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Evaluating the Impact of Dhaka's First Elevated Expressway on Urban Traffic Management: A Case Study of the Airport-to-Farmgate Corridor

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ABSTRACT: The First Dhaka Elevated Expressway (FDEE) is a transformative infrastructure project aimed at addressing Dhaka City's chronic traffic congestion. This study evaluates the expressway's impact on traffic management along the Airport-to-Farmgate corridor using a mixed-methods approach combining quantitative and qualitative data. Key findings reveal a significant reduction in traffic volume on surface roads (37–40%), substantial decreases in travel time (up to 67% during peak hours), and improvements in air quality (average PM_{2.5} reduction by 22%). These changes have enhanced commuter satisfaction, though benefits remain primarily skewed toward private vehicle users. Challenges such as toll affordability, limited integration with public transport, and congestion at merging points, particularly at Khamarbari, highlight areas requiring urgent attention. To maximize the expressway's potential, the study recommends redesigning critical junctions, integrating public transport systems, revising toll policies for inclusivity, implementing targeted safety measures, and ensuring continuous environmental monitoring. These measures aim to enhance accessibility, equity, and sustainability, offering valuable lessons for urban transport planning. This research serves as a critical resource for policymakers and urban planners, emphasizing the need for a balanced approach to infrastructure development in Dhaka and similar urban contexts globally.

KEYWORDS: Elevated Expressway, Traffic Management, Urban Mobility, Sustainability, Dhaka City

I. INTRODUCTION

Dhaka, the capital of Bangladesh, houses over 18 million residents, making it one of the most densely populated cities globally. As the population of the city is increasing rapidly, the transportation sector needs to expand to meet this rapid growth of the country [1]. Among the most congested routes is the corridor between Hazrat Shahjalal International Airport and Farmgate, a vital transportation artery. It has been estimated that a minimum of 25% of the land in a city should be used for road infrastructure with a view to managing the traffic effectively [2]. In Dhaka city, only 7% of the land is used in this purpose [2]. Dhaka City has an average of 12,588 cars, jeeps, and microbuses [3] continually rising. Expressways play a highly important role in improving the traffic operation of the whole urban road network [4]. In response, the government initiated the First Dhaka Elevated Expressway (FDEE), Total length 46.73 km (including 19.73 km main flyover and 31 km ramps and elevated links) long infrastructure project aimed at alleviating congestion by creating an elevated roadway for vehicular traffic. This study investigates the expressway's impact on traffic management along the Airport to Farmgate route. Using pre- and post-construction traffic data, the research analyzes changes in travel times, congestion levels, and commuter satisfaction.

The study's objectives are to:

- Assess the expressway's impact on congestion between the Airport and Farmgate.
- Evaluate reductions in travel time post-implementation.
- Determine commuter satisfaction with the expressway.
- Identify emerging challenges, such as surface road congestion and accessibility issues.

The primary objectives of the Expressway are to increase traffic capacity within and around the city and to reduce traffic times and provide travel comfort and convenience [5]. The Expressway will be designed to relieve existing overloaded roads [1]. This study provides crucial insights for policymakers, urban planners, and transportation authorities, offering guidance for improving Dhaka's traffic infrastructure. The findings also serve as a model for future

infrastructure projects in other metropolitan regions. The Dhaka Elevated Expressway Project phase details are as follows:

- Phase 1: Hazrat Shahjalal International Airport to Banani Rail Station (7.45 km)
- Phase 2: Banani Rail Station to Mogbazar Level Crossing (5.85 km)
- Phase 3: Mogbazar Level Crossing to Kutubkhali (6.43 km)



