qualitative and quantitative data, ensuring a comprehensive understanding of public sentiment and operational shortcomings.

The surveys were conducted on buses, at stops, and among key stakeholders such as drivers and operators. A statistically representative sample size was selected to ensure that the findings could be generalized across the public transport network. Digital tools like Kobo Toolbox enhanced the efficiency and accuracy of the data collection process.

The survey gathered responses from a total of 145 individuals in Pokhara Metropolitan City.

A. Section 2: Physical

- Infrastructure at bus stops/stations (well-located, easily accessible, shelters, seating, lighting)

  The majority of respondents (49.66%) gave the infrastructure at bus stops and stations a poor rating, and another 14.48% gave it a very poor rating. Only 34.48% believe the infrastructure is good, while a mere 1.38% rate it as excellent. This suggests significant deficiencies in facilities such as shelter, seating, lighting, and accessibility, which likely detract from the overall user experience and discourage public transport use.

- Time taken to reach the nearest public transport stop from residence

  According to the survey, most respondents find public transport stops to be reasonably accessible, as evidenced by the fact that 42.07% of them report getting to their closest stop in less than five minutes. An additional 31.72% can access a stop within 5-10 minutes. However, about 26.21% of respondents face longer travel times of 10 minutes or more, with 8.28% needing more than 15 minutes. This highlights the varying accessibility of public transport stops for users based on their location.

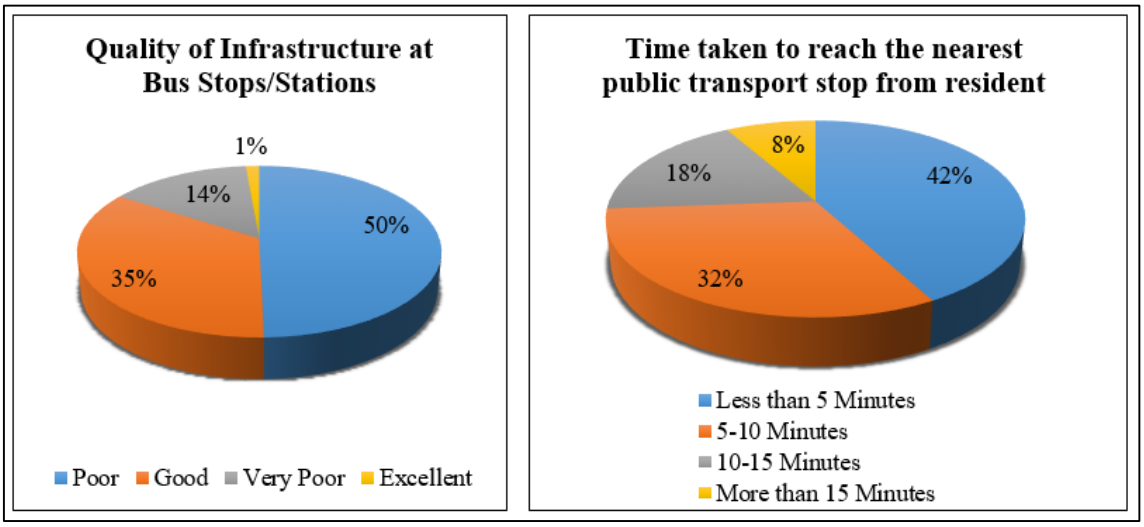


Figure 30 Data about Infrastructures from Respondents

- Waiting Time at Transfer Points

  The majority of respondents (55.86%) spend 5-10 minutes waiting at transfer points, which appears to be a reasonable duration. Additionally, 22.07% wait less than 5 minutes, indicating efficient transfers for some users. However, a noteworthy portion (17.24%) experiences waiting times of 10-20 minutes, and 4.83% report waiting more than 20 minutes, signaling potential inefficiencies in scheduling and coordination at transfer points. This data provides insights into the efficiency of bus transfers within the system.

- Convenience of Transfers Between Public Transport Modes

The survey highlights significant inconvenience in transferring between different public transport modes, with 57.93% of respondents rating it as inconvenient and 4.83% as very inconvenient. Only 35.17% find transfers convenient, while a small 2.07% rate the experience as very convenient. This demonstrates challenges in seamless connectivity across transport modes.

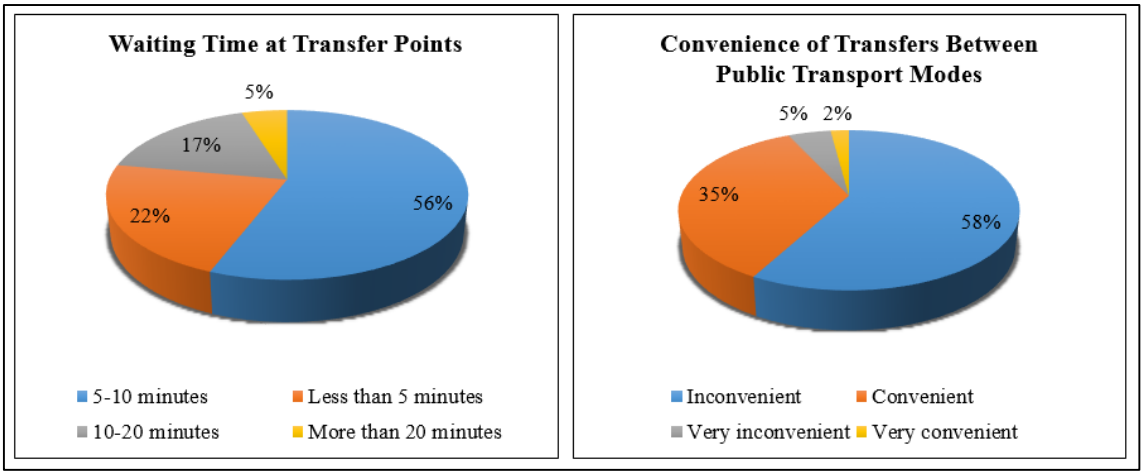


Figure 31 Data about Waiting Time and Convenience at Transfer Points

B. Section 2: Operational Integration

- Coverage of Key Destinations

  The survey reveals that public transport routes provide adequate coverage of key destinations such as workplaces, schools, and markets for 42.76% of respondents. However, 35.86% report only partial coverage, and 21.38% feel that the routes do not meet their needs. These figures highlight the varying levels of satisfaction with route coverage.

- Frequency of Transfers within Trips

  Half of the respondents (50.34%) typically transfer once during their journey, while 29.66% transfer twice or more. Meanwhile, 20% of respondents can complete their trips without any transfers. This reflects the level of route connectivity and its impact on travel efficiency.

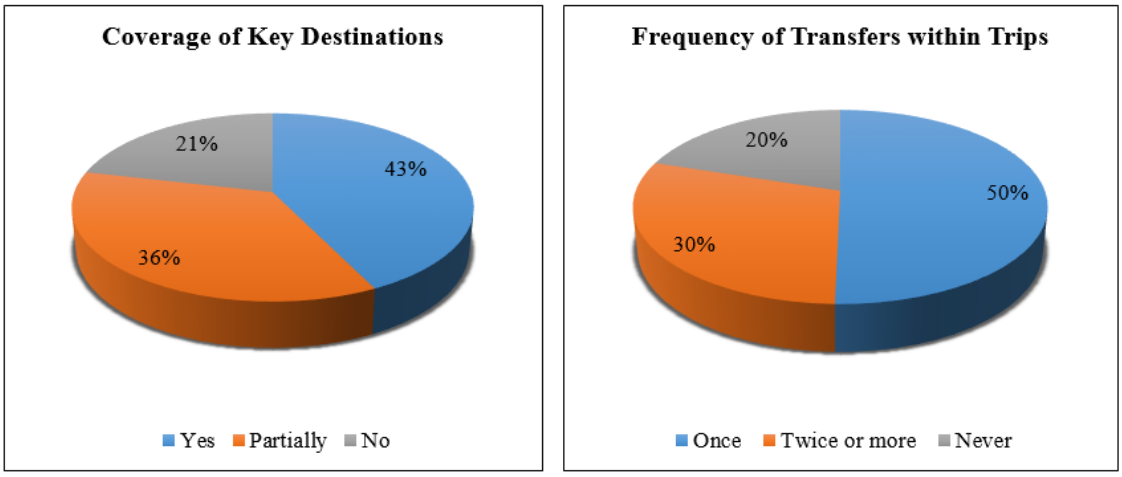


Figure 32 Data about Coverage and Frequency of Transfer

- Evaluating public transport on the following factors and attributes:
  - Reliability (Punctuality of buses according to schedule)

    The punctuality of buses according to their schedules received mixed feedback. While 47.59% of respondents expressed satisfaction, 34.48% were dissatisfied, and 14.48% were very dissatisfied. Only 3.45% of respondents were very satisfied. This suggests that while some commuters experience reliable services, many face delays or inconsistencies, necessitating improvements in scheduling and adherence.

  - Customer service (Cleanliness, Seat comfort, Behaviors of Bus staffs)

    The quality of customer service, including cleanliness, seat comfort, and the behavior of bus staff, appears to be a significant area of concern. Nearly half of the respondents (48.28%) expressed dissatisfaction, and 16.55% were very dissatisfied. In contrast, 33.10% were satisfied, while only 2.07% reported being very satisfied. This indicates significant dissatisfaction with the customer service provided on public transport.

  - Safety and security (Safety against crimes on buses)

    Safety against crimes on buses is another critical issue, as 44.14% of respondents expressed dissatisfaction, and 12.41% were very dissatisfied. While 37.24% were satisfied with the safety measures, only 6.21% were very satisfied. This reveals concerns about safety among public transport users.

- Overall Satisfaction (Reliable, Comfort and Safety)

  Overall satisfaction with public transportation, considering reliability, comfort, and safety, was reported as satisfactory by 46.21% of respondents. However, 35.86% were dissatisfied, and 15.17% were very dissatisfied. Only 2.76% of respondents were very satisfied, suggesting significant room for improvement.

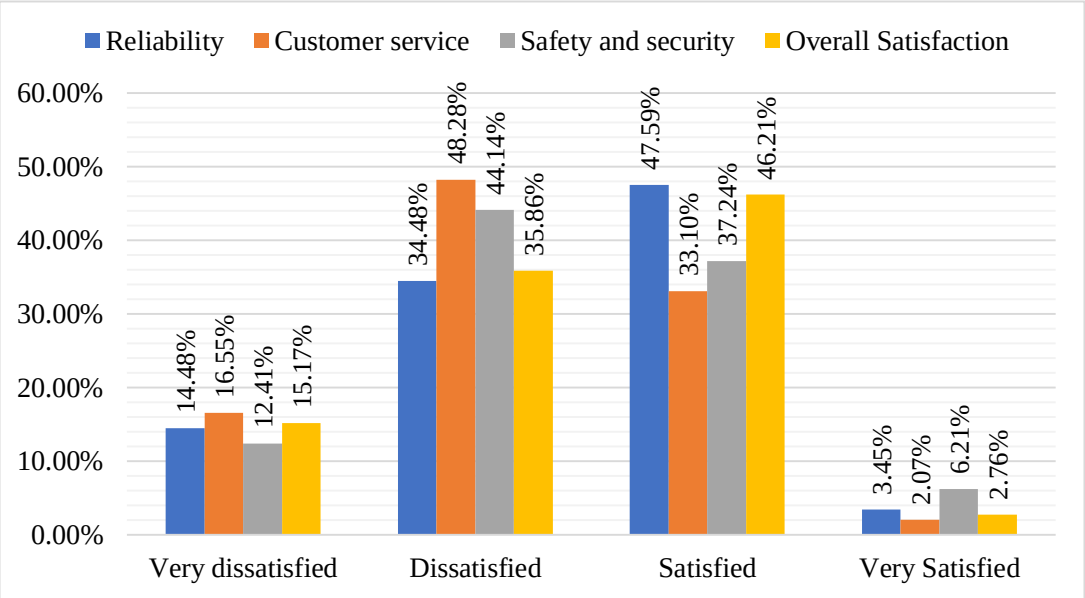


Figure 33 Chart Showing Results for Evaluating Public Transport

C. Section 3: Fare

- Fare Affordability

  When asked whether the fare structure was affordable, 64.83% of respondents said no, while 35.17% found it affordable. This indicates a majority perception that current fares are not cost-effective for users.

- Issues with Fare Payments

  Regarding fare payment issues, 42.07% of respondents reported occasional problems, 22.07% faced frequent or rare issues, and 13.79% stated they never experienced problems. This highlights inconsistencies in fare-related processes.

- Transparency of Fare Calculation

  The transparency of fare calculations was rated poorly, with 59.31% of respondents expressing dissatisfaction and 9.66% reporting being very dissatisfied. Only 28.28%

were satisfied, and 2.76% were very satisfied, reflecting significant concerns over fare clarity.

- Digital Payment Options

  An overwhelming majority of respondents (81.38%) supported the implementation of digital payment options, such as mobile apps or cards, for public transport. A minority (18.62%) opposed this idea, indicating a strong demand for modern payment solutions.

