CHALLENGES OF ROAD TRANSPORTATION INFRASTRUCTURE IN DHAKA

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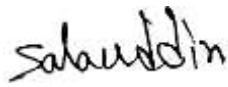
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CERTIFICATION

This is to certify that this project and thesis entitled "**Challenges of Road Transportation Infrastructure in Dhaka**" is done by the following students under my direct supervision and this work has been carried out by them in the Department of Civil Engineering under the Faculty of Engineering of Daffodil International University in partial fulfillment of the requirements for the degree of Bachelor of Science in Civil Engineering. The presentation of the work was held on 31 December 2022 .
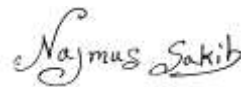
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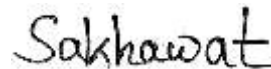Department of Civil Engineering

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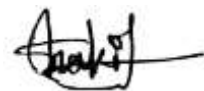
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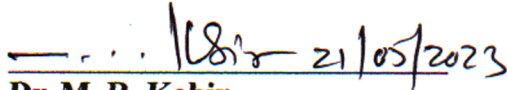
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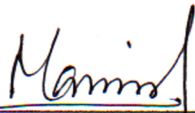<h2 style="text-align:center;color:green">BOARD OF EXAMINERS</h2>

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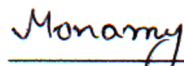
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DECLARATION

We hereby attest that we are the sole author of this thesis and that no part of it, nor the entire thesis, has been submitted to any other university or institution for a degree. We certify that this project report on **Challenges of Road Transportation Infrastructure in Dhaka** is done by us under the supervision of Md. Saurav Barua, Associate Professor, Department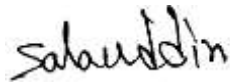 of Civil Engineering, Daffodil International University. We are announcing that this project is our unique work, we additionally proclaim that this undertaking works are unique and have never been submitted in its entirety for any degree or diploma at this university.
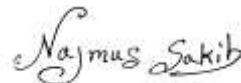
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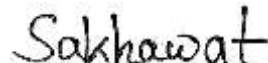
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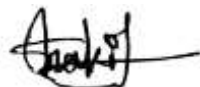
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DEDICATION

We devote this work to almighty ALLAH first, also our parents and teachers for their deep amicable support and help.

ABSTRACT

Bangladesh has grown in physical dimensions and more in population in the last few decades. The demand on transport infrastructure has been growing tremendously with the rapid growth in population and the supply has not been able to cope with the demand. This study discusses the current transport challenges issues of Bangladesh and provides a brief historical account as a background to understand how it has reached its present status. The transportation infrastructure development system is beset with many problems and poses challenges which need to be addressed with insightful initiatives, long-term planning, and implementation of the plans at the appropriate time. This study general people based perception we are collected from 77 respondent using random sampling methods. The growth of disorganized development in megacities without adequate planning has negative effects on the functioning of their urban infrastructure. The inefficiencies in Bangladesh's transportation system may be traced back to the lack of coordination between the country's land-use planning and its transportation infrastructure. This has led to unchecked and unplanned growth, a lack of compliance, and an unbalanced distribution of land uses. Transportation modes that are not dependent on roads, such as rail and waterways, have seen their potential and appeal diminished as a result of the persistent emphasis on road-based network systems. In reality, the amount of roads and their accessibility and efficiency fall well short of what is needed (about half of the area has reasonable accessibility). The entire street network's functionality is weakened by the unplanned and erratic orientation of the roads, which in turn causes problems with the transportation system's operations and management. The opportunity to build new roads or adopt modern systems to improve the overall transportation system is reduced by the massive densification and expanding rapidly development of residential, commercial, and other infrastructure. Authorities have only a limited grasp of the city's underlying problems, so they're only able to offer patchwork solutions without a comprehensive plan for the future. This is placing undue strain on the city's infrastructure and slowing its development. Once the investigation comes to a close, the focus shifts to the most pressing issues, which are then suggested solutions.

CHAPTER 1: INTRODUCTION

1.1   Introduction

From the 1960s, when it was still a British colony, and especially since 1971, when it became the capital of an independent Bangladesh, Bangladesh's population has grown at an alarming rate (Nasir et al., 2016). Migrants from smaller urban centers and, especially, rural areas have contributed significantly to the growth. Due to the lack of decentralization, Dhaka has remained the hub of most activities in the country, therefore more and more people are moving there in search of what they see as easy access to work. The city has not grown very much geographically and has primarily been contained within the limits of the river and the Bay of Bengal.

Due to Bangladesh's restricted geographical expansion and the fact that most of the interior areas are already built up, there is little room for building new roads without disrupting any population. More people, more economic activity, and more diverse land uses all add up to more daily journeys, and the city's undersized road system can barely keep up, causing commute times to be nearly nonexistent. Use of inefficient modes, changing land-uses, inadequate public transportation, inability to transfer demand to non-road variety of perspectives, on-street parking, and at-grade junctions are only a few of the reasons that have worsened the difficulties of limited road infrastructure. In this paper, we provide a brief overview of Bangladesh's development and the infrastructure facilities that support it. The report just presents problems without offering any solutions (Miura et al., 2012). Organizational duties for the urban and rural transport systems, as well as the economic, environmental, and safety consequences of the current traffic picture, are not discussed. Nonetheless, the difficulties are likely to reveal the source of the problems and serve as a starting point for finding solutions. The city has evolved with only minimal aid from a partial master plan that was designed for it in 1959 (Costin et al., 2018). Even the city's periphery, which will soon form a crucial component of the city's core, is developing without any supervision, control, or regulation (Abdur Razzaque, 1997). Bangladesh's city plan is now expanding axially in the north-south direction, especially to the north, as a result of marshy land in the east-west peripheral region and riverbanks flood flow land in the south. Without proper planning, the city's residential, retail, and other socioeconomic infrastructures like

supermarkets, high-rise buildings or townhouse, garment factories, etc. are springing up all over the place, creating an anarchic trip creation situation.

Figure 1.1: Flyover infrastructure upgrades in major cities

Source: (Abdur Razzaque, 1997)

The whole transportation system of Bangladesh is directly and indirectly impacted by the unplanned mixed landuse pattern, the presence of agricultural, business, and residential inside the core region of Bangladesh, and the highly centralized government frame structure. One of the main issues with the country's transportation system is ineffective and dysfunctional traffic management, which is largely to blame for making the current system even less effective. In fact, there is very little room to employ conventional low-cost but extremely cost-effective traffic management strategies for the reasons of unplanned and nonintegrated road infrastructure growth. The transportation system's crisis has had a significant impact on the physical appearance and functionality of the main cities. The entire physical and social environment is gradually decaying, bringing individuals pain and hardship. It is of the utmost importance, and requires immediate attention, to develop district town as a sustainable mega metropolis due to the ever-increasing travel demand caused by the spectacular expansion of urban population as well as the highly dandified landuse pattern (Miura et al., 2012). Every haphazard effort to improve the situation is just making things worse in the long run since so few people grasp the true nature and origins of the township's difficulties. The majority of improvement activities are carried out with a focus on the immediate need rather than a longer-

term vision, which either adds to or limits the city's potential for the growth of its transport infrastructure (Li et al., 2011). To understand or uncover the underlying reasons of the city's issues and inherent deficiencies in the land use land cover and transportation systems, however, a thorough research must be conducted. In light of the above, the authors conducted a thorough analysis to identify the inherent limitations and future challenges for sustainable development of the city by studying the majority of the interconnected domains of urban landuse and transport system.