Figure 1: First Dhaka Elevated Expressway

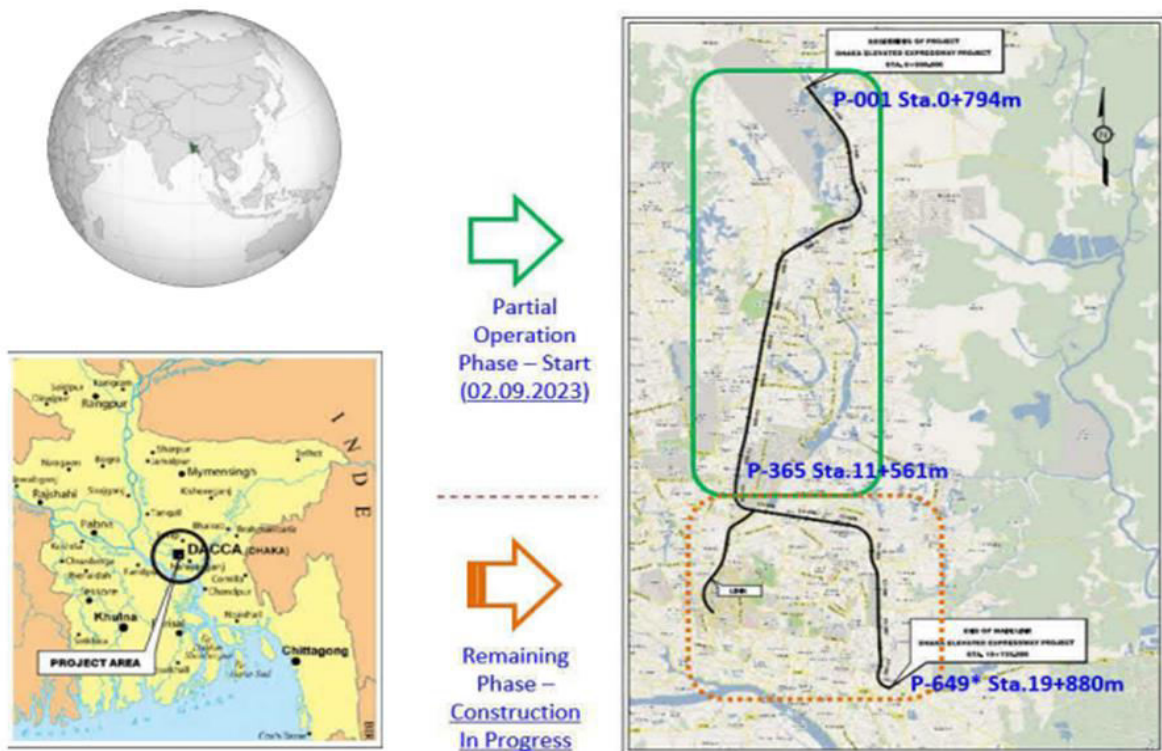


Figure 2: First Dhaka Elevated Expressway site map and location [1]

II. METHODOLOGY

A mixed-methods approach was adopted for this research, integrating quantitative and qualitative data collection techniques:

- **Primary Data:** Gathered through surveys, structured interviews, and traffic volume measurements.
- **Secondary Data:** Derived from the First Dhaka Elevated Expressway Authority and satellite imagery.
- **Analysis Tools:** Statistical software for quantitative analysis and thematic coding for qualitative feedback.

The selection of the Airport to Farmgate corridor for this study is grounded in several key considerations that underscore its significance.

Limitations: The study's time frame was restricted to three months, potentially limiting the ability to observe long-term impacts. Access to historical traffic data was also constrained, affecting the scope of pre-and post-expressway comparisons.

III. DATA ANALYSIS, RESULTS AND DISCUSSION

This section undertakes a comprehensive analysis of the data collected in the investigation of the elevated expressway's impact on traffic management between the Airport and Farmgate areas of Dhaka. The primary objective of this research is to evaluate how the introduction of the elevated expressway has influenced traffic patterns, enhanced travel efficiency, alleviated congestion, and addressed various traffic-related challenges in this corridor. The data analysis will encompass three principal categories. Firstly, Data collection from head office of First Dhaka Elevated Expressway (FDEE). Secondly, Additional data were gathered through a Questionary survey.

3.1 Secondary Data Collection from First Dhaka Elevated Expressway (FDEE) Authority

Data about the difference in traffic volume, travel time reductions, air pollution and commuter satisfaction before and after the elevated expressway were collected from the head office of First Dhaka Elevated Expressway (FDEE) and collaborating with the Authority of FDEE. Tables 1, 2, 3, and 4 summarize the changes in traffic volume, travel time reductions, air pollution levels, and commuter satisfaction at key locations along the corridor.

Table 1: Data about the difference in traffic volume before and after the Elevated Expressway.