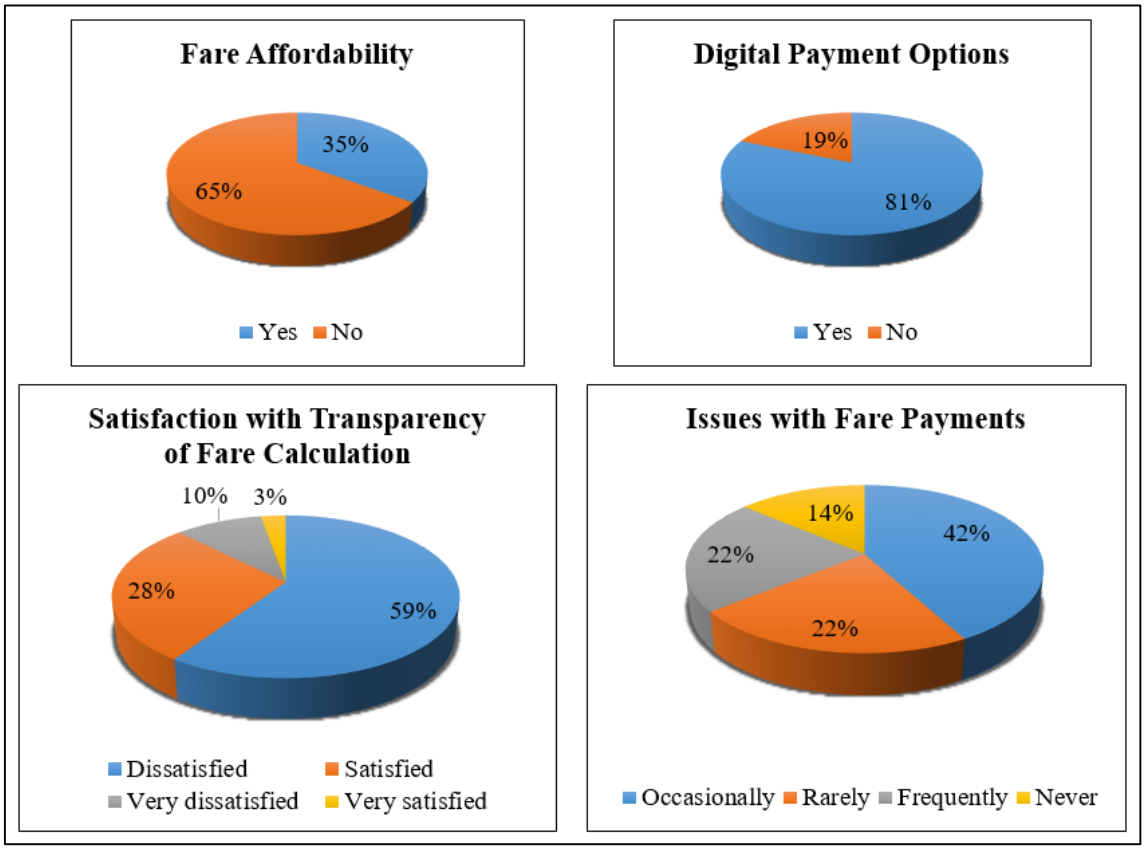


Figure 34 Data about Different Parameters Related to Fare

D. Section 4: Information

- Information Availability

  The ease of finding information about public transport routes, schedules, and transfer points was reported as difficult by 57.24% of respondents, while 28.28% found it easy. A smaller proportion rated it as very difficult (12.41%) or very easy (2.07%), indicating challenges in accessing reliable information.

- Clarity of Information

When asked about the clarity and availability of information provided by public transport systems, 47.59% rated it as poor, and 8.28% rated it as very poor. A significant number (41.38%) considered it good, while only 2.76% rated it excellent. This reflects widespread dissatisfaction with the communication of transport-related information.

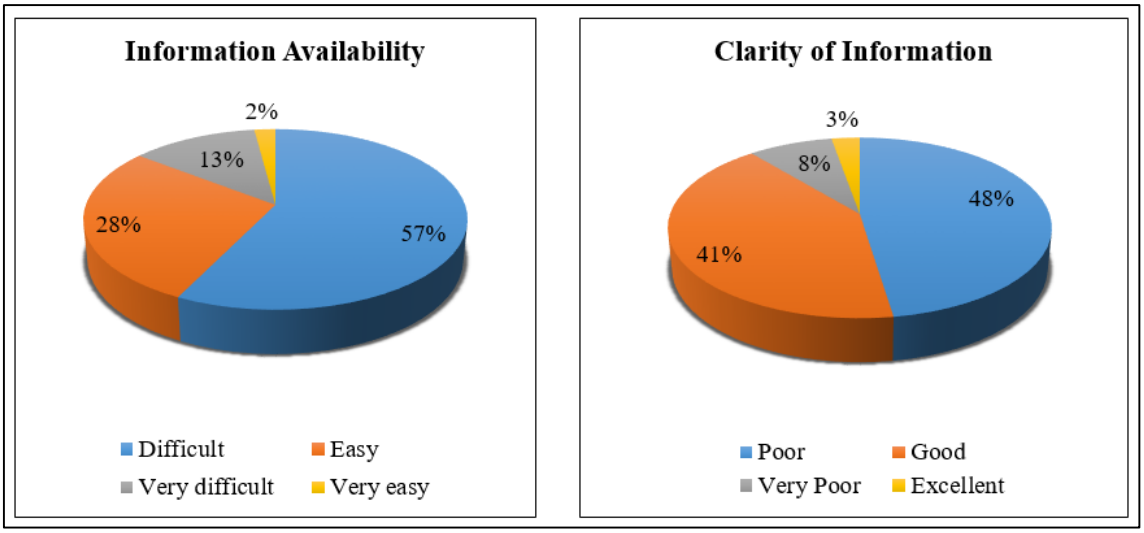


Figure 35 Data about Different Parameters Related to Information

E. Section 5: Comments from Open End Discussions

Passengers expressed various concerns and suggestions for improving the public transportation system in Pokhara. The necessity to build vehicles that are accessible to the elderly and disabled, as well as the provision of basic amenities like dustbins, were frequent concerns. Many passengers emphasized that old and disabled commuters should be given priority, noting the complete lack of facilities for them in the current system.

Visibility of location names was another concern, with passengers suggesting that nameplates of locations should be displayed prominently. Issues related to changing modes of transport at key transit points, such as Prithivi Chowk for those traveling from Lekhnath to Lakeside, were highlighted as being inconvenient and time-consuming.

Time punctuality emerged as a critical issue, with several comments pointing out that conductors and drivers often fail to adhere to schedules. Passengers noted long waiting times at bus stops, sometimes as long as 15-20 minutes on routes like Lamachaur. This delay was described as frustrating and a hindrance to efficient travel. Suggestions were made to limit stops to a maximum of 5 minutes to improve time management.

The inconsistent and sometimes unfair fare collection practices were another major concern. Passengers reported that conductors occasionally asked for higher fares during holidays or rainy days. Some also mentioned that student identity card discounts were not consistently provided, and there were no discounts after specific hours or on weekends, which they found unreasonable. Additionally, passengers felt the fare was generally expensive, especially considering the quality of service.

Concerns regarding the behavior of bus staff were frequently mentioned. Passengers observed that conductors and drivers often behaved rudely, with some suggesting that staff should undergo training on professional behavior and customer service. Traffic responsiveness and rule enforcement were also raised as issues, with some passengers calling for strict penalties, including jail time, for those collecting higher fares than usual or violating traffic rules.

The infrastructure of the public transport system also drew criticism. Passengers noted the lack of fixed bus stops and drop-off locations, pointing out that buses stopping behind zebra crossings obstruct pedestrian visibility and create safety hazards. They also mentioned the old, poorly maintained buses causing air pollution and suggested replacing these vehicles.

Suggestions for technological upgrades were also common. Passengers proposed introducing a web page or mobile application to track buses in real-time, along with digital payment options to simplify fare payments. Additionally, several people highlighted the need for affordable fares and easier payment modes, particularly for students, to make public transport more accessible.

Overall, passengers conveyed the need for a more systematic and user-friendly public transportation system, emphasizing improvements in punctuality, behavior, accessibility, infrastructure, and the integration of technology.

APPENDIX 3 - KEY INFORMANT INTERVIEWS

A. Pokhara Yatayat Private Limited

Figure 36 In-depth Interview with Pokhara Yatayat P. Ltd Representative

Key Informant: Mr. Laxmi Kanta Dhakal, Queue Head, Pokhara Yatayat Pvt. Ltd

i. Buses and Route Information

Pokhara Yatayat Pvt. Ltd operates 14 routes within Pokhara City, utilizing a total of 378 buses. The fleet includes 47 buses with a 37-seater capacity, 102 buses with 29- and 32-seater capacities, and 125 buses with a 26-seater capacity. On the Lamachaur-Chhorepatan route, which falls under the study area, 28 buses of 37-seater capacity operate. To maintain safety and reliability, buses older than 20 years have been removed from service. For new routes, a team comprising committee members and bus owners conducts site visits before implementing trial operations for a few days to assess feasibility.

ii. Operation

Buses operate on a rotational schedule across all routes, with services beginning as early as 5:15 AM and continuing until 8:00 or 9:00 PM, depending on passenger demand at night. Departures occur every 5 to 7 minutes to maintain a regular flow of service. The schedule is prepared weekly by the committee and is revised during festivals or other

occasions to accommodate increased passenger numbers. Any decisions regarding route revisions or additions are made in consultation with relevant stakeholders. Bus stop infrastructure, constructed at the operators' expense, has faced setbacks, such as being destroyed during road expansion projects.

मिति	लामाचौर	बेगनास × मझेरीपाटन	लामाचौर	मझेरीपाटन	लामाचौर	मझेरीपाटन	लामाचौर	हल्ट
2081.2.23	1—6	7—12	13—18	19—24	25—30	31—36	37—42	43—47
24	43—47	1—6	7—12	13—18	19—24	25—30	31—36	37—42
25	37—42	43—47	1—6	7—12	13—18	19—24	25—30	31—36
26	31—36	37—42	43—47	1—6	7—12	13—18	19—24	25—30
27	25—30	31—36	37—42	43—47	1—6	7—12	13—18	19—24
28	19—24	25—30	31—36	37—42	43—47	1—6	7—12	13—18
29	13—18	19—24	25—30	31—36	37—42	43—47	1—6	7—12
30	7—12	13—18	99	25—30	31—36	37—42	43—47	1—6

क्र स	बस नं	क्र स	बस नं	क्र स	बस नं	क्र स	बस नं
1	6535	13	6731	25	7059	37	6534
2	6451	14	6985	26	6730	38	6827
3	6453	15	7014	27	6757	39	6969
4	6454	16	6938	28	6821	40	6970
5	6949	17	6832	29	6950	41	6951
6	6536	18	6711	30	6888	42	6971
7	6461	19	6551	31	6549	43	6984
8	6458	20	6552	32	6892	44	6893
9	6459	21	6563	33	6456	45	6989
10	6460	22	6455	34	6548	६६	6547
11	6395	23	6550	35	6947		
12	6704	24	7009	36	6948		

उल्लेखित तालीका मिति २०८०।१२। १२ गतेबाट लागु हुनेछ तालीकाको मिति समाप्त भएको भोलि पल्टबाट पुनः मिति दोहोरिने छ।

बेगनासताल र मझेरीपाटन रुटमा परेका सवारीहरु अनिवार्य संचालन (चाउथेमा–टोकन बेगनास–कोस) हुनुपर्ने छ अन्यथा लामाचौर क्यू रोक्का गरिने छ।

लामाचौर देखी छोरेपाटन रुटमा संचालन हुने सबारी ले अनिवार्य रुपमा छोरेपाटन स्टेसनमा सोहीरुटको (लामाचौर को) सवारीलाई धपाउनु पर्ने छ।