1.2   Objectives of the Study

The discussion above has brought attention to the state of the country's transportation infrastructure, raising major questions about the viability of its transit systems in the future. In light of this background, the aims of this study are as follows:

1. To review current status of transpiration services in Bangladesh.
2. To evaluate on opportunities and challenges for improving performance of the present transit system.
3. To analyze on service based people perception transportation infrastructural development in Bangladesh.
4. To recommend on transportation infrastructure problematic challenges stand the solution.

1.3   Rational of the Study

In terms of supplying the essential infrastructure, notably transportation infrastructure, large-scale urbanization in Asia is complicating matters. Because the megacities of developing Asian nations are still expanding, policymakers may not be able to identify a readily transferable model from elsewhere to handle this issue. In order to develop the transportation infrastructure appropriate for a city of this size, it is necessary to take into account the city's future scale and adopt a long-term strategic perspective. One of Asia's fastest developing megacities, Dhaka is also seeing rapid urbanization, high density, and a lack of infrastructure resources. Buses of different varieties, as well as privately run, low-capacity motorized (taxis) and non-motorized vehicles, make up Bangladesh's current public transportation system (rickshaws). Since there is no institutional framework for the engineered operation and administration of transport in general and mass transit in particular, the issues with mass transit are complex. Due to the large number of operators, owners, businesses, and government organizations engaged, the issue is

poorly organized and handled. This is an ideal chance to assess the efficacy of existing public transportation systems and highlight their fundamental flaws. High-frequency coordinated public transportation service is needed because of the increased demand that results from high-density, mixed-use land development. This improves the accessibility of public transportation for passengers. When public transportation is able to serve arbitrary travel destinations and truly compete with the ease of private automobiles, it is a sign of a well integrated network of high frequency services. Transit performance measurements are utilized because they offer insight into the past and present of a business (Schuckmann et al., 2012). In order to achieve the prospects and potentials of the public transportation system with available governmental support and resources, it is necessary to study the current transit system in Bangladesh. The user's view of their genuine need differs significantly from what regulations are attempting to embrace for upcoming efforts. To improve the current public transit picture and, consequently, to start any future investments, there should be a proper aggregation of both public and private operators' perspectives.

1.4   Problem Statement

Transport is a vital aspect of every nation's economy. Since our nation's freedom, infrastructure development has accelerated, and there are now many different forms of transportation by land, sea, and air. Unlike other countries, Bangladesh has four transportation ministries supported by RHD, LGED, DNCC, DSCC, RAJUK, BRTA, BRTC, WASA, PWD, and BPC. With continuing economic expansion and development, there are many traffic malfunctions such as road accidents, rail accidents, and others that result in the loss and injury of many valued lives, exposing people to vulnerability (I. Ahmed, 2016). As a result, this article focuses on addressing the causes of transportation difficulties as well as suggesting remedies for minimizing vulnerability in order to promote sustainable development. The research people's perception discussion of key topics with examining social service duties, stating statistics graphs, and emphasizing action policy for going higher.

1.5   Limitation of the Study

The term "ecosystem" refers to a group of people who work in the construction industry. Theoretically, the focus of this study is on Bangladesh's traffic problems and transportation challenges. But both of these transportation problems happen in different places and are caused by different things. But it was not possible to cover all of them in this study. So, it was decided that this study would focus on Bangladesh as a whole. This study was done using a qualitative

approach that was based on statistical data from a variety of sources. In order to learn more about the phenomenon, the empirical evidence from the study area could have been more comprehensive. However, because the study area was already well-known, statistical data could be checked with first-hand knowledge.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

To communicate an awareness of earlier studies on transit oration performance, a complete literature study is conducted. According to the objectives of this study, this literature highlights a number of problems. In addition to quantifying transit efficiency, legislative efforts for transit services and associated methodologies are also explored. Early study on transit efficacy and indicators in developed nations is conducted. The phrase "ecosystem" refers to a group of construction sector employees. The term "transportation infrastructure" refers to a group of people who work in the construction industry.

2.2 Impression of transportation System in Bangladesh

The transport system of Bangladesh consists of roads, railways, inland waterways, two seaports, maritime shipping for both domestic and international traffic. The transport intensity of the Bangladesh economy is considerably lower than that of many developing countries.

Figure 2.1: Transportation Approach in Bangladesh

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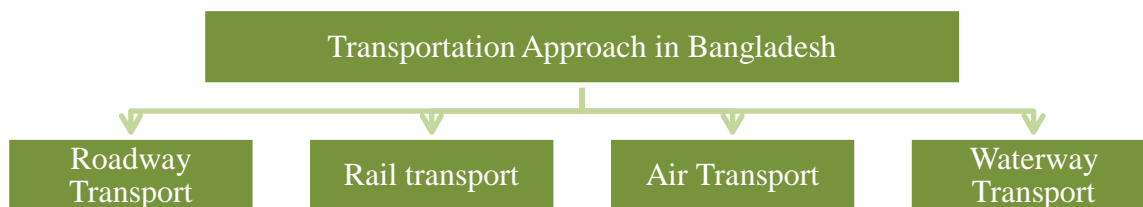
Source: Md. R. Ahmed & Karmaker, (2019)

2.2.1 Road Transportation System

In terms of both passenger and freight transportation, road transportation has grown the greatest in the past 50 years. Road transportation became the most essential form of communication following Bangladesh's independence in 1971. Roads, culverts, and bridges that had been destroyed by war were quickly rebuilt. New bridges were constructed on national routes. The district offices were linked to the national highway system. The length of the national highway is 3790.861 km, the length of the regional highway is 4206.121 km, and the length of the zilla road is 13,121.757 km (Schuckmann et al., 2012). In December 2000, there were about 406,000 distinct types of motorized vehicles on Bangladeshi roadways.

There are 26,707 buses and minibuses, 12,580 intercity buses, 42,750 trucks, 10,346 jeeps, 56,377 automobiles, 2,376 taxis, 89,317 auto rickshaws, and 165,460 motorbikes. Recently, private taxi services (Uber and Pathao) were established in the city of Dhaka (I. Ahmed, 2016). During the first four years of the Sixth Plan, the Roads and Highways Department created 628 kilometers of new roads, upgraded and restored 4335 kilometers of roads, built 26,799 meters of bridges, culverts, flyovers, and overpasses, and reconstructed 16,876 meters of bridges and culverts (RHD).

Table 2.1: Number of Registered Vehicles in Bangladesh: 2016-2020

SI. No	Type of Vehicles	2016	2017	2018	2019	Upto-June 2020	Grand Total
1	Ambulance	378	495	564	667	311	2415
2	Auto Rickshaw	11173	9168	21638	30967	10217	83163
3	Auto Tempo	1322	1592	609	228	42	3793
4	Bus	3833	3760	2755	3606	1501	15455
5	Cargo Van	1017	1413	1280	4	1	3715
6	Covered Van	3340	5176	5729	3042	792	18079
7	Delivery Van	2181	2410	2100	1531	515	8737
8	Human Hauler	3487	3393	1423	510	91	8904
9	Jeep (Hard/Soft)	4892	5425	5555	5630	1943	23445
10	Microbus	5804	5575	4137	3683	1149	20348
11	Minibus	472	492	436	837	285	2522
12	Motor Cycle	332057	326550	395603	406897	138193	1599300
13	Pick Up (Double/Single Cabin)	11371	13512	13097	11952	4372	54304
14	Private Passenger Car	20304	21959	18227	16783	5009	82282
15	Special Purpose Vehicle	620	993	1339	1182	330	4464
16	Tanker	394	319	529	419	166	1827
17	Taxicab	44	15	161	11	6	237

18	T ractor	2576	2777	3553	2561	856	12323
19	Truck	7275	10353	12663	8326	2229	40846
20	Others	3870	5021	5976	5294	2007	22168
	Total	**416410**	**420398**	**497374**	**504130**	**170015**	**2008327**

Source: (BRTA, 2023)

2.2.2 Rail Transportation System

Dual Gauge (DG), a hybrid of the MG (1000mm) and BG (1676mm) systems, has been in use in Bangladesh since 2001. The number of kilometers of actively used railway track was 2,858 in 1970, but it fell down to 2,656 in 2006. There are now 138.89 route-km of railroad in Bangladesh, of which 103.70 km are on DG lines and 35.19 km are on MG lines. On the other side, during the Bangladesh era in Table 2.2, a total of 228.74 route-km of rail lines have been abandoned (Costin et al., 2018).