Location	Before Expressway (Vehicles/Hour)	After Expressway (Vehicles/Hour)	% Change
Airport	8,500	5,000	-41%
Banani	7,200	4,500	-37%
Mohakhali	9,000	6,200	-31%
Farmgate	8,800	5,400	-39%

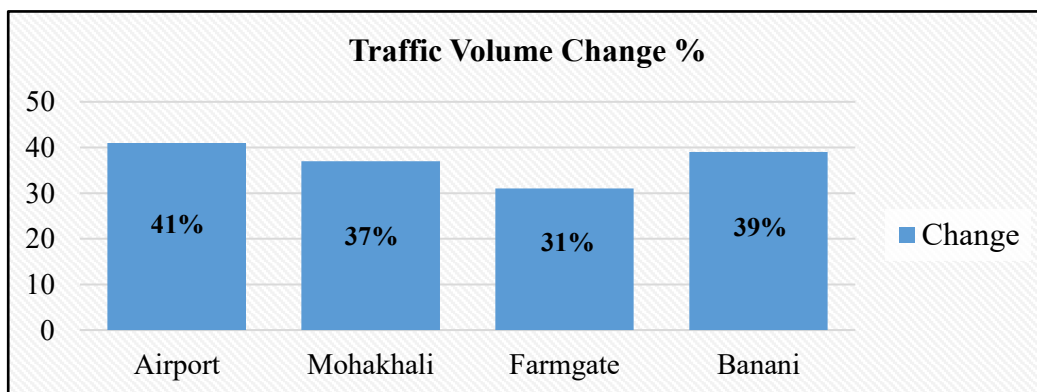


Table 2: Data about Travel Time Reductions before and after the Elevated Expressway.

Time of Day	Pre-Expressway Travel Time (Minutes)	Post-Expressway Travel Time (Minutes)	% Reduction
Peak Hours	90	30	-67%
Off-Peak Hours	35	20	-43%

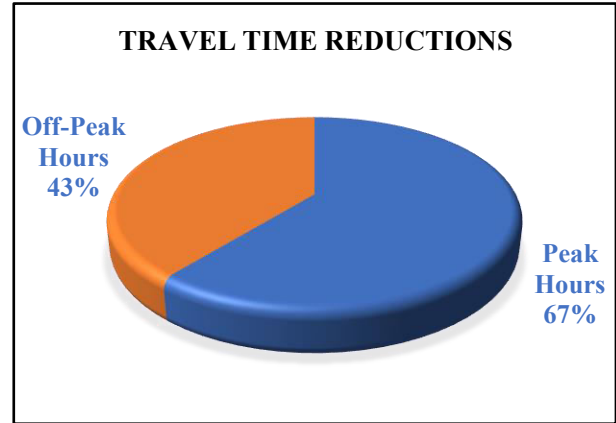


Table 3: Data about Air Pollution Levels before and after Elevated Expressway.

Location	PM 2.5 (Pre-Expressway)	PM 2.5 (Post-Expressway)	% Change
Banani	180 $\mu\text{g}/\text{m}^3$	140 $\mu\text{g}/\text{m}^3$	-22%
Farmgate	200 $\mu\text{g}/\text{m}^3$	155 $\mu\text{g}/\text{m}^3$	-22.5%