Figure 37 Bus Schedule of Pokhara Yatayat

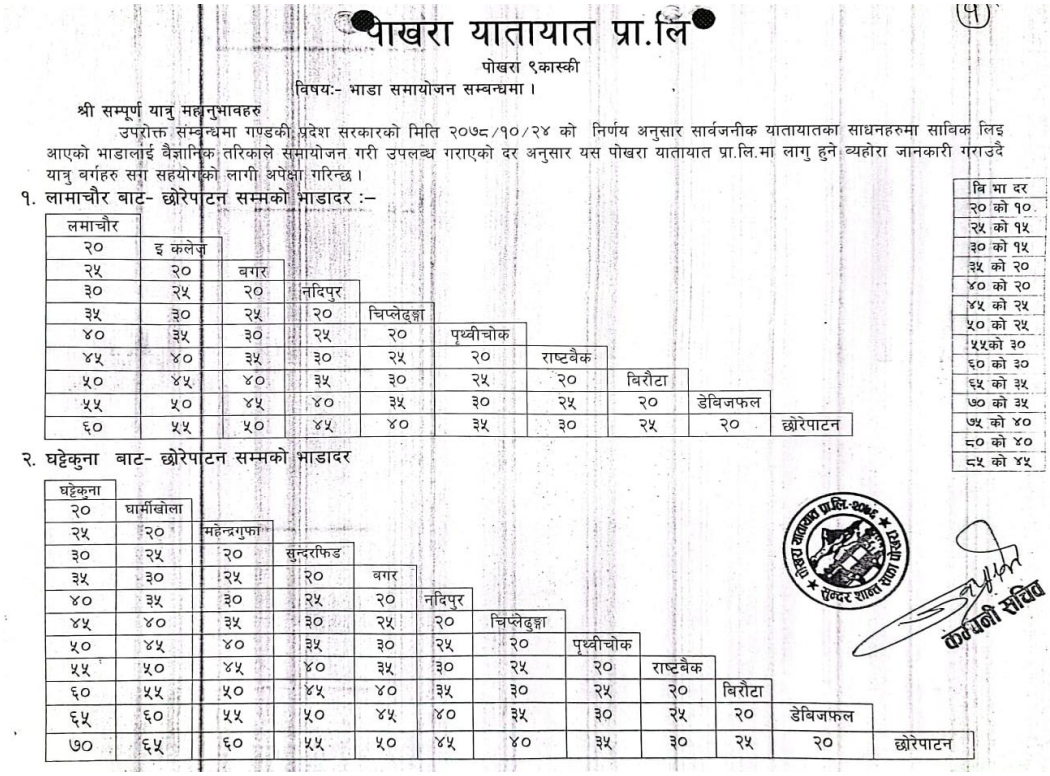
iii. Facility in Bus

The design of buses under Pokhara Yatayat adheres to designated seat reservations, with two seats allocated for women and two for disabled individuals. While buses are equipped with GPS systems to track timing, speed, and schedules, they lack CCTV surveillance systems. These features aim to ensure basic accessibility and operational efficiency for passengers and operators.

iv. Fare System

The fare structure is determined according to government regulations. Students are eligible for discounted fares, providing them with some relief in travel costs. The fare list

is made visible to all passengers on board, ensuring transparency in pricing. The implementation of a consistent fare system is central to maintaining operational fairness and accessibility.



पोखरा यातायात प्रा.लि.

पोखरा ९कास्की

विषयः- भाडा समायोजन सम्बन्धमा ।

श्री सम्पूर्ण यात्रु महानुभावहरु

उपरोक्त सम्बन्धमा गण्डकी प्रदेश सरकारको मिति २०७८/१०/२४ को निर्णय अनुसार सार्वजनीक यातायातका साधनहरुमा साविक लिइ आएको भाडालाई वैज्ञानिक तरिकाले समायोजन गरी उपलब्ध गराएको दर अनुसार यस पोखरा यातायात प्रा.लि.मा लागु हुने व्यहोरा जानकारी गराउदै यात्रु वर्गहरु सँग सहयोगको लागी अपेक्षा गरिन्छ ।

१. लामाचौर बाट- छोरेपाटन सम्मको भाडादर :-

लमाचौर									
२०	इ कलेज								
२५	२०	बगर							
३०	२५	२०	नदिपुर						
३५	३०	२५	२०	चिप्लेढुङ्गा					
४०	३५	३०	२५	२०	पृथ्वीचोक				
४५	४०	३५	३०	२५	२०	राष्टबैक			
५०	४५	४०	३५	३०	२५	२०	बिरौटा		
५५	५०	४५	४०	३५	३०	२५	२०	डेबिजफल	
६०	५५	५०	४५	४०	३५	३०	२५	२०	छोरेपाटन

बि भा दर
२० को १०
२५ को १५
३० को १५
३५ को २०
४० को २०
४५ को २५
५० को २५
५५को ३०
६० को ३०
६५ को ३५
७० को ३५
७५ को ४०
८० को ४०
८५ को ४५

२. घट्टेकुना बाट- छोरेपाटन सम्मको भाडादर

घट्टेकुना										
२०	घार्मीखोला									
२५	२०	महेन्द्रगुफा								
३०	२५	२०	सुन्दरफिड							
३५	३०	२५	२०	बगर						
४०	३५	३०	२५	२०	नदिपुर					
४५	४०	३५	३०	२५	२०	चिप्लेढुङ्गा				
५०	४५	४०	३५	३०	२५	२०	पृथ्वीचोक			
५५	५०	४५	४०	३५	३०	२५	२०	राष्टबैक		
६०	५५	५०	४५	४०	३५	३०	२५	२०	बिरौटा	
६५	६०	५५	५०	४५	४०	३५	३०	२५	२०	डेबिजफल
७०	६५	६०	५५	५०	४५	४०	३५	३०	२५	२०	छोरेपाटन

Figure 38 Fare Rate for Pokhara Yatayat

v. Smart Card System

A Smart Metro Card System was introduced in August 2019, with support from the municipality. It was installed in 800 buses with 300 thousand smart cards, allowing passengers to use a single card across multiple routes. The system relied on swipe-enabled machines installed in buses. However, the initiative lasted only two months due to issues in transaction management, with money not being properly transferred to bus owners' accounts. This hindered the long-term success of the system.

vi. Information

Passengers can access route information via Pokhara Yatayat's Facebook page. Fare lists are displayed prominently on buses for easy reference by passengers. The organization handles complaints through phone calls, providing a direct channel for passengers to voice their concerns and suggestions regarding services.

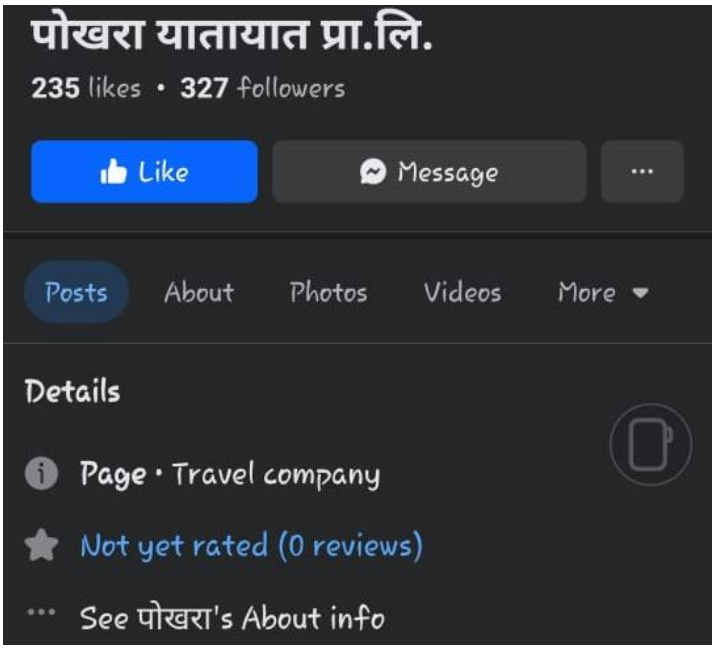


Figure 39 Pokhara Yatayat Facebook Page

vii. Institutional Operation

The organization operates independently without financial support or funding from the government. The committee members, elected for a four-year tenure, oversee operations. The institution sustains itself through contributions collected from bus owners, which cover office operational expenses. This self-reliant model is integral to the functioning of Pokhara Yatayat.

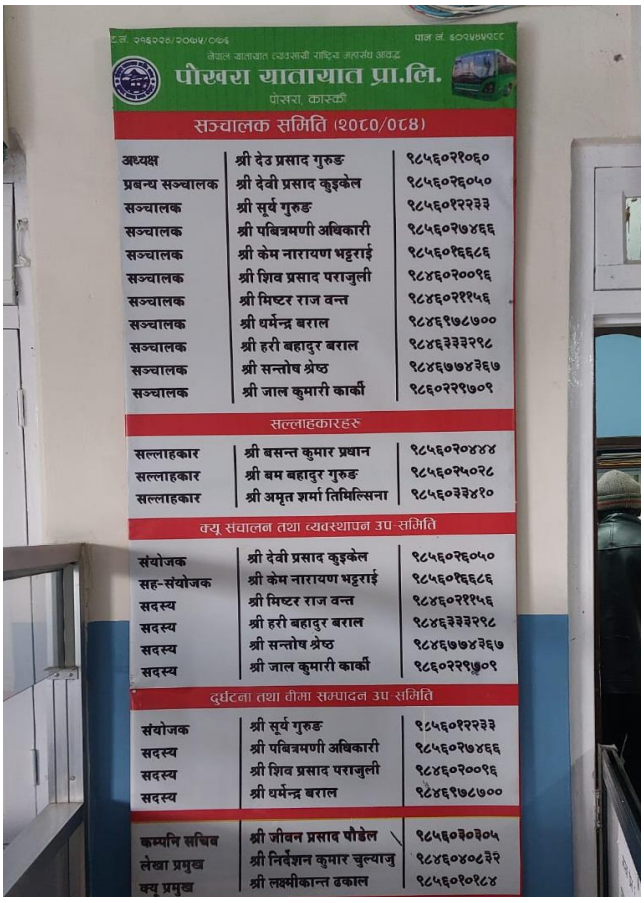


Figure 40 Committee of Pokhara Yatayat

viii. Others

No significant cases of safety issues, crimes, or pickpocketing have been reported within the public transport system. However, accidents occur occasionally. To mitigate risks, buses and passengers are insured, with passenger insurance coverage

provided up to NPR 2 lakh. This ensures a degree of security for passengers in case of unforeseen incidents.

B. Begnastaal Pokhara Yatayat Private Limited.

Figure 41 In-depth Interview with Begnastaal Pokhara P. Ltd. Representatives

Key Informant: Mr. Buddhi Prasad Subedhi, Managing Director, Begnastaal Pokhara Yatayat Pvt. Ltd

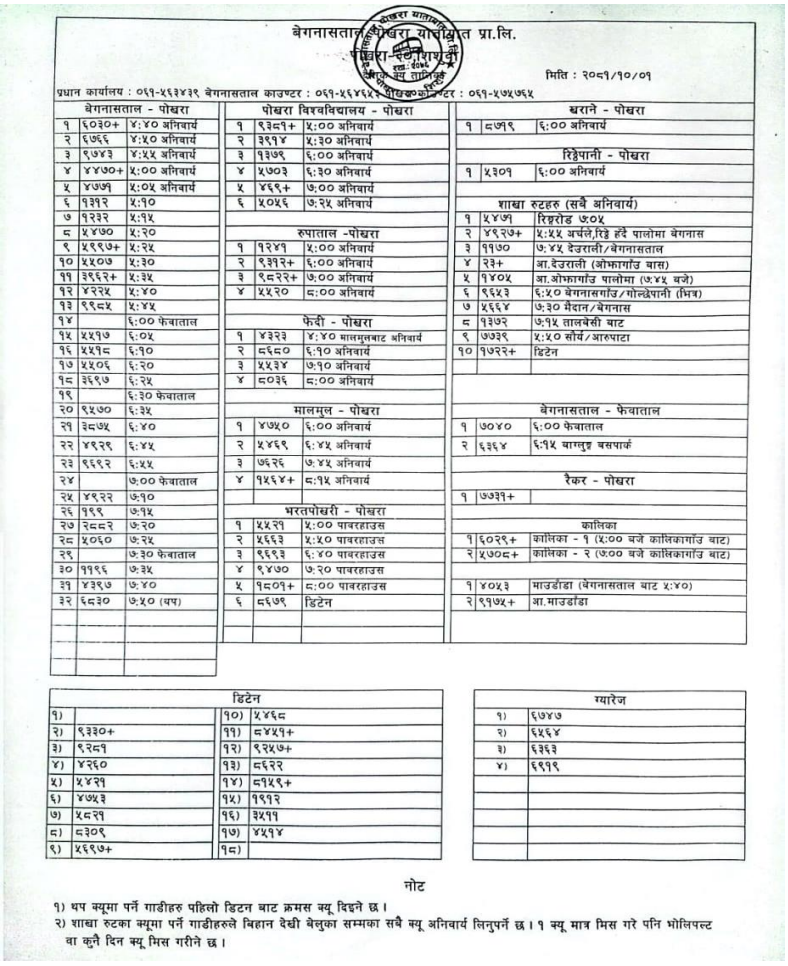
i. Buses and Route Information

Begnas Pokhara Yatayat Pvt. Ltd operates a total of 10 routes within Pokhara City, utilizing a fleet of 130 buses. The majority of these are 29- and 32-seater buses, totaling 102 vehicles. To ensure reliability and safety, buses older than 20 years have been removed from operation. For the introduction of a new route, a team consisting of committee members and bus owners conducts site visits to assess the feasibility of the route. The buses then operate on a trial basis for a few days before finalizing the route. Notably, the bus service is accessible in almost every corner of the city.

ii. Operation

The buses run on a rotational schedule covering all routes. Services commence as early as 4:40 AM to cater to students and continue until 8:00 or 9:00 PM, depending on passenger demand at night. Buses depart every 10 minutes to maintain consistent service.