East-west communication, which was previously only possible via rail ferry services, has greatly improved with the completion of the Bangabandhu Multifunctional Bridge (BMB) over the river Jamuna, which incorporates railway lines. As an added bonus, the bridge allows the country to fully capitalize on the potential of the BG and MG lines. The current network is zigzagging along the Dhaka-Chittagong line. The southern region has a relatively low railway density, and the Barisal Division is not connected by rail (Eckersten et al., 2021).

The East Zone (EZ) and the West Zone are BR's administrative divisions (WZ). The entire distance covered by EZ is 1390.78 kilometers. Just 119.45 kilometers of the railway line between Dhaka and Chittagong is double-tracked, while another 124.80 kilometers are now being doubled, and BR has just recently extended the DG system from Joydevpur to Dhaka. It should be noted that the MG line has a stronger presence in the EZ.

The WZ also has MG and BG lines. Nonetheless, BG lines and DG lines predominate in this region. Just 96.01 km of double-track BG line are located in the zone. Regrettably, there is currently no direct train connection to the Mongla Port. Tables 2.2 and 2.3 provide specifics on the BR train network.

Table 2.2: Bangladesh Railway Routes Network in Kilometres

Item	East Zone			West Zone			
	Metre Gauge	Dual Gauge	Total	Metre Gauge	Broad Gauge	Dual Gauge	Total
Route under operation	1283.04	83.60	1366.64	501.64	507.10	280.55	1289.29
Closure of route	24.14	—	24.14	29.51	175.09	—	204.60
Total route	1307.18	83.60	1390.78	531.15	682.19	280.55	1493.89

Source: GIS Database, TSMR, TSC Wing, Planning Commission, (BB, 2023)

Table 2.3: Railway Routes Network by Gauge in kilometre

Item	Metre Gauge	Broad Gauge	Dual Gauge	Total
Route under operation	1,784.68	507.10	364.15	2,655.93
Closure of route	53.65	175.09	0	228.74
Total route	1,838.33	682.19	364.15	2,884.67

Source: GIS Database, TSMR, TSC Wing, Planning Commission (BB, 2023)

The Bangladesh Railway provides an effective service to places such as Chittagong, Sylhet, Khulna, Mymensingh, Bogra, Rajshahi, Dinajpur starting from Dhaka. The inter-city Express Service is available to and from important cities at cheap fares. Train services between DhakaKolkata have been commenced on 14 April 2008 in order to establish communication between Bangladesh and India. About 32% of the total area of Bangladesh is effectively covered by railways. Bangladesh Railway (BR) has a total route kilometer of 2734, of which 901 km is Broad Gauge (BG) and 1833 km is Meter Gauge (MG). The BR is at present catering to passenger and freight services at 489 stations spread over the entire country. In 2016, 65 million people took the train in Bangladesh, and 2.52 million tons of freight was transported on the rails. The railways in Bangladesh are split up into two zones. The east zone's workshop division is based in pahartali, while the west zone's is located in saidpur. Parbotipur is where the railway's major locomotive workshop is located, servicing both broad and meter gause locomotives. In 2017, Bangladesh Railways ran 90 up-and-down intercity trains, 64 commuter trains (DEMU), 135 shuttles on local trains, and 2 foreign services (Tosti et al., 2021).

Table 2.4: Number of Train according to class in Bangladesh Railway

Serial no.	Class of train	East Area	West Area	Total
1.	Intercity	46	40	86
2.	Local, mixed, P and V	73	53	126
3.	Moitree	00	04	04
4.	Mail express, comuter, DEMU	82	50	132
	Overall	201	145	348

Source: (BB, 2023)

2.2.3 Air Transportation system

35% of all global trade is carried by air. The phrase "ecosystem" refers to a group of people who work in the construction industry. 4 In the wake of Covid-19, the medical cargo operation emerged as the priority operation, and the world experienced the operation of Passenger to Cargo (P2C) flights, which essentially means transporting cargo by passenger aircraft with cabin loading at times. There were a sizable number of P2C flights operated by international airlines including Biman Bangladesh Airlines Limited and US Bangla Airlines of Bangladesh. Throughout the past decade, Bangladesh's aviation sector has come a long way and seen positive growth (Laird et al., 2014).

Biman The phrase "ecosystem" refers to a group of people who work in the construction industry. It is also shown that international airlines are now enjoying a significant share of both the passenger and freight transport markets, indicating a significant opportunity for Bangladesh's aviation sector to expand further. The study found a number of problems, including unethical pricing competition, short airport watch hours, insufficient boarding bridges, and poor transit facilities. Making fuel accessible at a fair price, low-cost financing, avoiding an unethical pricing war, building infrastructure, and opening up Bangladesh's skies are the primary ways forward.

According to the World Bank's collection of development indicators, which it compiles from official sources, the amount of freight transported through air in Bangladesh in 2020 was 118 million ton-km. Bangladesh - Air transport, freight (million ton-km) real statistics, historical data, forecasts, and estimates were obtained from the World Bank in February of 2023.

Figure 2.2: Bangladesh - Air Transport, Freight (million Ton-km)
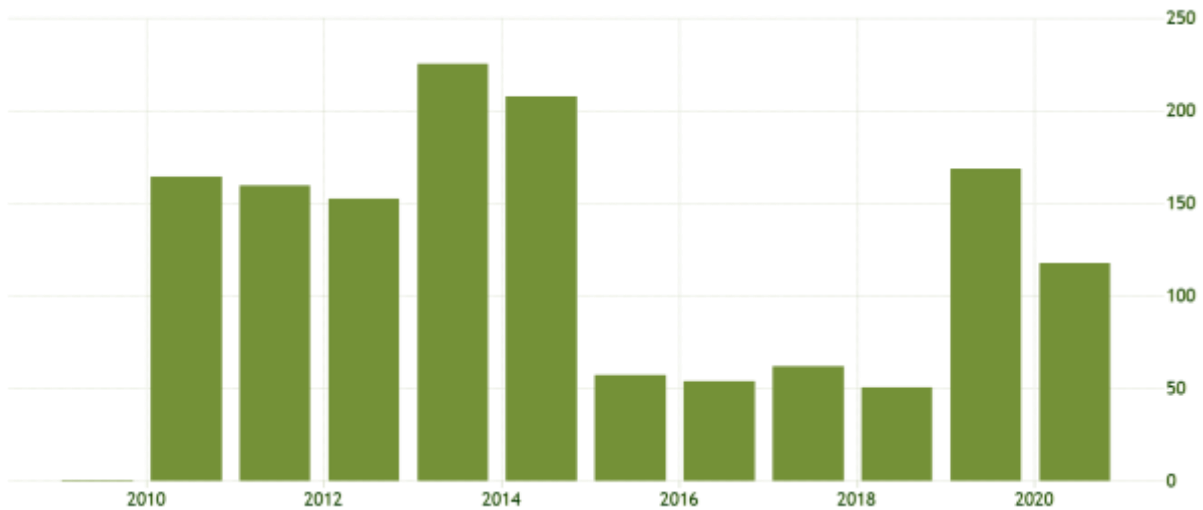
Source: (World Bank, 2023)

The volume of freight, express, and diplomatic luggage carried on each flight stage (operation of an aircraft from takeoff to landing) is measured in metric tons multiplied by kilometers traveled.