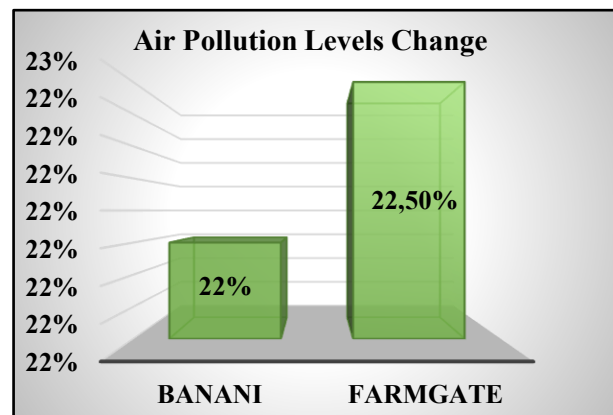
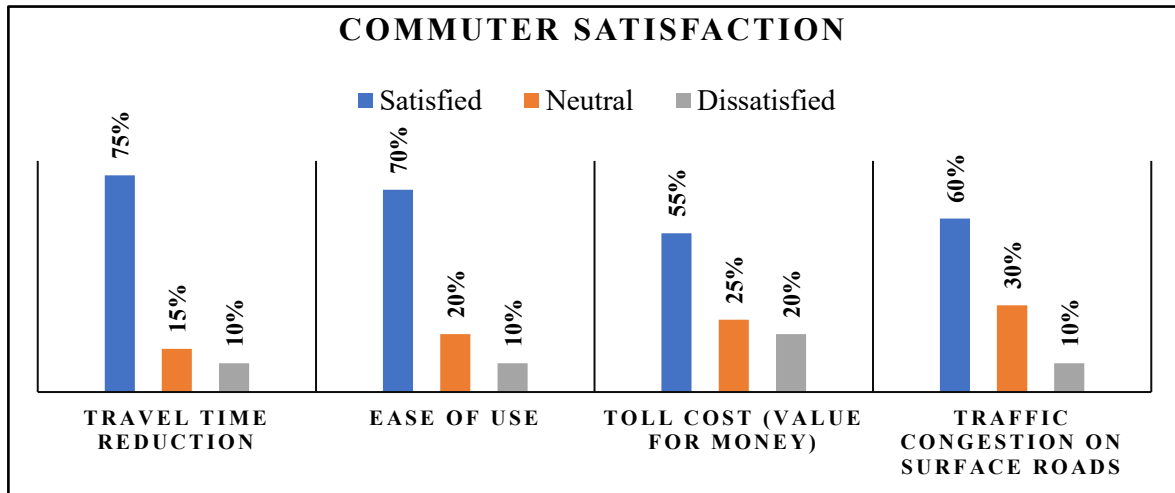


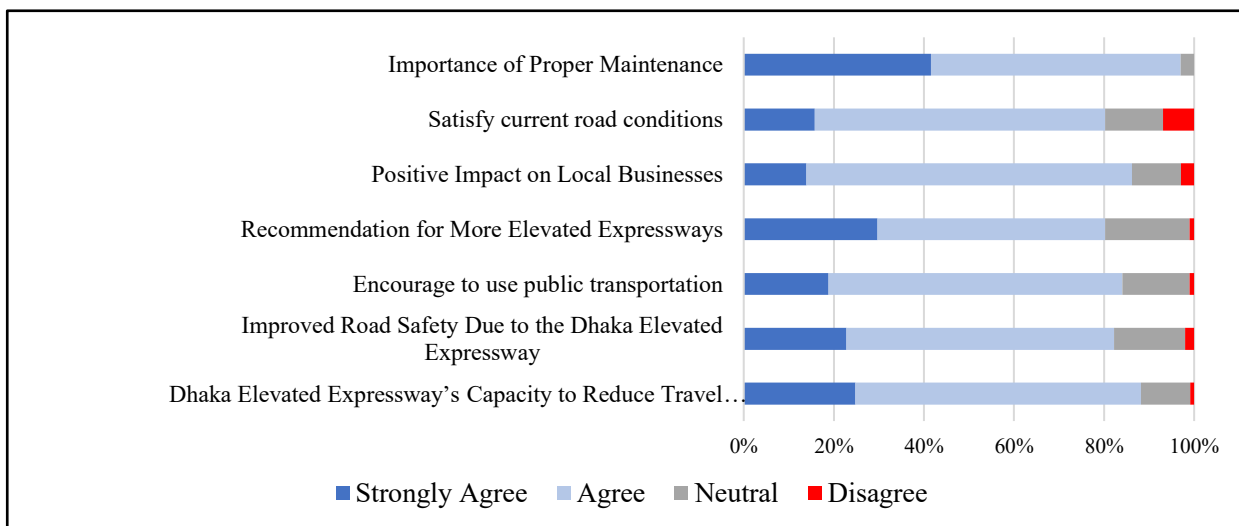
Table 4: Data about Commuter Satisfaction before and after Elevated Expressway