The weekly schedule is prepared by the committee and is revised during festivals or other occasions to accommodate increased passenger numbers. Decisions regarding route modifications or additions are made in consultation with other stakeholders. Bus stop infrastructure has been developed at the operators' own expense, and the organization has contributed to road construction projects, such as the section between Devlari and Polyantar. Nevertheless, buses regularly stop anywhere to pick up or drop off people, and there are no set bus stops.



बेगनासताल पोखरा यातायात प्रा.लि.

मिति : २०८१/१०/०१

प्रधान कार्यालय : ०६१-५६३४३९ बेगनासताल काउण्टर : ०६१-५६४६२९ पोखरा काउण्टर : ०६१-४७५७६५

बेगनासताल - पोखरा		
१	६०३०	४:४० अनिवार्य
२	६७६६	४:४० अनिवार्य
३	९७४३	४:४५ अनिवार्य
४	४४७०+	५:०० अनिवार्य
५	४७७१	५:०५ अनिवार्य
६	१३१२	५:१०
७	१२३२	५:१५
८	५४७०	५:२०
९	५९९७+	५:२५
१०	५५०७	५:३०
११	३९६२+	५:३५
१२	४२२५	५:४०
१३	९९८५	५:४५
१४		६:०० फेवाताल
१५	५५१७	६:०५
१६	५५१८	६:१०
१७	५५०६	६:२०
१८	३६९७	६:२५
१९		६:३० फेवाताल
२०	९५७०	६:३५
२१	३८७५	६:४०
२२	४९२९	६:४५
२३	९६९२	६:५५
२४		७:०० फेवाताल
२५	४९२२	७:१०
२६	१९९	७:१५
२७	२८८२	७:२०
२८	५०६०	७:२५
२९		७:३० फेवाताल
३०	१११९	७:३५
३१	४३९७	७:४०
३२	६८३०	७:५० (थप)

पोखरा विश्वविद्यालय - पोखरा		
१	९३८१+	५:०० अनिवार्य
२	३९१४	५:३० अनिवार्य
३	१३७९	६:०० अनिवार्य
४	५७०३	६:३० अनिवार्य
५	४६९+	७:०० अनिवार्य
६	५०५६	७:२५ अनिवार्य

रुपाताल -पोखरा		
१	१२४१	५:०० अनिवार्य
२	९३१२+	६:०० अनिवार्य
३	९८२२+	७:०० अनिवार्य
४	५५२०	८:०० अनिवार्य

फेदी - पोखरा		
१	४३२३	४:४० मालमुलबाट अनिवार्य
२	८६८०	६:१० अनिवार्य
३	५५३४	७:१० अनिवार्य
४	८०३६	८:०० अनिवार्य

मालमुल - पोखरा		
१	४७५०	६:०० अनिवार्य
२	५४६९	६:४५ अनिवार्य
३	७६२६	७:४५ अनिवार्य
४	१५६४+	८:१५ अनिवार्य

भरतपोखरी - पोखरा		
१	५५२१	५:०० पावरहाउस
२	५६६३	५:५० पावरहाउस
३	९६९३	६:४० पावरहाउस
४	९४७०	७:२० पावरहाउस
५	१८०१+	८:०० पावरहाउस
६	८६७९	डिटेन

धरापे - पोखरा	
१	८७१९

रिङ्देपानी - पोखरा	
१	५३०१

शाखा रुटहरु (सबै अनिवार्य)		
१	५४७१	रिङरोड ७:०५
२	४९२७+	५:४५ अर्घले,रिङे हुँदै पालोमा बेगनास
३	१११७	७:४५ देउराली/बेगनासताल
४	२३+	आ.देउराली (ओझागाउँ बास)
५	१४०५	आ.ओझागाउँ पालोमा (७:४५ बजे)
६	९६५३	६:५० बेगनासगाउँ/गोल्ढुंपानी (मिस)
७	५६६४	७:३० मैदान/बेगनास
८	१३७२	७:१५ तालबेसी बाट
९	७७३९	५:५० सौर्ये/आरुपाटा
१०	१७२२+	डिटेन

बेगनासताल - फेवाताल		
१	७०४०	६:०० फेवाताल
२	६३६४	६:१५ बाग्लुङ बसपार्क

रैकर - पोखरा	
१	७७३१+

कालिका		
१	६०२९+	कालिका - १ (५:०० बजे कालिकागाउँ बाट)
२	५७०८+	कालिका - २ (७:०० बजे कालिकागाउँ बाट)
१	४०५३	माउडाँडा (बेगनासताल बाट ५:४०)
२	९१७५+	आ.माउडाँडा

डिटेन				ग्यारेज	
१)		१०)	५४६८	१)	६७४७
२)	९३३०+	११)	८४५१+	२)	६५६४
३)	९२८१	१२)	९२४७+	३)	६३६३
४)	४२६०	१३)	८६२२	४)	६९१९
५)	५४२१	१४)	८१५९+		
६)	४७५३	१५)	१९१२		
७)	५८२१	१६)	३५११		
८)	८३०९	१७)	४५१४		
९)	५६९७+	१८)			

नोट

१) थप क्यूमा पर्ने गाडीहरु पहिलो डिटेन बाट क्रमस क्यू दिइने छ ।
२) शाखा रुटका क्यूमा पर्ने गाडीहरुले बिहान देखी बेलुका सम्मका सबै क्यू अनिवार्य लिनुपर्ने छ । १ क्यू मात्र मिस गरे पनि भोलिपल्ट वा कुनै दिन क्यू मिस गरीने छ ।

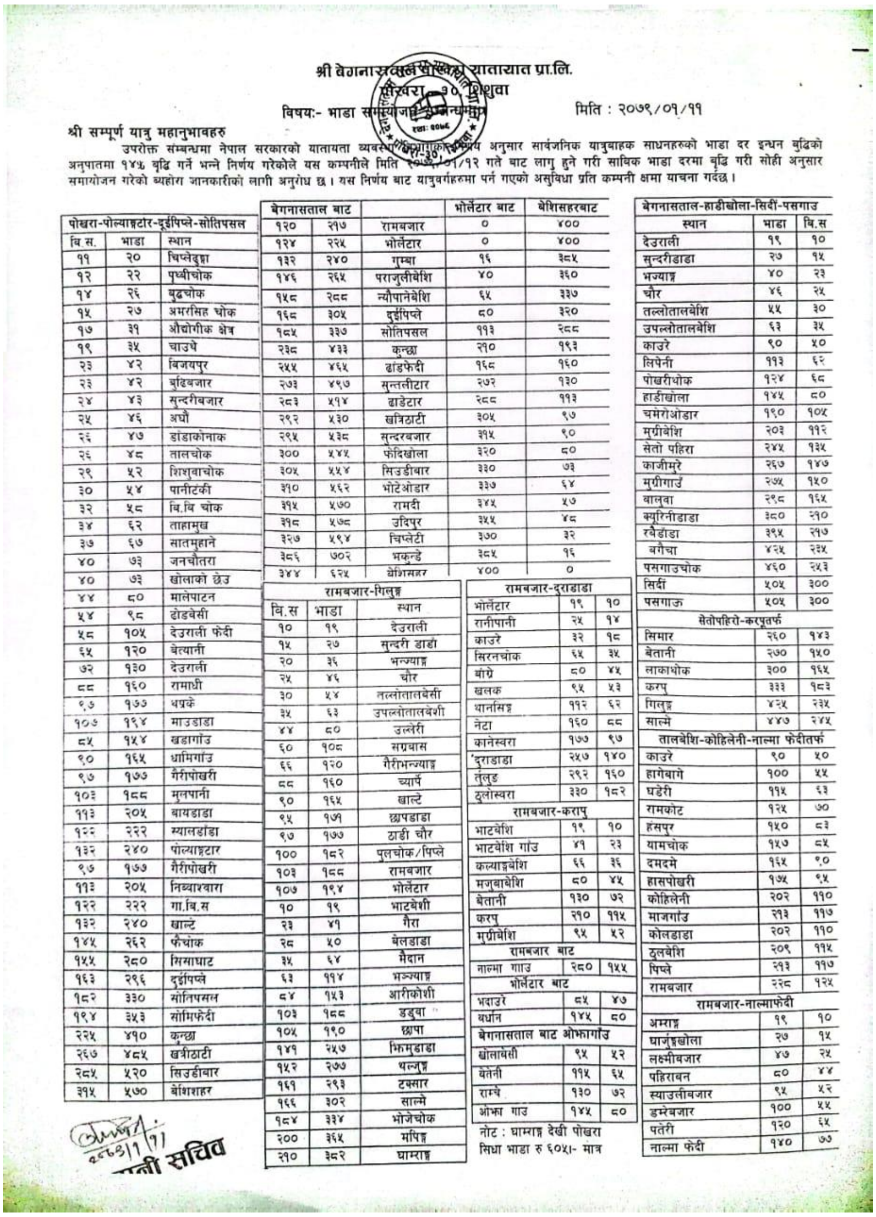
Figure 42 Operation Schedule of Begnastaal Pokhara Yatayat Buses

iii. Facility in Bus

The design of buses under Begnas Pokhara Yatayat adheres to rules that reserve two seats for women and two for disabled individuals. However, the buses are not equipped with CCTV cameras or GPS systems to track timings, speed, or schedules. This reflects a reliance on manual operations and limited technological integration within the fleet.

iv. Fare System

The fare structure is determined in compliance with government regulations. Students are eligible for discounted fares, though cash remains the preferred mode of payment among passengers. While digital payment systems such as smart card or phone-based payments exist, they are not widely accessible to all passengers, limiting their use within the system.



श्री बेगनास[illegible] यातायात प्रा.लि.

[illegible]-१० शिशुवा

विषय:- भाडा [illegible]

मिति : २०७९/०१/११

श्री सम्पूर्ण यात्रु महानुभावहरु

उपरोक्त सम्बन्धमा नेपाल सरकारको यातायता व्यवस्था [illegible] अनुसार सार्वजनिक यात्रुवाहक साधनहरुको भाडा दर इन्धन बृद्धिको अनुपातमा १४% बृद्धि गर्ने भन्ने निर्णय गरेकोले यस कम्पनीले मिति [illegible]/०१/१२ गते बाट लागु हुने गरी साविक भाडा दरमा बृद्धि गरी सोही अनुसार समायोजन गरेको ब्यहोरा जानकारीको लागी अनुरोध छ। यस निर्णय बाट यात्रुवर्गहरुमा पर्न गएको असुविधा प्रति कम्पनी क्षमा याचना गर्दछ।

पोखरा-पोल्याङटार-दुईपिप्ले-सोतिपसल		
वि.स.	भाडा	स्थान
११	२०	चिप्लेढुङ्गा
१२	२२	पृथ्वीचोक
१४	२६	बुद्धचोक
१५	२७	अमरसिंह चोक
१७	३१	औद्योगीक क्षेत्र
१९	३५	चाउथे
२३	४२	बिजयपुर
२३	४२	बुढिबजार
२४	४३	सुन्दरीबजार
२५	४६	अधौ
२६	४७	डांडाकोनाक
२६	४८	तालचोक
२९	५२	शिशुवाचोक
३०	५४	पानीटंकी
३२	५८	बि.वि चोक
३४	६२	ताहामुख
३७	६७	सातमुहाने
४०	७३	जनचौतरा
४०	७३	खोलाको छेउ
४४	८०	मालेपाटन
५४	९८	ढोडबेसी
५८	१०५	देउराली फेदी
६५	१२०	बेत्यानी
७२	१३०	देउराली
८८	१६०	रामाधी
९७	१७७	धप्रके
१०७	१९४	माउडाडा
८५	१५४	खडागाँउ
९०	१६५	धामिगाँउ
९७	१७७	गैरीपोखरी
१०३	१८८	मुलपानी
११३	२०५	बायडाडा
१२२	२२२	स्यालडाँडा
१३२	२४०	पोल्याङटार
९७	१७७	गैरीपोखरी
११३	२०५	निब्वारवारा
१२२	२२२	गा.बि.स
१३२	२४०	खाल्टे
१४५	२६२	फैचांक
१५५	२८०	सिमाघाट
१६३	२९६	दुईपिप्ले
१८२	३३०	सोतिपसल
१९४	३५३	सोमिफेदी
२२५	४१०	कुन्छा
२६७	४८५	खत्रीठाटी
२८५	५२०	सिउडीबार
३१५	५७०	बेंशिशहर