2.2.4 Air Passenger Service Quality in Bangladesh

When it comes to passenger safety, exactitude, and speed, air travel stands head and shoulders above the rest. But, air transport requires high professional in work to ensure these benefits. The question therefore becomes, for civil aviation sectors in Bangladesh, how to develop a genuine and long-lasting competitive advantage, and service quality becomes a crucial aspect in doing so.

Bangladesh has three international airports including Hazrat Shahjalal International Airport (HSIA) in capital Dhaka, one in the southeastern port city Chittagong and another in the northeastern city of Sylhet. With its present infrastructure, HSIA is capable of handling around 8.5 million passengers yearly, while 150 planes can take off and land at the airport every day. According to an analysis of last five years, HSIA has handled 3.2 million passengers yearly on an average with 50 flights carrying around 8,500 passengers to different international destinations daily. All the airports in Bangladesh are operated under the Civil Aviation Authority of Bangladesh (CAAB), an autonomous body. CAAB is responsible for airports, runways and air traffic control, taxiways, terminal buildings, warehouse, control tower, operation and administrative buildings, air navigation and radio communication system. There

are three international and six domestic airports in Bangladesh (Md. R. Ahmed & Karmaker, 2019). Table 2.5 provides the list of International and Domestic airports in Bangladesh with their locations.

Table 2.5: International and Domestic Airports in Bangladesh

Location	ICAO	IATA	Airport Name
International airports			
Chittagong	VGEG	CGP	Shah Amanat International Airport
Dhaka	VGZR	DAC	Hazrat Shahjalal International Airport
Sylhet	VGSY	ZYL	Osmani International Airport
Domestic airports			
Bagerhat			Khan Jahan Ali Airport (under construction)
Bari sal	VGBR	BZL	Barisal Airport
Cox's Bazar	VGCB	CXB	Cox's Bazar Airport
J essore	VGJR	J SR	Jessore Airport
Raishahi	VGRJ	RJH	Shah Makhdum Airport
Saidnur	VGSD	SPD	Saidpur Airport

Source: ICAB (2023)

2.2.5 Waterways

Bangladesh, a country with thousands of rivers, relies heavily on water transport for the transportation of products and people, especially in specific places where a number of large rivers join. It is also the most affordable means of transit when compared to rail and road transportation. 24000 km of waterways may be found in Bangladesh. Yet, 6,000 kilometers are navigable during monsoon season and 3,900 kilometers during dry season. There are around 22,300 registered vessels engaged in trade. Several hundred thousand handmade manual boats are traditional vessels, which have been plying inland and coastal waters for hundreds of years and play a key role as a rural mode of transport of goods and people. Inland ports and associated amenities include eleven large inland ports, twenty-three coastal island ports, 133 launch stations, and more than one thousand rural minor landing places. Bangladesh Inland Water Transport Authority (BIWTA) is the organization in charge of Bangladesh's inland water transportation.

Unfortunately, the infrastructure issues with the inland waterway system are inadequately addressed. Due in part to insufficient dredging and a lack of berthing facilities, the inland waterway system is not utilized to its full capacity. By improving waterways, it may be possible to lower transit costs for bulk freight and improve access to regions with poor road access, such as the northwestern section of Bangladesh (Schuckmann et al., 2012).

The importance of maritime shipping to Bangladeshi trade and business cannot be overstated. The port of Chittagong accounts for 30% of Bangladesh's gross domestic product and 92% of its foreign and maritime trade. It is known as the beating heart of the Bangladeshi economy. The rest is carried out through Mongla and few other river and land ports. Chittagong is one of the oldest ports in the region surrounding the Bay of Bengal. These two ports deal major portion of country's export import business.

Table 2.6: Information of inland waterways

Length of inland waterways	2500 km
Length of navigable waterways	9833 km
Monsoom	5968km
Dry season	3865km
Least available depth range	3.90 to 1.50 meter

Source: BIWTA, (2023)

2.3   Problems of the Transportation System in Bangladesh

The effectiveness of Bangladesh's transportation services is not a problem. Several studies have been conducted to investigate the feasibility of mass transportation in Bangladesh.

2.3.1   Inadequate Number of Vehicle

Most low-income people take the bus, minibus, or auto-tempo to get around. The number of vehicles used by the poor in Dhaka is insufficient, despite the fact that "many vehicles" are generally the root of the city's transportation problems. Nonetheless, there is no shortage of cars in the city (Ehsan et al., 2018). But, the owners intentionally create this shortage so that they may make more money by transporting more passengers in each vehicle and demanding higher rates. Because of this, the number of cars on the road is fast increasing, with an estimated 300 new cars hitting the roads every day. Due to traffic congestion in Bangladesh's capital city, the number of registered motor vehicles has increased.

It should be noted that the bus companies indeed have a legitimate issue. The phrase "ecosystem" refers to a group of people who work in the construction industry. More buses would help to increase traffic congestion in the current condition. It stands to reason that as soon as the buses would require less journey time, the proprietors would raise the quantity and frequency of travel (Gao et al., 2021).

2.3.2 Problem in the Management

Indeed, there are problems with mega city's transportation management. The trio's black relationship:

➢ Automobilists
➢ Bureaucrats
➢ Elected officials

A group of people that operate in the construction sector are referred to as a "ecosystem." Since there is no system giving funds to political employees for conducting their activities, politicians usually collect the same from lawbreakers (in this case, the car owners), who get additional profit from such crimes. It has also been found that some of them act as go-betweens in disputes for their own gain (Picketts et al., 2016).

In the current context of vehicle jamming, any legislative reform in the aforementioned sector is useless.

2.3.3 High-fare

There are a variety of elements that go into establishing how much each vehicle charges for fares. There are, however, three important currents in Bangladesh that are contributing to its completion. This includes:

➢ Owners push for a sky-high fare while passengers want for the lowest possible price.
➢ Politicians and bureaucrats try to step in because they want a piece of any growth that occurs.

The government, often in cahoots with the vehicle owners, arrange for an insufficient number of vehicles, allowing the vehicle owners/drivers to raise fares by exploiting the scarcity (Rahman & Rahman, 2015).

2.3.4 Long travel time

The greater the distance between individual vehicles, the faster they can travel. One example is if there are frequent starts and stops, right-hand turns, and other disruptions to the vehicle's forward speed. Since there is currently no option for expanding the road, improving intra-vehicular distance can only be achieved by reducing the volume of traffic or the frequency with which cars come on the route (Asariotis, 2020). The city council needs to take additional measures to shorten the journey time of the public transportation systems.

2.3.5 Environmental Pollution

There is a rising tendency in the use of fossil fuels by the road transportation sector in Bangladesh, which correlates with a corresponding rise in greenhouse gas emissions. We calculate an annual increase of 8% in greenhouse gas emissions from the road transportation sector between 1995 and 2000. In 1995, the transportation sector as a whole was responsible for around 2845 Gg CO_2 equivalent in greenhouse gas emissions, and by 2000, that number had increased to roughly 4050 Gg CO_2 equivalent. Cars on the road are frequently decades old, crammed with passengers, and poorly maintained (Bhuiyan, 2010). Other ancient cars, such as rusty minibuses and trucks that are 40 years old, are also clogging the city's roadways with their exhaust fumes.

2.3.6 Poor Quality of Transport Services

Poor governmental and private sector organizations and a lack of investment define Bangladesh's transportation system. It functions in a geographical area fraught with peril and a sociopolitical setting marked by extreme poverty and frequent disturbances caused by human activity. The standard of service has been consistently subpar across all delivery methods and organizational tiers. In Bangladesh, it is not uncommon to see packed buses, trains, or boats that also have questionable safety and security records and operate with unpredictable reliability.