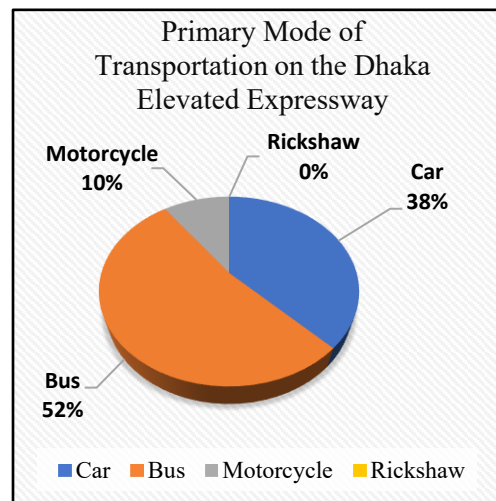
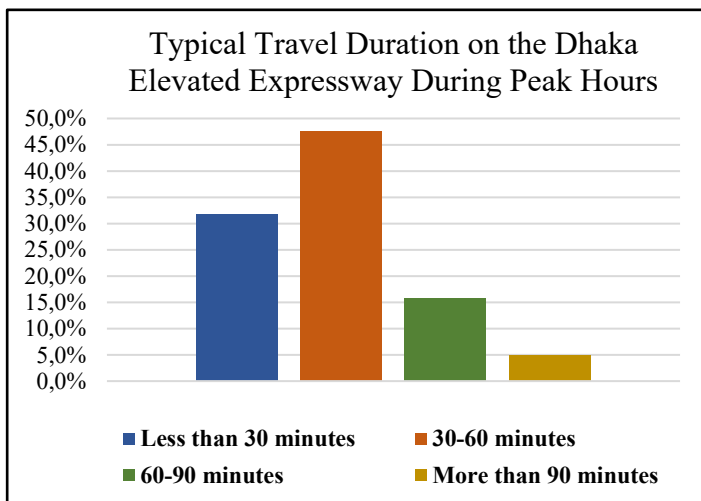
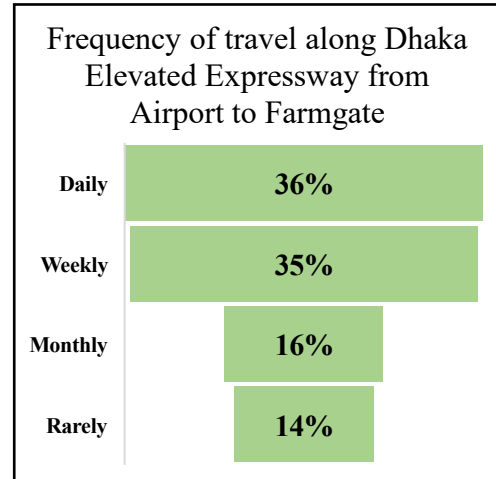
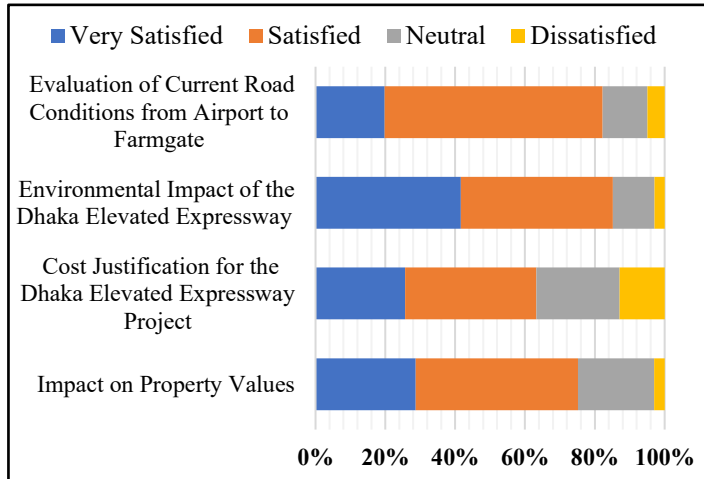
Factor	% Satisfied	% Neutral	% Dissatisfied
Travel Time Reduction	75%	15%	10%
Ease of Use	70%	20%	10%
Toll Cost (Value for Money)	55%	25%	20%
Traffic Congestion on Surface Roads	60%	30%	10%