बेगनासताल बाट			भोर्लेटार बाट	बेशिसहरबाट
१२०	२१७	रामबजार	०	४००
१२४	२२५	भोर्लेटार	०	४००
१३२	२४०	गुम्बा	१६	३८५
१४६	२६५	पराजुलीबेशि	४०	३६०
१५८	२८८	न्यौपानेबेशि	६५	३३७
१६८	३०५	दुईपिप्ले	८०	३२०
१८५	३३७	सोतिपसल	११३	२८८
२३८	४३३	कुन्छा	२१०	१९३
२५५	४६५	ढांडफेदी	१६८	१६०
२७३	४९७	सुन्तलीटार	२७२	१३०
२८३	५१४	ढाडेटार	२८८	११३
२९२	५३०	खत्रिठाटी	३०५	९७
२९५	५३८	सुन्दरबजार	३१५	९०
३००	५४५	फेदिखोला	३२०	८०
३०५	५५४	सिउडीबार	३३०	७३
३१०	५६२	भोटेओडार	३३७	६४
३१५	५७०	रामदी	३४५	५७
३१८	५७८	उदिपुर	३५५	४८
३२७	५९४	चिप्लेटी	३७०	३२
३८६	७०२	भकुन्डे	३८५	१६
३४४	६२५	बेंशिसहर	४००	०

रामबजार-गिलुङ्ग		
वि.स	भाडा	स्थान
१०	१९	देउराली
१५	२७	सुन्दरी डाडा
२०	३६	भन्ज्याङ्ग
२५	४६	चौर
३०	५४	तल्लोतालबेसी
३५	६३	उपल्लोतालबेशी
४४	८०	उल्लेरी
६०	१०८	सप्रबास
६६	१२०	गैरीभन्ज्याङ्ग
८८	१६०	च्यार्पे
९०	१६५	खाल्टे
९५	१७१	छापडाडा
९७	१७७	ठाडी चौर
१००	१८२	पुलचोक/पिप्ले
१०३	१८८	रामबजार
१०७	१९४	भोर्लेटार
१०	१९	भाटबेशी
२३	४१	गैरा
२८	५०	बेलडाडा
३५	६४	मैदान
६३	११४	भञ्ज्याङ्ग
८४	१५३	आरीकोशी
१०३	१८८	डडुवा
१०५	१९०	छापा
१४१	२५७	झिमुडाडा
१५२	२७७	थल्जुङ्ग
१६१	२९३	टक्सार
१६६	३०२	साल्मे
१८४	३३४	भोजेचोक
२००	३६५	मपिङ्ग
२१०	३८२	घाम्राङ्ग

रामबजार-दुराडाडा		
भोर्लेटार	१९	१०
रानीपानी	२५	१४
काउरे	३२	१८
सिरनचोक	६५	३५
बांग्रे	८०	४५
खलक	९५	५३
थानसिङ्ग	११२	६२
नेटा	१६०	८८
कानेस्वरा	१७७	९७
दुराडाडा	२५७	१४०
तुंलुङ	२९२	१६०
ठुलोस्वरा	३३०	१८२
रामबजार-करापु		
भाटबेशि	१९	१०
भाटबेशि गाँउ	४१	२३
कल्याङ्गबेशि	६६	३६
मजुवाबेशि	८०	४५
बेतानी	१३०	७२
करपु	२१०	११५
मुग्रीबेशि	९५	५२
रामबजार बाट		
नाल्मा गाउ	२८०	१५५
भोर्लेटार बाट		
भदाउरे	८५	४७
बर्धान	१४५	८०
बेगनासताल बाट ओझागाँउ		
खोलाबेसी	९५	५२
बेतेनी	११५	६५
राम्चे	१३०	७२
ओझा गाउ	१४५	८०

नोट : घाम्राङ्ग देखी पोखरा सिधा भाडा रु ६०५।- मात्र

बेगनासताल-हाडीखोला-सिर्दी-पसगाउ		
स्थान	भाडा	वि.स
देउराली	१९	१०
सुन्दरीडाडा	२७	१५
भज्याङ्ग	४०	२३
चौर	४६	२५
तल्लोतालबेशि	५५	३०
उपल्लोतालबेशि	६३	३५
काउरे	९०	५०
लिपेनी	११३	६२
पोखरीथोक	१२४	६८
हाडीखोला	१४५	८०
चमेरोओडार	१९०	१०५
मुग्रीबेशि	२०३	११२
सेतो पहिरा	२४५	१३५
काजीमुरे	२६७	१४७
मुग्रीगाउँ	२७५	१५०
वालुवा	२९८	१६५
क्युरिनीडाडा	३८०	२१०
रबैडाँडा	३९५	२१७
बगैचा	४२५	२३५
पसगाउचोक	४६०	२५३
सिर्दी	५०५	३००
पसगाऊ	५०५	३००
सेतोपहिरो-करपुतर्फ		
सिमार	२६०	१४३
बेतानी	२७०	१५०
लाकाथोक	३००	१६५
करपु	३३३	१८३
गिलुङ्ग	४२५	२३५
साल्मे	४४७	२४५
तालबेशि-कोहिलेनी-नाल्मा फेदीतर्फ		
काउरे	९०	५०
हागेबागे	१००	५५
घडेरी	११५	६३
रामकोट	१२५	७०
हंसपुर	१५०	८३
यामचोक	१५७	८५
दमदमे	१६५	९०
हासपोखरी	१७५	९५
कोहिलेनी	२०२	११०
माजगाँउ	२१३	११७
कोलडाडा	२०२	११०
ठुलबेशि	२०९	११५
पिप्ले	२१३	११७
रामबजार	२२८	१२५
रामबजार-नाल्माफेदी		
अम्राङ्ग	१९	१०
घार्जुङ्गखोला	२७	१५
लक्ष्मीबजार	४७	२५
पहिराबन	८०	४४
स्याउलीबजार	९५	५२
डम्रेबजार	१००	५५
पतेरी	१२०	६५
नाल्मा फेदी	१४०	७७

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Figure 43 Fare Rates for Begnastaal Pokhara Yatayat Buses

v. Information

Passengers can access route information via the Facebook page maintained by Begnas Pokhara Yatayat. Fare lists are prominently displayed inside buses, ensuring that passengers are aware of pricing. Complaints are managed through phone calls, providing passengers with a direct channel to communicate any issues or concerns regarding the service.

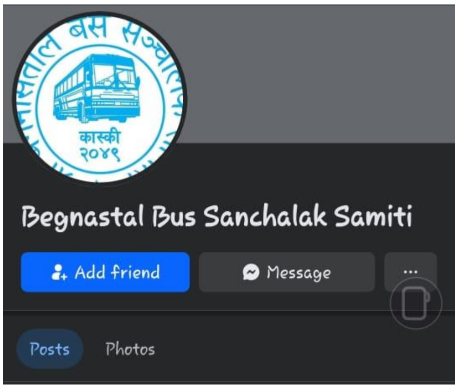

Figure 44 Facebook Account of Begnastaal Pokhara Yatayat

vi. Institution Operation

The institution operates independently without financial assistance from the government. A nine-member committee, elected for a four-year tenure, oversees the management of the organization, supported by a staff of 16 individuals. The office is self-sustained through contributions collected from bus owners, with each bus required to pay NRs 750 per day. This funding covers the operational expenses of the office and other administrative activities.

Figure 45 Committee of Begnastaal Pokhara Yatayat

vii. Others

No significant cases of safety issues, crimes, or pickpocketing have been reported within the public transportation system. However, accidents occur occasionally. Both buses and passengers are insured, with passenger insurance coverage extending up to NPR 2 lakh. For the registration of a new bus, the committee ensures compliance with insurance requirements, oversees the bus's color coding, and manages accident coverage for added security. These measures aim to provide a level of protection for both passengers and operators.

C. Transportation Management Office, Gandaki

i. Vehicle Registration and Feasibility Studies

The trend of vehicle registration in the Gandaki Province has been steadily increasing over the years. However, a slight decline in this trend has been observed recently. For the operation of bus services on new routes, a feasibility study is conducted by a committee under the Chief District Officer to ensure the practicality and sustainability of the proposed service. These studies aim to assess the viability of the routes before bus operations begin.

Figure 46 In-depth Interview with Transportation Management Office Representative, Gandaki

Key Informant: Mr. Ashok Gautam, Nimitta Karyalaya Pramukh, Transportation Management Office, Gandaki

ii. Role of Private Operators and Rotational Systems

Private operators in the public transportation sector primarily focus on profitability, which has posed challenges in ensuring equitable and efficient services. To address this, a rotational system has been implemented on public bus routes. This system ensures that buses operate in an organized manner, with one vehicle departing as soon as another arrives, maintaining a steady flow of transportation. This setup also eliminates the need for passengers to follow a fixed schedule, as buses are readily available.

iii. Supervision and Fare Regulation

Supervision of public transportation occurs occasionally and covers aspects such as the physical condition of buses, the behavior of drivers and conductors, and other operational standards. The Transportation Management Office is responsible for deciding fare structures for public buses, ensuring consistency across the system. However, most operational responsibilities, such as route management and daily operations, are handled by the bus operators' committees.

iv. Bus Stops and Infrastructure

The construction of bus stops and parks is funded through budgets and projects from the central and provincial governments. However, the condition of existing bus parks is

reported to be poor and unmanaged. These facilities often lack essential amenities and proper organization, making them inadequate for supporting efficient public transport operations. Additionally, GPS systems are not installed in buses, limiting the ability to track their movement and schedules effectively.

v. Problems in Public Transportation

Several issues persist within the public transportation system. A lack of punctuality and time reliability was highlighted as a major concern. For longer routes, buses take significantly more time than alternative modes of transport, such as motorcycles, which can complete the same journey in a fraction of the time. Parking problems were also observed, with insufficient facilities contributing to congestion. Pollution caused by vehicles remains an issue, even though vehicles older than 25 years have been banned. Furthermore, accidents occur frequently, posing safety risks for passengers and drivers alike.

vi. Need for Coordination

Addressing these challenges requires effective coordination among stakeholders. Despite the efforts of various committees and the implementation of certain measures, the desired results have not yet been achieved. The lack of effective action to resolve existing problems continues to hinder the efficiency and quality of public transportation in Gandaki Province.

D. District Traffic Police Office, Kaski

i. Traffic Management System

Traffic management in Pokhara is operated manually and overseen by traffic police officers. The system lacks advanced technology and relies heavily on human resources for monitoring and controlling traffic. Currently, traffic lights are installed at only two major junctions, Srijana Chowk and Prithivi Chowk, limiting automated regulation across the city.

ii. Road and Traffic Challenges

Major problems faced in traffic management include poor road infrastructure, lack of lane discipline, and frequent violations of red lights. One of the main reasons for accidents in the city is speeding, although hit-and-run incidents are also rather frequent. Although few

crimes or significant cases have been recorded in public buses, accidents involving public transport vehicles remain a concern.

iii. Complaints Against Public Buses

Several complaints have been raised by passengers regarding public buses. These include not allowing disabled people to board buses, failing to provide discounts for students, not giving priority or reserved seats to those eligible, over speeding, and collecting fares higher than the approved rate. These issues reflect ongoing challenges in ensuring equitable and responsible public transport services.

Figure 47 In-depth Interview with District Traffic Police Office Representative, Kaski

Key Informant: Mr. Shiva Prasad Pathak, Information Officer, District Traffic Police Office, Kaski

iv. Surveillance and Monitoring

To monitor the city's traffic, 80 CCTV cameras have been installed at various locations. These cameras help in supervising traffic flow and addressing violations. Despite this effort, the increasing number of vehicles combined with limited resources, such as a shortage of traffic police personnel, has made traffic management more challenging.

v. Actions Taken by Traffic Management Office

Various actions are being undertaken to address traffic and public transport issues. Awareness programs such as "Chalak Sanga 1 Minute" and "Yatru Sanga 1 Minute" aim to educate drivers and passengers about traffic rules and responsibilities. Plans are in place to introduce speed checks in high-risk areas like Hemja Sadak. Classes for rule violators are available, although currently limited to those caught for drink-and-drive cases. Quick response teams have been established to address accidents promptly.

Complaints can also be made through hotline numbers, such as 103 and 100, providing passengers and citizens with a direct line for grievance redressal.

vi. Stakeholder Coordination

Coordination among multiple stakeholders is a key component of traffic management efforts in Pokhara. Collaboration involves the Department of Roads, Municipality, Metro Police, and Civil Police, local governments at the ward level, the License Department, private vehicle owners' committees, and others. These efforts are aimed at reducing traffic issues, improving public transport operations, and ensuring smoother traffic flow across the city. The focus remains on maximizing existing resources to address current challenges effectively.