2.3.7 Not Realizing the Importance of Transportation in the Area

Bangladesh has been developing its national transportation infrastructure with an inwardly focused approach. In the framework of the ongoing globalization process, it has been observed that the global economy's dynamism has been fueled to a great degree by the expansion of economic interaction between economies located in the same region or sub-region. Bangladesh has not planned and developed its transport infrastructure with a regional perspective in mind,

despite its key location in a sub-region that includes Nepal, Bhutan, and North-East India, among others.

2.3.8 Transport System Not Fully Integrated

Integrated system development, which has become a major challenge in modern sustainable transport development, is especially important for Bangladesh due to its severe resource shortage. Hence, there is an urgent need for the optimal combination of modes and the minimizing of resource usage. Yet, one cannot establish such a blend by examining a mode in isolation from others. So, despite the fact that rail and water transport are generally more efficient than road transport due to their higher energy efficiency and higher labor productivity, this fact alone cannot guarantee that these modes will be utilized more frequently. In the majority of instances, they cannot deliver door-to-door services on their own.

2.3.9 The Private Sector's Role Is Not Well Defined

It is no longer regarded as axiomatic that government ownership and direct operation of services are necessary for transport to provide social benefits. In numerous nations, it has been demonstrated that private sector ownership and administration of transport services can also provide social benefits to the general populace. To secure competitive access to industrialised nations and global trade in general, as well as to exploit the opportunities of providing transport services to the sub-region, Bangladesh needs the proactive involvement of private companies to improve service process cost savings and capital connect.

2.3.10 Lack of Transportation Policy

As of yet, there is no urban transportation policy in Bangladesh. So, there is no unanimous agreement on the kind of transportation and infrastructure the city should prioritize. In the past, funding primarily went toward infrastructure development for inter-urban links and setting up links to rural growth hubs, rather than urban transport. In general, the goal of such a policy should be to create a well-rounded and ecologically sustainable urban transportation network in which all forms of transportation both motorized and non-motorized can function effectively (Karlsrud, 1999).

2.3.11 Illiteracy and Inability of Manpower

Many persons with low levels of education are being hired by the transportation industry. They're being brought on board with no preparation whatsoever. Every day, regular people are injured as a result of accidents caused by the incompetence and naivete of the transport driver and others involved(Kjärstad et al., 2011).

2.3.12 Corruption

According to the TIB research, the Bangladesh Road Transport Authority (BRTA) is one of the most corrupt government agencies in the country. The research report from TIB found that bribery of at least Tk 10 lakh is required to introduce a new automobile to the nation's capital. In Bangladesh, a typical car costs around 50,000 taka. Twenty thousand taka is the price of corruption for a route permit. TIB found that 61% of drivers in the nation's capital did not have valid licenses. And the BRTA and the police need bribes to issue this permit. The TIB investigation claims that some buses in the nation's capital charge 75 percent more in rent than they collect from riders (Mia et al., 2015). Due to a lack of political power and goodwill, TIB has revealed extensive irregularities and corruption in the transportation sector.

2.3.13 Accident

The investigation indicated that traffic accidents and fatalities have reached their greatest levels in the past eight years.

550 people were killed and 201 were injured in 606 railway accidents in 2022, while 357 people were killed, 357 were injured, and 743 were still missing as a result of 262 canal accidents (McGetrick et al., 2017).

Regional highways accounted for 52.02 percent of accidents, followed by national highways with 27.7 percent and feeder roads with 11.88 percent. 5.67 percent of all accidents occurred in the city of Dhaka, while 1.71 percent occurred in the city of Chattogram. On July 29, 2022, there were 27 car accidents that resulted in 44 deaths and 83 injuries, making it the day with the highest daily death toll due to road accidents that year. Possible causes included reckless driving, high speed, dangerous passing, road design flaws, the use of defective cars, negligent vehicle users and pedestrians, inexperienced drivers, and drug use. The group urged tight enforcement of the 2018 Road Transport Act in order to keep an eye on the state of roadways (Sarker, 2019).

Table 2.7: Highest Last eight years accident in Bangladesh

Year	Accidents	Deaths	Injured
2022	6749	9951	12356
2021	5629	7809	9039
2020	4891	6686	8600
2019	5516	7855	13330
2018	5514	7221	15466
2017	4979	7397	16193
2016	4312	6055	15914
2015	6581	8642	21855

Source: New Age (2018)

2.3.14 Institutional Deficiency

In general, the Bangladeshi institutions associated with the transport sector have a feeble and obsolete structure. Their lack of capacity and lack of resources severely hinders their capacity for good governance, smart policymaking, and effective public management. Strong vested interests and legal restrictions exacerbate the issue. All of these are mirrored in the poor and ineffective administration of the transportation industry.

2.3.15 Lack of Vision

A vision determines the course of development and drives the formation of policy initiatives and strategies to achieve specific goals. Regrettably, Bangladesh lacks a similar vision for transport development. Thus, our development efforts have resulted in a sectorial imbalance that has led to the wasteful use of scarce resources, negative environmental repercussions, the establishment of a system with little emphasis on any regional function, etc (Haque, 2020).

2.4   Countermeasures to way out transportation problems

Raising the Vehicle Registration Number: Most low-income people take the bus, minibus, or auto-tempo to get around. While "many vehicles" may be to blame for Dhaka's transportation woes in general, the poor actually have too few cars to meet their needs. Nonetheless, there is no shortage of cars in the metropolis. However, the owners intentionally create this shortage

so that they can profit from the increased demand for their services and the higher fees they are able to charge as a result. As a result, the number of cars on the road is fast increasing, with about 300 more being added every day. But, more cars should be added to the database (Chowdhury, 2016).

Efforts to Improve Transportation Management: Many governance issues are plaguing Bangladesh's road industry, according to Transparency International. It claims that in order to win over voters, politicians and local elites use their power to direct state-funded road construction projects toward wasteful spending. If landowners have any say in how a road is built, expect delays and higher costs as the route is altered several times. It is widely held that corruption in the procurement and supervision of civil works contributes to the poor quality and excessive expense of these projects (Puppala & Chittoori, 2012).

Improved Public Transportation That Is Also Cleaner and Less Expensive: Access to jobs, marketplaces, and important services like schools and hospitals is crucial in a densely populated and economically impoverished country like Bangladesh, and this is where walking, animal-drawn vehicles, and public transportation come in. Without government subsidies, the private sector can offer enough bus service, but only with strict safety regulations. The poor would bear the brunt of the health care costs associated with unrestricted transportation. If we want to keep transportation services cheap for the working poor, women, the elderly, and the disabled, we need to take a hard look at the conditions under which they are provided. For an agglomeration economy to thrive, urban transportation is essential. Hence, policies should account both factors.

Joint government and corporate sector efforts should be encouraged (PPP): Increase private sector involvement in the supply of transportation infrastructure by creating a dedicated office within the Ministry of Communication.

Provide Bangladesh Railways more leeway in management: It has been determined that a study comparing gradual railway improvement to a radical approach converting meter-gauge lines to broad gauge, heavier axle loads, and other modern technical standards is warranted before granting Bangladesh Railways more managerial autonomy and reorganizing them along lines of business (passengers and freight).

It is time to take a look at the Integrated Multi-Modal Transport Policy, make any required changes, and finally adopt it: The Integrated Multi-Modal Transport Policy and its

component modal policies, developed under previous administrations and in accordance with SAARC's Regional Multi-Modal Transport Study, will be examined, revised as necessary, and subsequently adopted (2007). So, the mode-specific plans and policies will have a larger context within which to function. To effectively plan for public investments in transportation, its implementation will necessitate surveys and studies to update knowledge of travel demand (Rana, 2011).