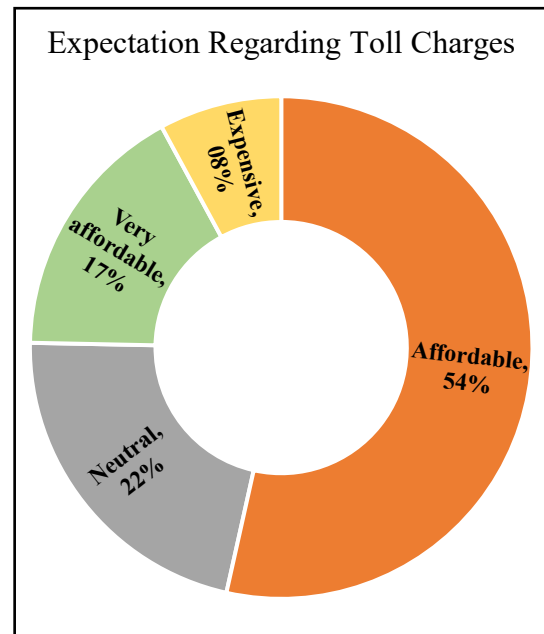
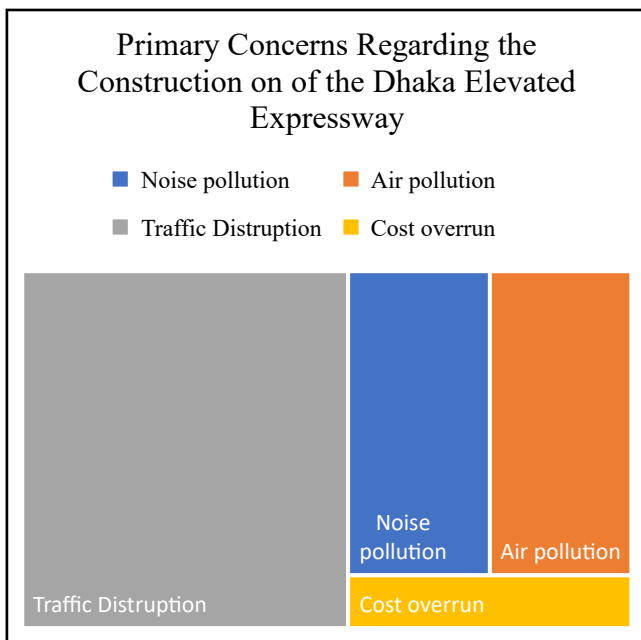
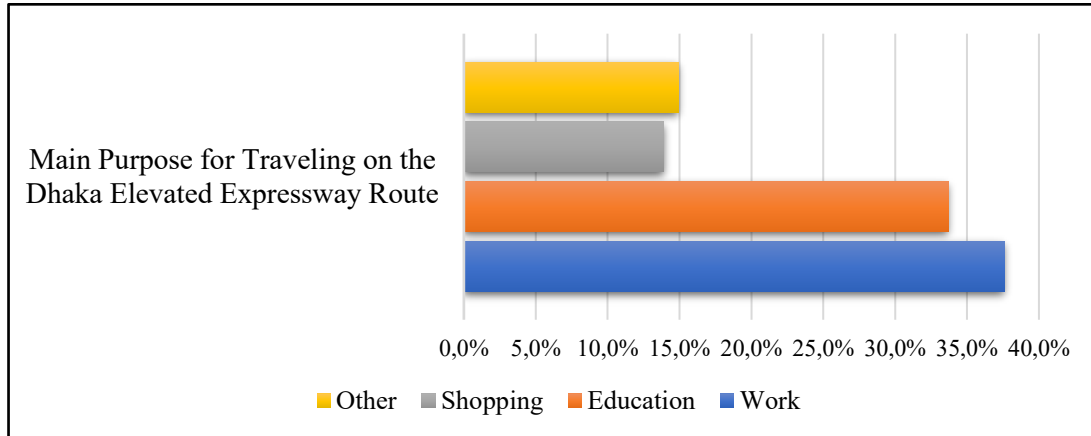


3.2 Questionnaire Survey Analysis

This study conducted a comprehensive survey analysis to evaluate the impact of the elevated expressway on traffic management between the Airport and Farmgate in Dhaka City. Conducting surveys by stopping vehicles on the First Dhaka Elevated Expressway (FDEE) is quite challenging. A google form has been created and linked it to a QR code to simplify the process. Passengers in the vehicles can easily scan the QR code and fill up the survey questions via the form without any hassle. A total of 101 respondents participated, providing insights through a structured questionnaire composed of 17 questions that explored various dimensions of their commuting experiences. By synthesizing quantitative data from the survey with qualitative insights provided by the respondents, this analysis presents a comprehensive perspective on the expressway's role within the broader traffic management framework of Dhaka City, highlighting both its advantages and the areas that require further attention. The queries and results and discussions are given below:







IV. CONCLUSIONS AND RECOMMENDATIONS

The First Dhaka Elevated Expressway (FDEE) has successfully achieved its primary goal of enhancing traffic flow along the Airport-to-Farmgate corridor. Since its inauguration, the expressway has significantly reduced congestion on surface roads, with traffic volumes dropping by an estimated 37–40%. Additionally, during peak hours, travel times along the corridor have been cut by as much as 67%, offering substantial time savings for commuters. Furthermore, the expressway's contribution to improved air quality indicates positive environmental impacts, which are crucial for a city grappling with high levels of pollution.

Despite these notable achievements, the benefits of the expressway are unevenly distributed among Dhaka's diverse commuting population. Private vehicle users are the primary beneficiaries of the improved connectivity and reduced travel times. Conversely, users of public transport and pedestrians have seen limited direct advantages. Public buses are currently not integrated with the expressway system, leaving the majority of the city's commuters without access to its facilities. Pedestrians, too, remain underserved by the infrastructure, which does not adequately address their mobility needs.

Another pressing concern is the affordability of the expressway for low-income commuters. The toll fees required to access the expressway present a financial barrier for many, further limiting its accessibility. Additionally, traffic congestion has increased at certain key junctions, such as Khamarbari, as vehicles merge onto and off the expressway. This indicates the need for improved traffic management at these critical points.

To unlock the full potential of the FDEE and make it a cornerstone of Dhaka's urban transport system, several strategic measures are necessary:

Redesigning Critical Junctions

The Khamarbari intersection near Farmgate has been consistently identified as a major congestion hotspot, necessitating an immediate redesign to enhance traffic flow efficiency. Proposed interventions could include the implementation of an advanced, optimized traffic signal system designed to manage traffic volume dynamically or the construction of additional ramps and overpasses to facilitate smoother vehicular movement. These measures would aim to alleviate the bottlenecks and significantly reduce travel delays.

Integration with Public Transport

The current expressway infrastructure primarily caters to private vehicle users, which raises concerns about its inclusivity. To address this, integrating the expressway with Dhaka's public transport systems, such as the Bus Rapid Transit (BRT) or Metro Rail networks, is crucial. Such integration would enable a seamless transit experience for commuters using public transport, ensuring equitable access to the expressway. Moreover, this strategy could discourage excessive dependency on private vehicles, contributing to a more sustainable urban transport ecosystem.

Revising Toll Policies

The toll policy requires a flexible and inclusive approach to ensure affordability for a broader segment of users. For instance, introducing tiered pricing with discounts for frequent users, daily commuters, or economically disadvantaged groups could make the expressway more accessible. Such revisions would not only promote inclusivity but also encourage consistent usage, maximizing the infrastructure's utility.

Enhancing Safety through Accident Analysis

Comprehensive accident analyses should be conducted to understand the nature and frequency of incidents occurring along the expressway. Based on these findings, targeted safety interventions, such as deploying speed monitoring systems, enhancing road lighting, and installing clear and strategically placed signage, should be implemented. These measures would aim to reduce accident rates and ensure a safer commuting experience for all users.

Environmental Monitoring and Management

Continuous monitoring of environmental parameters, particularly air quality and noise levels, is imperative to evaluate the expressway's impact on Dhaka's urban environment. Establishing dedicated monitoring stations along the expressway and periodically publishing the data would facilitate transparency. Additionally, mitigation strategies, such as planting green buffers or installing noise barriers, could be employed to address adverse environmental effects.

Assessing Long-term Impacts

To comprehensively understand the expressway's effectiveness and contribution to Dhaka's urban landscape, a longitudinal impact assessment is recommended. This study should analyze various aspects, including changes in urban mobility patterns, economic development indicators, and commuter behaviors over an extended period. The findings could inform future infrastructure planning and ensure that the expressway continues to meet the evolving needs of the city.

By implementing these recommendations, the First Dhaka Elevated Expressway can evolve into a more inclusive and sustainable component of Dhaka's urban infrastructure. Its success can serve as a valuable model for other developing cities worldwide, showcasing how integrated planning and equitable design can transform urban mobility.

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