E. Pokhara Metropolitan City Office, Pokhara

i. Lack of Supervision Mechanism for Public Bus Operations

Pokhara Metropolitan City currently lacks a formal mechanism to supervise the operations of public buses. This absence of regulatory oversight impacts the efficiency and reliability of public transportation services. Public transport in Pokhara primarily operates under the management of private committees, from registration to daily operations, with limited municipal involvement.

ii. Public Bus Infrastructure Under Municipality Oversight

The municipality’s role in public transport infrastructure is limited to road development and maintenance. While physical infrastructure like roads is essential for the operation of public buses, the absence of integrated municipal oversight limits the overall management of the public transport system.

iii. Privately Owned Bus Committees

All public buses in Pokhara are owned and operated by private committees. These committees oversee the entire process, from registration to operation and management, making them the sole operators of public bus services. While this structure promotes local involvement, it poses challenges in ensuring standardization and uniformity in service delivery.

iv. Municipality as a Coordinating Institution

The municipality serves as a coordinating institution between public bus operators and other stakeholders. This role includes facilitating collaboration with national and international organizations to improve urban transport systems. However, the municipality's limited control over operations affects its ability to directly influence service quality.

v. Introduction of Cycle Lanes

A cycle lane has been constructed on a new road as part of a pilot project by the municipality. However, the cycle lane is limited to the main road, and its usage remains suboptimal. The project is still in its testing phase, aiming to assess the effectiveness of promoting non-motorized transport.

vi. 'Pokhara Green Transport' project

The 'Pokhara Green Transport' project, supported by Korea, aims to modernize Pokhara's urban transport system by creating a smart, technology-friendly, and sustainable network. The project focuses on real-time digital integration to provide passengers with instant access to public transport information, reducing wait times and ensuring compliance with designated pick-up and drop-off points. The initial phase of the project will require a funding investment of 1.5 million USD. By 2025, the plan will have built three major bus terminals and 1,286 bus stops on 84 routes, with the first phase focussing on urban traffic management. Subsequent phases will focus on developing a green, sustainable transport system by 2030, covering key routes like Lamachaur-Chhorepatan and extending to high-traffic areas like Prithvichowk.

By introducing advanced technology and infrastructure, the project seeks to reduce traffic congestion, promote efficient urbanization, and boost tourism in Pokhara. Korea's support in collaboration with local and international stakeholders underscores a commitment to building a model digital transport ecosystem that aligns with global best practices. This transformative initiative will not only improve public mobility but also enhance Pokhara’s appeal as a modern and sustainable metropolitan hub.

APPENDIX 4 - SECONDARY DATA COLLECTION

A. Passengers Flow Analysis of Public Transit Service in Pokhara, (Midun et al., 2023)

The study assessed the current public transportation system and made suggestions to improve Pokhara's public transportation's efficacy and efficiency. The passenger flow volumes on ten distinct routes were examined. Findings indicate that there were more delays since the frequency of services did not correspond with real variations in customer demand.

Routes	Morning		Day		Evening		Average no. of passengers	
	1	2	1	2	1	2	Peak hour	Off-peak hour
Lamachour-Chhorepatan	74	49	66	41	63	45	58	54
Harichowk-Majeripatan	39	57	49	48	57	45	50	49
Manipal- Belghari	53	63	47	29	62	54	58	38
Housing-Khaltey Masina	57	52	33	29	64	38	53	31
Gufa-Fewa Lake	28	62	42	44	42	62	49	43
Simpani-Mahatgauda	41	40	23	52	-	-	41	38
Kaseri-Hallanchowk	40	57	34	31	46	41	46	33
Bagar -Fewalake	24	28	49	50	72	73	50	50
Chhorepatan-Bagar	32	50	72	55	68	50	50	64
Harichowk-Chhorepatan	49	26	71	40	24	37	34	56
	1= Forward Direction			2= Reverse Direction				

Table 9 Average Number of Passengers in Different Public Bus Routes of Pokhara

Source: (Midun et al., 2023)

From the above research, the route taken for the study i.e. Lamachour-Chhorepatan is the second highest route for passenger flow in average (i.e. 56) and that of Fewa Lake – Bagar is 50 among the ten routes studied by author. This shows the importance of the routes selected in this research.

B. Comparative Performance Evaluation of Public Transportation Services in Pokhara Valley, (Subedi et al., 2023)

The performance of the public transit system running along the Fewa-Begnas route in the Pokhara Valley was evaluated in this study. Three main areas were the focus of the evaluation: passenger perceptions, vehicle operational performance, and economic factors. Passenger perceptions were analyzed through a survey covering nine specific indicators, with the results interpreted using index value calculations. Five criteria—travel time, journey speed, running time, running speed, and the transport system capacity index—were used to evaluate the vehicles' operating performance. From an economic

standpoint, the evaluation included figuring out the overall income made per km as well as the total operating cost per kilometre for public buses.

Important information about the performance of the two public transport systems in the Pokhara Valley—Pokhara Yatayat (System 1) and Begnastal Pokhara Yatayat (System 2)—was obtained from the study's analysis of a number of performance metrics. These metrics addressed operational, passenger perception, and economic factors.

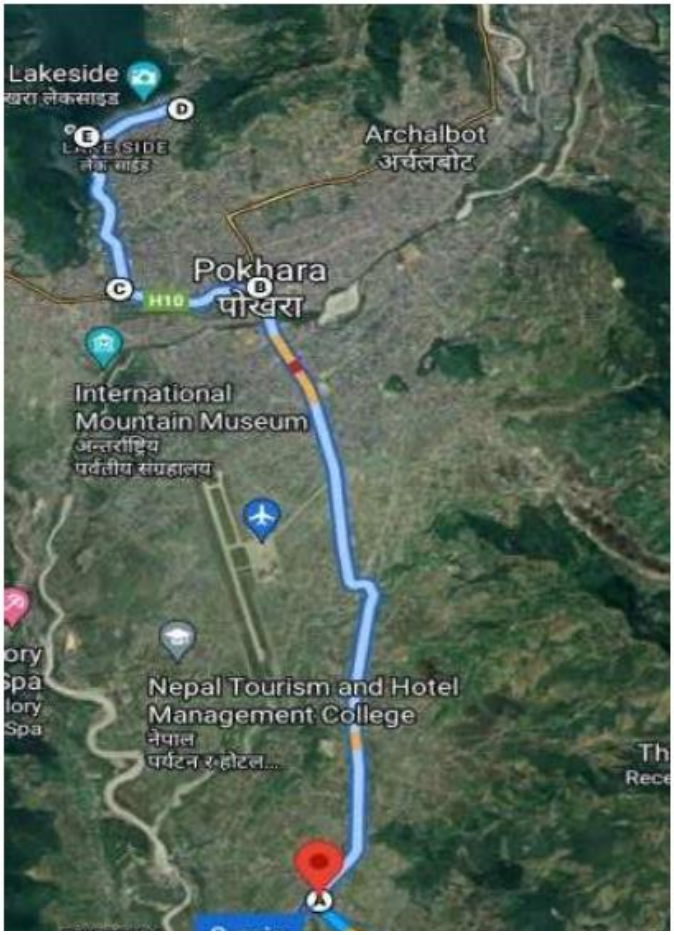

Figure 48 Study Area by Subedi et al., 2023

- Economic Perspective

  According to the data, Pokhara Yatayat had inferior economic performance and greater operational costs on this route, while Begnastal Yatayat did better in terms of revenue generation and operating cost efficiency.

- Operational Performance

  The index values revealed that Pokhara Yatayat had shorter journey times, higher journey and running speeds, and better operational efficiency compared to Begnastal Pokhara Yatayat. However, the number of passengers using Pokhara Yatayat was lower than those using Begnastal Pokhara Yatayat.

- Passenger Perception

  Passenger feedback was assessed through indices such as safety, seat comfort, overall travel comfort, staff behavior, and their treatment of different passenger groups

(women, children, the elderly, and people with disabilities). Passengers rated Pokhara Yatayat higher than Begnastal Pokhara Yatayat across all these aspects.

In summary, Begnastal Pokhara Yatayat performed better economically, while Pokhara Yatayat excelled in operational efficiency and passenger satisfaction.

APPENDIX 5 - IOE GC PAPER PRESENTATION CERTIFICATE

त्रिभुवन विश्वविद्यालय
Tribhuvan University
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फोन: ०१-५३३५७६६

Date: April 21, 2025

To Whom It May Concern:

This is to certify that the paper titled **"An Assessment on Public Bus Service Quality Based on Users' Perceptions: Case of Pokhara Metropolitan City"** (Submission# **216**) submitted by **Dipesh Thapa** as the first author, which had been accepted for presentation after the peer-review process, has successfully been presented at the 16th IOE Graduate Conference held during April 18 - 20, 2025. Kindly note that the final revision of the papers and publication process of the conference proceedings is still underway and hence inclusion of the accepted manuscript in the conference proceedings is contingent upon timely response to further edits during the publication process.

Dr. Raj Kumar Chaulagain,
Convener,
16th IOE Graduate Conference

APPENDIX 6 - IOE GC PRESENTED PAPER

An Assessment on Public Bus Service Quality Based on Users' Perceptions: Case of Pokhara Metropolitan City

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Abstract
This study aims to assess the users' perceptions on the quality of city bus in Pokhara, and, pointing out areas of improvements in public bus services to meet passengers' expectations. 145 respondents were questioned about various aspects of the bus service, including infrastructure, punctuality, customer service, safety, fare issues and information availability for 3 different bus routes throughout the city. Correlation analysis and descriptive statistics were used to analyze the results. The results show that the public bus service in the city is a complex set of challenges that affect its effectiveness and satisfaction levels. The study highlights the need for improvements in infrastructure and operational efficiency, particularly in terms of timely services and clear information dissemination. In addition, the study highlights that enhancing fare transparency and implementing digital payment systems could positively influence public transport usage.

Keywords
Pokhara, public bus transport, user satisfaction, service quality, survey, bus service

1. Introduction

Public transportation refers to a shared travel system available to everyone, typically operating on fixed routes and schedules. Users are charged a set fare for each trip, which is clearly communicated in advance. Examples of this type of transportation include city buses, metros, coaches, trolley buses, and aircraft. From a financial standpoint, public transit is inexpensive and contributes to the reduction of automobiles on the road. Buses, minibuses, and micros, is a common means of travel in Nepal, particularly in Pokhara, the country's largest city. Pokhara is known for its natural beauty, cultural diversity, and adventure activities. The estimated population of Pokhara, Nepal in 2023 is 475,969. This represents a 3.97% annual change from the previous year [1]. Also, Out of a total of 140,459 households in Pokhara Metropolitan City (PMC), vehicle ownership varies across different modes of transport. Only 8.08% (11,356 households) own a car, jeep, or van, while 48.82% (68,569 households) rely on motorcycles or scooters, and 17.33% (24,341 households) have a bicycle (CBS 2021). This means that 74.23% of households own some form of private vehicle, whereas the remaining 25.77% likely depend on public transportation, walking, or shared mobility options for their daily commute.

However, the public transportation system in Pokhara faces challenges due to rapid urbanization and population growth. Due to problems such lane stoppage, inconvenient departure times, delays in getting to their destination, and bus congestion, the quality of Pokhara's bus services is frequently questioned [2]. Private vehicle ownership is on the rise as a result of public transportation's increasing unreliability [1]. Other sources of traffic problems are due to the deteriorated road condition and inappropriate road facilities, inefficient traffic control devices, illegal usage of sidewalks, lack of discipline of drivers and pedestrians, and lack of public transport services in the city. In addition, inadequate regulations, poor use of traffic management measures, and low levels of enforcement also aggravate the problem. These challenges not only affect residents' daily lives but also hinder Pokhara's image as a tourist-friendly city. Notably, a visible trend of people shifting toward private vehicles raises concerns about the declining usage of public transport, making it essential to understand the underlying reasons and their implications. Still, there is time to effectively manage the transportation sector in Pokhara, unlike Kathmandu, where the challenges have become significantly harder to address [3].

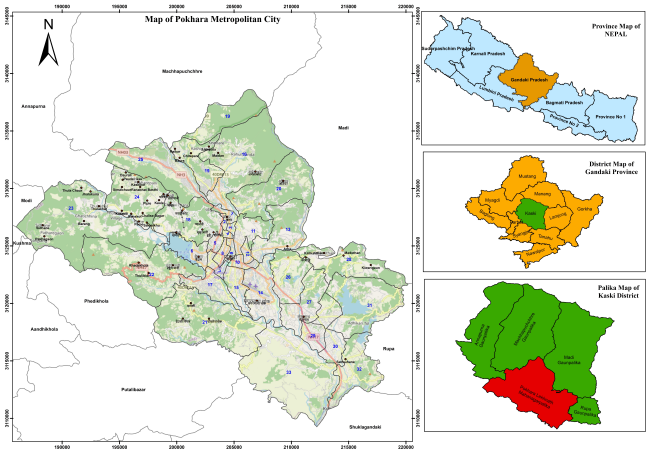

Figure 1: Location Map of Pokhara Metropolitan City (PMC)

1.1 Public Bus Service in Pokhara

In Pokhara, the largest city in the nation, public transportation—including buses, minibuses, and micros—is a popular mode of transportation. The city of Pokhara and its surrounding townships and villages are served by a privately

operated public transport system [4]. In 1970 AD, Pokhara's public transport system was built. Pokhara boasts a vast network of privately run public transit that serves the city, surrounding townships, and other villages. The public bus transportation services in and around Pokhara Valley are primarily operated by private businesses. It also has a vibrant public transportation system with seven main service providers: Pokhara Fewa Yatayat, Gandaki Taxi Bebahasi Public Limited, Pokhara Taxi Sewa Pvt. Ltd, Pokhara Yatayat, Mama Yatayat, Begnastal Pokhara Yatayat, and Prithivi Rajmarga bus Bebahasi Samati. The public transportation system mainly consists of local and city buses, micros, micro-buses, and metered taxis (Horner, 2025; "Pokhara," 2025). There are 20 routes for the buses and vans and taxi has no prescribed routes. There are around 1200 taxis operating daily in the valley. Public transportation system of Pokhara is operated 365 days a year.