Having an effective system in place: The proposed road fund is a method for increased transparency and accountability in the management of road budgets, and its activation would offer an adequate mechanism for the maintenance and rehabilitation of road assets.

Lessening the number of transportation-related accidents via improving administration: Bangladesh, like many other countries, has significant annual losses as a result of accidents. The number of traffic accidents and fatalities is rising in tandem with the rise in the usage of motor vehicles, the population in metropolitan areas, and the total number of people who travel on roads. Hence, better transportation governance is essential to cutting down on accidents.

Long journeys can be cut short with smart planning: Reduced intra-vehicle distance, as well as more frequent stops, right-hand turns, and other motion interruptions, all add to the total travel time. Since extending the road is now not an option, reducing the volume of traffic is the only way to increase intravehicular distance. It is imperative that local officials take additional measures to shorten the duration of public transportation trips. Thus we have to shorten long trip time by appropriate management.

2.5   Problems of infrastructure development in Bangladesh

Infrastructure enhancements are required for economic growth. Infrastructure development in Bangladesh has flaws. Bangladesh is a low-lying South Asian nation with numerous of rivers; during the monsoon season, a large portion of the country floods. This contributes to the complexity and expense of modern transportation and communication networks. The Bangladeshi government has limited funds for building and maintaining infrastructure, which complicates the situation. Bangladesh inherited infrastructure and transportation networks from the colonial era. Only recently has the government been able to address the issue and invest in infrastructure, which has slowed the country's economic development (Deng, 2013). In June of 1998, the $1 billion Jamuna Multifunctional Bridge, the twelfth-longest in the world, was

finished. For the first time, the bridge connected eastern and northwestern Bangladesh. This project contributed to the nation's establishment of key infrastructure.

Due to land scarcity and population density, decentralizing infrastructure development projects in Bangladesh is essential for economic progress. The major issue for Bangladesh is decentralizing infrastructure development. As the economy expands, the nation's port infrastructure must also expand. To meet the demand for cost-effective infrastructure, it is necessary to analyze the specifics of megaprojects, including their designs, characteristics, priorities, and social goals. If the roads beneath the flyovers are neglected, attractive flyovers may not benefit our economy. We need additional funds to make infrastructure rehabilitation cost-effective (Saxe & Kasraian, 2020).

Eliminate infrastructure gaps to maximize Bangladesh's gains in the Asia-Pacific region. Bangladesh must improve tax collection to solve infrastructure and energy issues and support medium-term economic development. The tax-to-GDP ratio remains below 10% despite efforts to streamline tax administration and boost compliance. Bangladesh must boost the effectiveness of public expenditures. Bangladesh ranked 28th with an APII of 0.277 in 2015. Due to energy and transport infrastructure deficiencies, Bangladesh needs invest in transport infrastructure to reduce trade costs (New Age, 2018).

Figure 2.3Infrastructural Development Project in Bangladesh

Source: New Age (2018)

By 2030, infrastructure enhancements will bring Bangladesh up to par with other developing Asian nations and increase their gross national product by 6%. Bangladesh has approached

middle-income status for some time. It has gradually diminished national poverty. Bangladesh's infrastructure impedes progress (Laird et al., 2014).

Bangladesh has increased infrastructure spending. From $2 billion in 2011-2012 to $6 billion in 2016-2017. Funding for infrastructure has helped cement and steel expand and create jobs. According to auto re-rolling steel millers, Bangladesh is capable of producing 7.0 million tonnes of steel annually, however in 2017, all mills produced between 5.0 and 5.5 million tonnes. 2016 saw 4.0-4.5 million tonnes. Steel manufacturers asserted that government construction drove economic growth. Like steel, cement has expanded in recent years. The country's annual cement demand is approximately 25 million tonnes, compared to its effective production capacity of 43 million tonnes. Despite excess capacity, numerous firms increased their production in 2017 by six million tonnes (Macchiarulo et al., 2022).

2.6 Literature Gap

Md. R. Ahmed & Karmaker, (2019) analyzed Dhaka, Bangladesh's bus passenger travel patterns and transit performance. In order to gain a better understanding, they assessed travel and halting patterns based on field survey data. There is a considerable correlation between bus arrival, departure patterns, and waiting periods based on time of day and operation direction. Due to the lack of official time scheduling and driver halting behavior, the city's transportation services are inefficient. They examined a variety of planned transit services with predetermined stop requirements to boost transit productivity and fleet utilization.

Haque, (2020) investigate methods for enhancing Bangladesh bus transpiration services. They discovered eight parameters that affect the pleasure of frequent bus riders. Utilizing factor analysis and multiple regression, it was determined that five of the eight identified factors significantly affected passenger satisfaction. They include the level of comfort, the staff's demeanor, the number of bus transfers required to reach the location, supervision, and waiting facilities. The policy ramifications of these findings are examined.

Katz and Rahman (2010) researched transit services in the Bangladesh, notably the congestion on bus systems as a result of a lack of transportation infrastructure in the city and the absence of a suitable transit system that can handle the existing volume. Despite the absence of mass transit (metro service) and a poorly planned bus system, overcrowding reduces safety, performance, and comfort. They say that the situation can only change with an upgraded traffic management on roads and the installation of a planned rail or BRT mass transit system.

The South Asian cities of Bangalore, Dhaka, and Colombo were the focus of Gao et al., (2021) research on urban transportation scenarios. Due to growing urbanization, the expansion of motorization in these cities is accelerating, which places enormous strain on the transportation system and increases energy consumption, emissions, pollution, and road space demand. Despite this study focuses mostly on energy emissions and fuel economy, it finishes by emphasizing the possibilities of public transportation as a remedy. Bus-dominated transit services and well-maintained transport networks should be the objective in these cities in order to reduce traffic congestion and pollution.

According to Sinha et al. (2017), there is no perfect transportation system. Consequently, the second-best solution involves establishing trade-offs between the transport dimension (adequate balance between modes and means of transport), the environmental dimension, the economic dimension, and the social dimension in accordance with the socioeconomic and cultural realities of each particular environment.

Due to fundamental political and economic shift in Bangladesh, the transport sector faces a serious difficulty (Puppala & Chittoori, 2012). China's national and local governments are prioritizing public transportation to address transportation issues.

CHAPTER 3: RESEARCH METHODOLOGY

3.1   Introduction

The focus of this chapter is methodological approach on challenges of transportation infrastructure in Bangladesh. People perception on current challenges have been ground into transportation infrastructural development for the quesi-experiment. The findings of this experiment were extraordinary, surpassing those of any previous studies.

3.2   Study Design

The study follows a quasi-experimental method approach with mixed data collection. In order to conduct the study data is collected from the selected study area. The research design to be followed in this study is stated below.