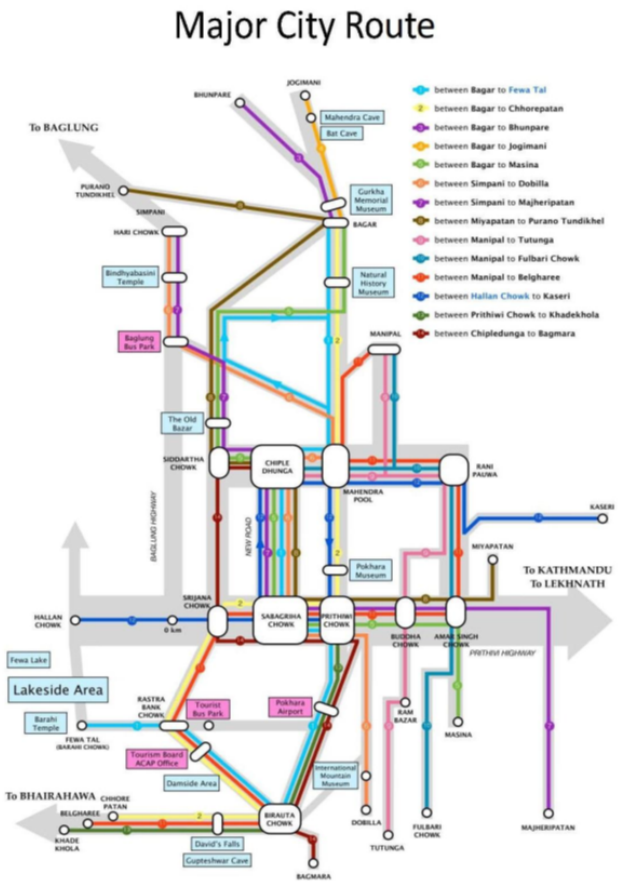

Figure 2: Major Public Transportation route of Pokhara

1.2 Problem Statement and Objective of the Study

In cities like Pokhara Metropolitan City, urban bus services form the backbone of the public transport system, offering affordable mobility options for residents and tourists. Pokhara Metropolitan City, Nepal's tourism capital and an emerging educational hub, is undergoing rapid urbanization and population growth, increasing the need for an efficient public transportation system to meet rising mobility demands. Bus services, the primary mode of public transport, play a crucial role in connecting people to workplaces, schools, health centers, and tourist destinations. However, as the city expands, concerns about the performance and reliability of these services have grown. Private vehicle ownership is on the rise as a result of public transportation's increasing unreliability [1]. These elements can be causing more pollution, traffic jams, and worries about road safety. Severe traffic bottlenecks occur at major crossroads like Prithivi Chowk, Sabhagriha Chowk, Zero KM, and Srijana Chowk during peak hours [5], affecting residents' daily lives and tarnishing Pokhara's image as a tourist-friendly city. The shift toward private vehicles further highlights declining public transport use and raises the urgency to address these challenges. This assessment not only provides insights into the existing state of public transportation but also aids in suggesting measures for enhancement.

This research aims to assess the users' perceptions on the quality of city bus in Pokhara, and, pointing out areas of improvements in public bus services to meet passengers' expectations. These results will further aid the authorities as well as involved stakeholders with the necessary information which they might use to improve the transportation system in Pokhara.

2. Literature Review

An efficient public transportation system is required for urban areas in developing countries like Nepal to reduce the problems of degrading environment, traffic congestion and poor level of service [2]. Public transport is the significant key to minimize the amount of personal transport inside the city plus it may help people who have a financial limit in paying the regularly changing paratransit mode or taxi fares and who do not own vehicles. [6]. It is frequently suggested that to carry out a strategy such as reducing car ownership and ownership desire are largely reliant on the providing of an excellent public transport system [7]. Public transport not only decreases the personal transports and other means of transportation but it also assists to minimize the difficulties like traffic bottleneck, the badness of air and noise, driveway issues and power use [8] .

In the previous researches, there have been discussions trying to identify whether a built environment or a better transit service can influence the development towards sustainable cities [9] . Based on these discussions about the quality of public transport has attracted much attention and research, which has led to the proposal of several indicators to evaluate the quality of mass transit service. These indicators include among others general transport network features, vehicles, terminations and stops of transportation, interchange locations and tangible services including equipment, the comfort of service and controlling operation support [10].

Other researchers have worked intensively especially in identifying the factors and contributors to the effectiveness of public transport and their findings that rely on and strengthen the idea of service quality survey from the customers' perspective. The result of [11] showed that Safety, comfort, timely performance, and accessibility were the significant factors which affect to level of service on the basis of perceived and expected quality, while buses, drivers and staffs, and administration were considered to be the significant

components contributing to the quality of tour bus service [12]. Additionally, Logistic regressions to assess different types of riders' satisfaction, were used in resulting for finding three main factors namely Bus Services, Vehicle, and Bus capacity [13]. It has been found that bus services, availability, and safety were the significant elements. Moreover, [6] carried out the quality measurement of public bus transport services by buses, bus stop facilities, and bus capacity. Furthermore, the Bus, Station, and Driver are the three important contributors to investigate the customer satisfaction of the bus service [14], when the number of passengers using public transport increases by enhancing the transit system's efficiency was the suggestion from another study [15]. Plus, Iseki and Taylor (2009) suggests that the two key elements to measure the potentiality of mass transit quality are, the terminations and stops of transportation services followed by the security factor [16]. While Abreha (2007) found through his research that, the critical components which help to the effectiveness of mass transit are reliability and accessibility [17]. Based on the literature, decision was made to measure the city bus service quality regarding users' perceptions, by using the passenger survey, because it has been suggested by many authors as the best method for quality evaluation of satisfaction.

2.1 Customer Satisfaction and Service Quality

Customer satisfaction measures how well a company's items or services meet or exceed client expectations [18]. These expectations regularly reflect numerous aspects of the company's business activities including the actual item, service, company, and how the company works within the worldwide environment. Client satisfaction measures are an overall mental assessment that's based on the customer's lifetime of item and service experience [19].

Service quality is one of the important characteristics which furnish the utility of public transport (Fujii and Van, 2009) and passengers are another important factor to determine and evaluate the service provided by the transport authorities (Freitas, 2013). The evaluation of service quality in transportation system in any economy is very important or vital to improve proits and productivity which may increase the customer satisfaction. The importance of evaluating the quality of service provided from the users' perspective cannot be overemphasized. On the basis of Ettema et al. (2011), users are considered as a soft index which is utilized as a principal key for measuring the service quality since the fact is that they are the direct users of the service provided [20]. Furthermore, the ultimate judges of the quality of service are the customers and their satisfaction can be studied by using the customers' satisfaction survey [16]. Therefore, should be assessment on service quality regularly. The proper knowledge and understanding of these quality parameters give a high quality level to the passengers and also fulill their needs and expectations (Freitas, 2013).

The criteria for evaluating service quality is the one explained by the customer [21]. 10 service quality measurements that clients utilize to judge the quality of the service advertised in 1984 were set up for study [22]. The ten measurements are not in a general sense autonomous of each other. There could be a couple of cover between the categories. As a result of a development think about a combination of the 10 unique measurements were decreased into five measurements of quality [23]: reliability, responsiveness, assurance (counting competence, kindness, validity, and security), tangibles and empathy (including get to, communication and understanding).

A transnational comparison of commuters using public transport service satisfaction is seen in 8 cities in Europe (Stockholm, Barcelona, Copenhagen, Geneva, Helsinki, Vienna, Berlin, Manchester, and Oslo) was conducted [19]. Four factors were generated by the results: buses and bus stop design that make commuters enjoying the travel experience and comfortable, information and reliability, traffic supply, staff skills, attitude toward the customer. Moreover, it was concluded that contrasts in public transport innovation and infrastructure might cause differences in person item loadings.

Service quality properties vital for client satisfaction with a public transportation bus in Cosenza, Italia [24]. A rating was asked to be done by the respondents showing satisfaction and importance in addition to 16 service quality (personal security, bus stop availability, route characteristic, reliability, bus stop furniture, frequency, bus overcrowding, cleanliness, cost, information, safety on board, personnel, complains, environmental protection and bus stop maintenance, promotion). The result appears that the inactive variable imperative for worldwide client fulfillment is benefit arranging which is reflected in the unwavering quality, recurrence, data, advancement, and complaint. Knowing the indicators for the evaluation based on user perception is essential for assessing the quality of services. Evaluation on the performance of the public transportation system in Dhaka city across five categories: service efficiency, system efficiency, cost efficiency, utilization efficiency, and network efficiency were done. The study reveals that the existing system is not operating efficiently due to issues like traffic congestion [25]. A study examining passenger satisfaction and the operational effectiveness of the public transportation system in Pokhara, Nepal [2]. According to the report, various bus services performed exceptionally well in various areas of service provision. In order to improve passenger happiness, the study underlined how crucial it is to maintain or raise the existing performance level. Jain et al. (2020) suggest a way to assess public transport systems from the viewpoints of the city, operators, and passengers. The effectiveness of public transportation in Kathmandu, Nepal were evaluated, by utilizing four key performance indicators (KPIs) along with twenty-nine micro indicators [26]. The study identifies areas for improvement, such as passenger discomfort during peak hours, overcrowding, and staff misconduct. It underscores the importance of continuous monitoring and benchmarking to enhance public transportation services.

Extensive research has been conducted on indicators of service quality, and the following indicators are pertinent for gauging service quality [27]:

• Service Availability refers to route characteristics, including bus line coverage, stop locations, spacing, frequency, operational hours, travel time, and transfer needs.

• Service Reliability is crucial for transit users and widely studied. It is measured by on-time performance, consistent headways, and adherence to schedules.
• Comfort is essential for transit users, covering physical and environmental aspects such as clean seating, comfortable temperatures, low crowding, smooth rides, and minimal noise or odors.
• Cleanliness refers to the upkeep of vehicles and facilities, including bus interiors, seating, windows, and shelters. Daily cleaning removes litter, while deep cleaning occurs periodically.
• Safety and Security ensure protection from accidents and crimes, covering safe bus operations, security at stops and onboard, and passenger behavior. These factors are vital for a trustworthy transit system.
• Information is crucial for passengers to plan their journeys, including transit usage, stop locations, transfers, schedules, and destination guidance. Clear information enhances service accessibility.

Based on the literature, the researchers decided to measure the city bus service quality regarding users' perceptions, by using the user survey, because it has been suggested by many authors as the best method for quality evaluation of satisfaction [28].

Aspects	Parameters
Physical	Infrastructures
	Accessibility
	Location/Route
Operational	Schedule and Time, Reliability
	Customer Service
	Safety and security
Fare and Payment	Fare and Ticket
	Fare Transparency
	Digital Payments
Informational	Information on Routes, Schedules, and Transfer Points

Table 1: Public Transportation Aspects and Parameters

3. Methodology

3.1 Methodology of Study

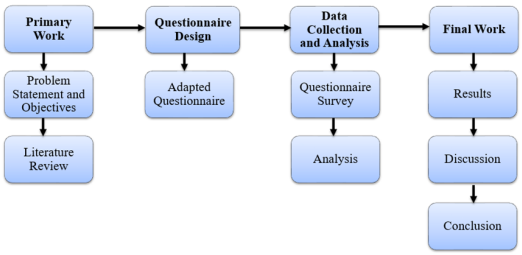

Figure 3: Research methodological procedure

In this study independent variables used as overall satisfaction in public buses transportation services. While dependent variables are particular service quality properties which consist of information on public buses transportation, staff behavior, cleanliness, seat availability, bus comfort, bus stops conditions, being safe from accidents and information related to bus stops.

3.2 Data Collection

To collect the data needed for the research, other resources were needed containing previous researches, studies, books, certified researchers, websites and references that highlighted and discussed this topic. Then distributing questionnaires on the respondents in the research area and get respondents' point of view on service quality and customer satisfaction using public bus transportation.

A well careful organization of the questionnaire will encourage the collection process and also will ensure and maximize the validity and reliability of information gathered from respondents. The first section requested general information on characteristics such as age, gender, employment status and frequency of usage.

The second section measured the respondents' evaluation and perception regarding the service quality of the transport service provided by the public transport service. The bus service in Pokhara has been used for the quality measurement in this research.

3.3 Respondents and Sample Profile

Sampling is divided into two types: Probability sampling and non-probability sampling. Probability sampling is to choose the participants by the confidence that this sample recently representing the target population. Also the purpose of the research is to identify areas for improvements affecting the whole population on conclusions, it is possible to use probability sampling. Random sampling technique are used for the survey. The main feature of using this techniques is that samples are chosen randomly.This method, a type of probability sampling, ensures that each participant has an equal chance of being selected, thereby reducing bias and improving the generalizability of the results. And the respondents chosen represent a diverse range of people using public transport. This questionnaire-based survey helped to gather responses from a diverse group of public transport users, capturing various perspectives.

The sample size is determined using the Corchan equation (1963) with a 10 % precision and a 95 % confidence level. The sample strategy takes into account every passenger who travels throughout the course of the three survey days. Data were collected partly from the users at the terminations and stops of a city bus, the users were directly interviewed while they were on board. As a result, 145 respondents were interviewed for all 3 bus routes throughout the city. The survey gathered responses from a total of 145 individuals in Pokhara Metropolitan City (although 97 numbers of sample required were calculated from Corchan equation).

	Frequency	Percentage
Gender		
Male	86	59.31%
Female	59	40.69%
Age		
≤ 20	30	20.69%
21-40	104	71.72%
> 40	11	7.59%
Profession		
Student	72	49.66%
Civil servant	12	8.28%
Private Sector Employee	31	21.38%
House Wife	16	11.03%
Other	14	9.66%
Most Common Trip Purpose		
School/University	59	40.69%
Work/Business	39	26.90%
Social Activities /Shopping/ Refreshment	36	24.83%
Other	11	7.59%
Frequency		
Daily	57	39.31%
Weekly	44	30.34%
Occasionally	34	23.45%
Rarely	10	6.90%

Table 2: Demographic and Trip Characteristics

3.4 Study Area

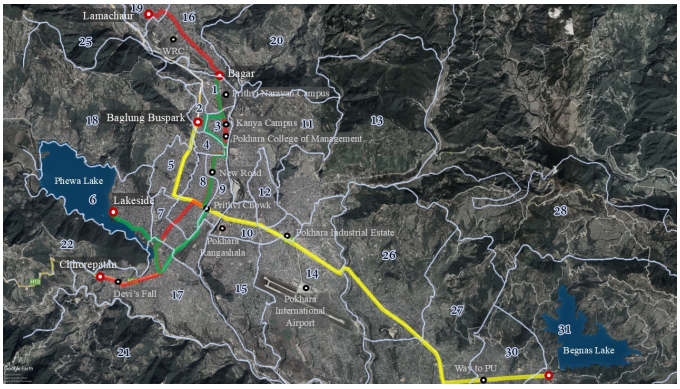

Figure 4: Studied Routes

The second-biggest city in Nepal, Pokhara, is conveniently situated and serves as the starting point for the Annapurna trek circuit in the Himalayas and is most popular tourist sites in Nepal. Covering 464 square kilometers it is the largest metropolitan area in Gandaki Province (Census 2021). Pokhara Sub-Metropolitan City was merged with Lekhnath Municipality and a few surrounding villages in 2016 to create PMC. PMC has 33 administrative wards, classified as core, outer and rural. The core area (12 of 33 wards) includes the old city of Pokhara and the core of Lekhnath. The classification into core, outer and rural areas is only for the convenience of planning for services and do not have any legal connotation (World Bank,2020). Two Routes from Pokhara City Bus Service and one Route from Lekhnath Pokhara Bus Service were selected for study.

• The Lamachaur-Chhorepatan Route is one of the routes selected which is 12.7kms. This route links several densely populated and commercially active areas, including New Road, Bagar, and Chipledhunga, which are among the busiest locations in Pokhara.

• Fewa Lake to Begnas Lake Route Section is 19.3 km section traverses the northern part of Pokhara, connecting key locations such as Mustang Chowk, Prithiv Chowk, Bus Park, Industrial Area, International Airport, Budi Bazar, Talchowk, and Sesuwa. Due to its wide passenger catchment area, this road segment has a significant demand for transport. The road segment goes alongside the lakes of Fewa and Begnas, two of Pokhara's most popular tourist destinations. It passes via the International Airport and incorporates a section of the Prithvi Highway.

3.5 Data Analysis

The data was thoroughly reviewed to ensure its reliability and validity, including checking for missing data, duplication, and entry errors. SPSS software was used for the analysis of both closed- and open-ended questions, enabling effective data interpretation. Validity was assessed through three key aspects: criterion validity, content validity, and construct validity. Data collection was done with reliable sources, and the study's questions were designed to guarantee the accuracy of the results. A sample of 20 questionnaires was tested for validity by measuring correlation coefficients. To measure internal consistency, Cronbach's alpha was used, with values ranging from 0.0 to +1.0. Higher values indicate better internal consistency, and the alpha was calculated for each section of the questionnaire to ensure reliability. For statistical analysis, SPSS was employed, utilizing tools such as Cronbach's Alpha for reliability statistics, frequency and descriptive analysis, and Pearson correlation coefficient to assess validity.

4. Findings and Analysis

This chapter contains results analyzed by SPSS from collected data. These results were performed using reliability Statistics, frequency, and descriptive analysis and Pearson correlation coefficient. The other analyzed data is also used to improve the recommendation that could be applied is local areas.

4.1 Descriptive Analysis

This section presents the descriptive analysis of the data gathered through the questionnaires during the study. Descriptive statistics is the study of statistically characterizing the main elements of data collection. Descriptive statistics can be used to logically simplify large amounts of data pertaining to these variables. For this purpose, respondents were provided with "Four-Point Likert Scale" questions, for example ranging from "strongly disagree" to "strongly agree," and scored from 1 to 4.

Table 3: Descriptive Statistics

Aspects	N	Mean	Std. Deviation
Infrastructure rating at bus stops/stations	145	2.23	0.70
Waiting time at transfer point	145	2.05	0.77
To transfer between different public transports modes	145	2.34	0.61
Reliability (Punctuality of buses according to schedule)	145	2.40	0.78
Customer service (Cleanliness, Seat comfort, Behaviors of Bus staffs)	145	2.2	0.74
Safety and security (Safety against crimes on buses)	145	2.37	0.78
Fare payments and System	145	2.28	0.96
Satisfaction with the transparency of fare calculations	145	2.24	0.66
Information about public transport routes, schedules, and transfer points	145	2.20	0.67
Clarity and availability of information provided	145	2.39	0.68
Overall Satisfaction (Reliable, Comfort, Safety, Fare and Information)	145	2.37	0.77

The infrastructure at bus stops/stations has a mean score of 2.23, indicating below-average satisfaction and a need for improvements in shelter, seating, lighting, and accessibility. The waiting time at transfer points scored 2.05, reflecting moderate delays when transferring between transport services. The ease of transferring between public transport modes was rated at 2.34, showing some difficulties in seamless transit. Bus punctuality received a mean of 2.40, suggesting reliability issues with the schedules. Customer service, with a score of 2.21, reflects moderate dissatisfaction in cleanliness, seating comfort, and staff behavior. Safety and security concerns scored 2.37, indicating moderate safety but room for improvement. Overall satisfaction, at 2.37, aligns with the scores for reliability and safety, showing significant dissatisfaction with the service. Issues with fare payments were rated 2.28, pointing to challenges like unclear pricing and inconsistent fares. The fare transparency score of 2.24 indicates dissatisfaction with the clarity of the fare system. The ease of finding transport information scored 2.20, showing difficulties for passengers in obtaining necessary details. The clarity and availability of information was rated at 2.39, suggesting that public transport information is not always clear or easily accessible.

4.2 Reliability Test

Table 4: Reliability Statistics

Variable	Cronbach's Alpha
Physical Aspects	0.26
Operational Aspects	0.73
Fare and Payments	0.58
Informational Aspects	0.73

The reliability test, using Cronbach's Alpha, assessed the internal consistency of various factors in the study. The Physical Aspects variable had a low Cronbach's Alpha of 0.26, indicating poor reliability, and was excluded from the analysis. Operational Aspects and Informational Aspects both scored 0.73, demonstrating good reliability, and were deemed suitable for inclusion in the study. Fare and Payment scored 0.58, indicating moderate internal consistency and was considered acceptable for inclusion. Overall, operational, fare and payment, and informational aspects showed adequate reliability, while physical aspects were excluded due to their unreliability.

4.3 Correlation

Variables	Correlation	Overall Satisfaction
Gender	Pearson Correlation Sig. (2-tailed) N	-0.029 0.733 145
Age	Pearson Correlation Sig. (2-tailed) N	0.086 0.303 145
Profession	Pearson Correlation Sig. (2-tailed) N	0.115 0.169 145
Most common trip purpose	Pearson Correlation Sig. (2-tailed) N	0.166 0.046 145
Frequency of Public Transport Use	Pearson Correlation Sig. (2-tailed) N	0.168 0.043 145

Table 5: Correlation Between Various Variables and Overall Satisfaction

The correlation test shows relationship between general characteristics of respondents i.e. gender, age, profession, most common trip purpose, frequency of public transport use and overall satisfaction in terms of reliability, comfort, safety, fare and information. From the correlation table it can be seen that only 2 variables i.e. most common trip purpose and frequency of public transport use have significant correlation with overall satisfaction as it has sig value less than 0.05 while other variables do not have significant relationship.

Likewise, the correlation test shows relationship between different aspects i.e. operation, fare, information and frequency of public transport use. From the correlation table it can be seen that only fare has significant correlation with

frequency of public transport use as it has sig value less than 0.05 while other variables do not have significant relationship

Variables	Correlation	Frequency of Public Transport Use
Operational	Pearson Correlation	0.14
	Sig. (2-tailed)	0.1
	N	145
Fare/Payment	Pearson Correlation	0.22
	Sig. (2-tailed)	0.01
	N	145
Information	Pearson Correlation	-0.05
	Sig. (2-tailed)	0.52
	N	145

Table 6: Correlation between variables and frequency of public transport use.

5. Discussion and Conclusion

5.1 Discussion

The results of this study give an indepth understanding of bus service quality from users' perceptions. Data collected through surveys and observations reveal substantial shortcomings in infrastructure, scheduling, regulatory frameworks, and passenger satisfaction. These inefficiencies lead to extended travel times, limited accessibility, and a lack of confidence in public transport services. The analysis underscores the difficulties faced by commuters and the systemic issues that prevent a cohesive and efficient transport network.

The physical infrastructure of Pokhara's public transport system is inadequate, contributing to an inconvenient and unsafe travel experience. The analysis from the regression and descriptive statistics highlights that poor bus stop infrastructure—lacking shelters, seating, and lighting—significantly affects commuter satisfaction. The absence of designated bus bays and frequent encroachment by vendors and unauthorized parking further hinder passenger movement and disrupt traffic flow. Accessibility issues are especially prevalent in suburban and peri-urban areas, where poorly planned transfer points increase travel times and create inconvenience for passengers. The lack of facilities for individuals with mobility impairments underscores the need for more inclusive infrastructure.

Operational aspects such as route coverage, scheduling, and fare management play a crucial role in shaping user experiences. Correlation analysis indicates that operational inefficiencies, particularly long waiting times and inconsistent bus schedules, negatively affect transport reliability and commuter satisfaction. The absence of a standardized timetable leads to irregular service, with frequent delays exacerbated by traffic congestion. Fare-related issues, such as a lack of transparency and inconsistent pricing, create financial challenges for passengers. Regression results show that fare has a significant impact on public transport usage frequency, emphasizing the importance of developing a centralized and transparent fare system. Despite high interest in digital payments, cash transactions remain dominant due to the mismanagement of previous attempts at implementing

5.2 Conclusion

The public bus service in Pokhara, as assessed through users' perceptions, reveals a complex set of challenges that affect its effectiveness and satisfaction levels. The study highlights that while the service infrastructure, such as bus stops and stations, is somewhat functional, it remains inadequate in terms of comfort and accessibility. There are significant concerns about delays, lack of reliability, and difficulties in fare payments, which negatively impact users' overall satisfaction. Additionally, issues related to safety, cleanliness, and the availability of necessary information further contribute to dissatisfaction among passengers.

The findings indicate that operational aspects, such as route coverage and punctuality, are key determinants of user satisfaction. The analysis shows that factors such as trip purpose and frequency of bus use significantly influence overall satisfaction, with fare-related issues strongly affecting public transport usage. The lack of a standardized timetable and poor infrastructure contribute to inefficiencies and inconvenience for commuters.

The study underscores the need for improvements in infrastructure and operational efficiency, particularly in terms of timely services and clear information dissemination. Although fare-related issues were identified, the study also highlights that enhancing fare transparency and implementing digital payment systems could positively influence public transport usage.

In conclusion, addressing these challenges is crucial to improving the public transport system in Pokhara, ensuring it meets the needs and expectations of the growing population. Continued research and feedback from users will be essential in informing future improvements and policies aimed at making public transport a more viable and attractive option for commuters in the city.

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APPENDIX 7 – PLAGIARISM TEST REPORT

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