Figure 3.1: Methodological Process
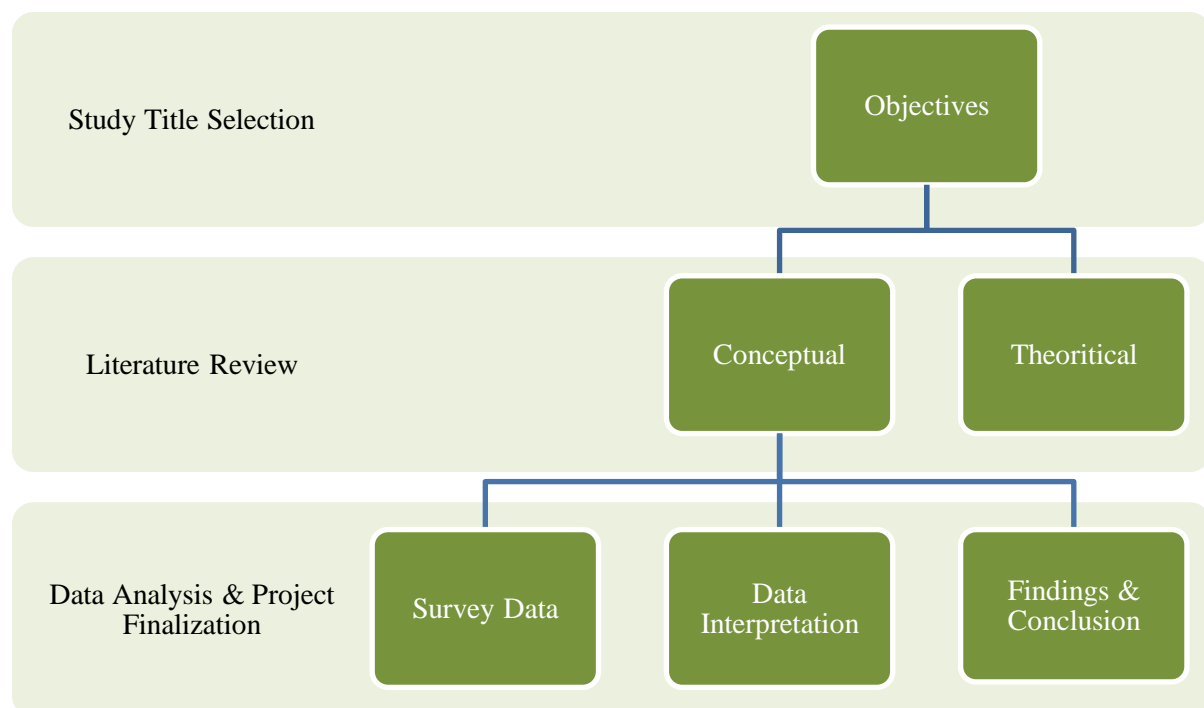
Source: Self-creation

3.3   Identifying Population

Specifically online-based 77 people perception data has been collected though autonomous randomized system.

3.3.1 Sample Approach

Perhaps the most important part of the field survey process is the creation of questions that accurately measure the opinions, experiences and behaviors of the public. Accurate random sampling and high response rate has wasted if the information gathered is built on a shaky foundation of ambiguous or biased questions. I have randomly defined 77 samples size from population-based calculation. The data has started July 2022 and to be completed on December 2022. Creating good measures involves both writing good questions and organizing them to form the questionnaire and data collection.

3.4   Data Collection Method

Primary Data: Primary data is collected from surveying the target population with appropriate questionnaire for the required information to address the stated objectives.

Figure 3.2: Primary Data Collection Source in Study area

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                    │   Methods of    │
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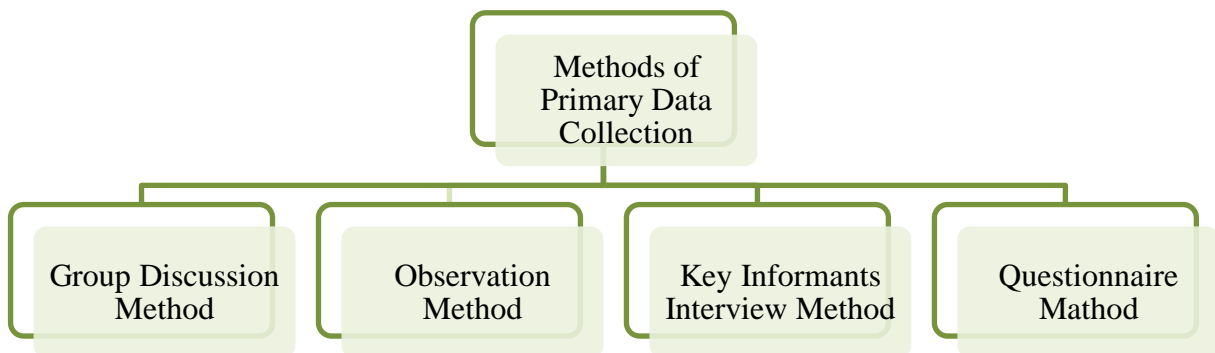
Source: P. Sam Daniel, Aroma G. Sam (2010)

Secondary Data: Different books, journal, article, company annual publishing report and websites are mainly used to collect relevant secondary data for this particular study. Different articles of many renowned scholars are also used as a source of secondary data source.

Figure 3.3: Secondary Data Collection Source in Study area

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                 │ Methods of Secondary Data │
                 │      Collection       │
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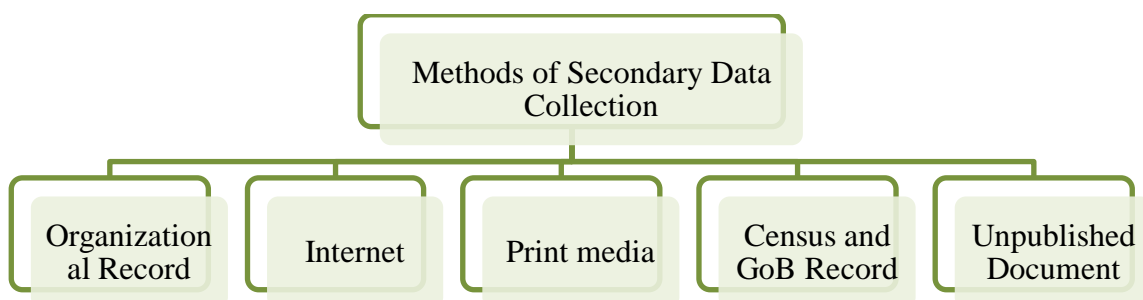
P. Sam Daniel, Aroma G. Sam (2010)

3.4.1 Questionnaire Setup

The questionnaire for the transportation infrastructure-knowing respondent is finds out the views of them about the vehicle, transport problem, transport related impact assessment of Bangladesh. There are questions in the questionnaire that asked the respondents to illustrate and spelt out most accurately to express their opinion why the lack of transportation infrastructure. The questionnaire is attached in Appendix-I.

3.4.2 Online Survey and Interview

Due to the time and other constraints I use online survey to collect information from my targeted respondents who are related with the HSC level student. First of all I decide to conduct online survey in addition with the direct interview by Google Form (https://docs.google.com/forms/d/1KMsSr6QVN-psdrNbIv9Gx8f99_XzTTVRRgqUdO8S-Ck/edit?usp=sharing). Then lists of questions are created for the respondents of my study. After creating the questions, I invite my targeted participants to participate in the survey very easily with their laptop or smart mobile phone. We can collect my expected response from the limited participators during COVID-19 pandemic and 77 responses are gathered in the excel tools automatically.

3.5   3.5 Data Analysis plan

In order to create a systematic procedure for collecting data from respondents, it is necessary to use a data collection instrument. A questionnaire, which provides a script for presenting a regular set of questions and response alternatives, is the instrument of choice for the vast majority of social and behavioral surveys. The survey's questions can be tailored to achieve a variety of research aims, and personal data can be collected to influence sample sizes.

3.5.1 Data Analysis Technique

Descriptive Statistics: Descriptive statistics is the term given to the analysis of data that helps to describe, show or summarize data in a meaningful way. Descriptive statistics do not, however, allow us to make conclusions beyond the data we have analyzed or reach conclusions regarding any hypotheses we might have made. This is simply a way to describe our data. Descriptive statistics are very important because if we simply presented our raw data it would be hard to visualize what the data is showing, especially if there is a lot of it. Descriptive

statistics therefore enables us to present the data in a more meaningful way, which allows simpler interpretation of the data.

3.5.2 Data Analysis Tools

This study is analyzed using the statistical software for social science (SPSS) and Microsoft Excel 2007 to display data results graphically. Excel is used to determine the percentage of respondents who selected a particular option in a questionnaire question. Respondent data are initially entered into an Excel spreadsheet. Online survey data are automatically entered into an Excel spreadsheet, while face-to-face study survey data are entered manually. Using an Excel spreadsheet, a graphical presentation is created that depicts the various responses from respondents. So that anyone can comprehend the views of the respondents regarding the development of Bangladesh's transportation infrastructure.

3.6 Methodology Limitation

Although I tried my best to develop the methodology accurately and precisely, there may be some limitations. They are:

Formulation of research aims and objectives: I might have formulated research aims and objectives too broadly. The research aims and objectives could be narrowed so that the level of focus of the study could be increased.

Implementation of data collection method: Because I do not have an extensive experience in primary data collection, there is a great chance that the nature of implementation of data collection method is flawed.

Sample size: Sample size depends on the nature of the research problem. If sample size is too small, statistical tests would not be able to identify significant relationships within data set. I can state that basing my study in larger sample size could have generated more accurate results. The importance of sample size is greater in quantitative studies compared to qualitative studies.

CHAPTER 4: RESULTS AND DISCUSSION

4.1   Introduction

The findings indicate that Bangladesh's transportation infrastructure development authorities must continually fight with insufficient resources to accommodate the ever-increasing traffic demand. This chapter examined the trend of urban residents in developing nations to utilize transportation infrastructure. Due to this tremendous increase in the number of vehicles in Bangladesh, the country has become unmanageable. The principal causes of traffic congestion are unplanned infrastructure and clogged roads, restricted resources, a lack of knowledge, a limited application of technology, and inadequate public transportation services. All data analyzed by Statistical package for social sciences (SPSS) version 26.1. Thus, a lot of actions are required to minimize traffic congestion and make the Dhaka metropolitan transportation system sustainable. Yet, it is essential to keep in mind that Bangladesh is a developing nation facing a number of other issues concurrently.

4.2   Sex distribution of respondent

Table 4.1: Sex distribution of respondent

Categories	Percent	Cum. Percent
Male	81.82	81.82
Female	18.18	100.00
Total	100	

Table 4.1 indicate that male are 81.82% and female 18.18% found that survey respectively.

Figure 4.1: Sex distribution of respondent
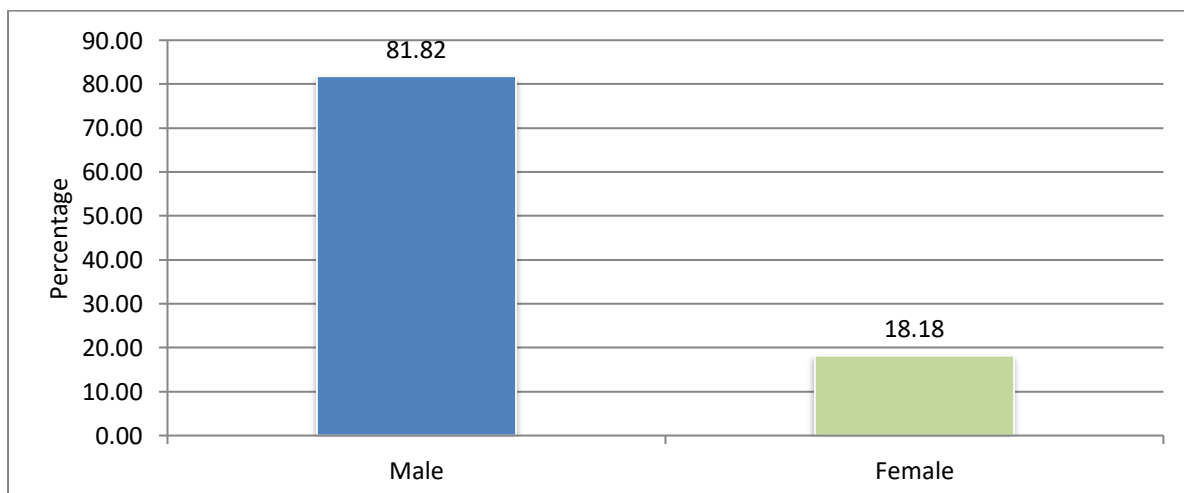
4.3 Age of respondent

Table 4.2: Age distribution

Categories	Percent	Cum. Percent
18-30 ages	35.06	35.06
31-40 ages	45.45	80.52
41-50 ages	15.58	96.10
51-60+ ages	3.90	100.00
Total	100	

Table 4.2 indicate that survey data 18-30 ages of 35.06% are 31-40 ages of 45.45%, 41-50 ages of 15.58% and 51-50+ ages respondent 3.90% old in found respectively.

Figure 4.2: Age distribution
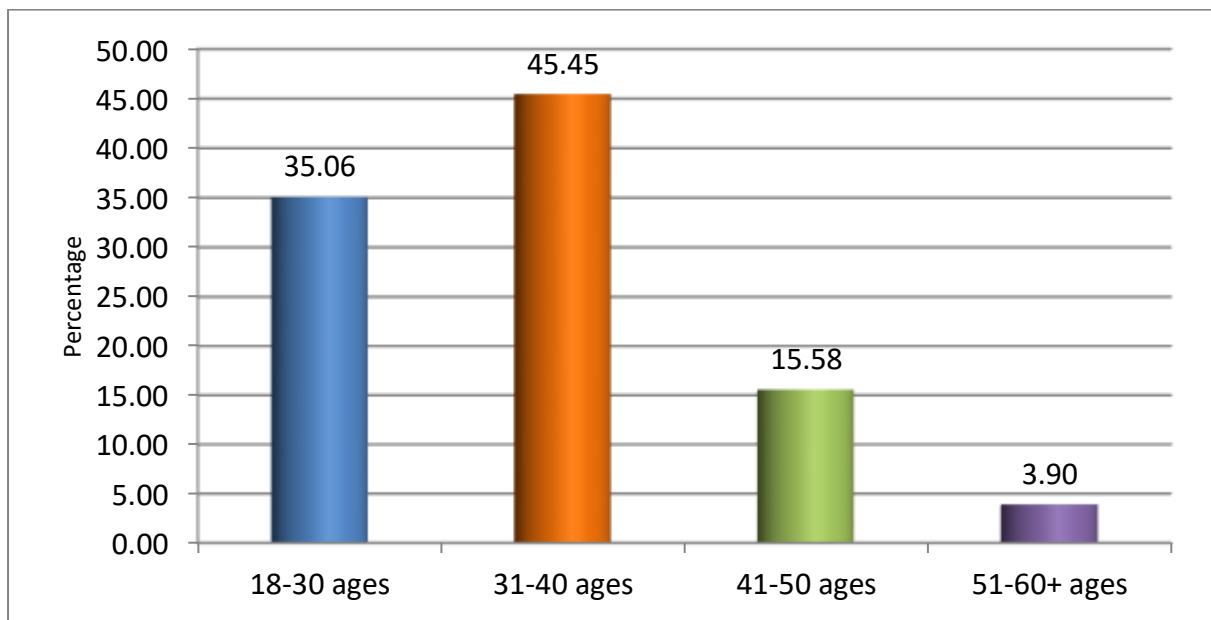
4.4   Educational qualification of respondent

Table 4.3: Respondent wise educational qualification

Categories	Percent	Cum. Percent
No formal education	2.60	2.60
Primary pass	16.88	19.48
SSC pass	5.19	24.68
HSC pass	28.57	53.25
Bachelor	41.56	94.81
Post Graduation & above	5.19	100.00
Total	100	

Table 4.3 reveal that survey data 2.60% respondent no have formal education, 16.88% respondent are only palmary pass, secondary level education completed 5.19%, higher secondary education level completed 28.5%, bachelor degree obtained 41.56% and post graduation above degree completed 5.19 % are 31-40 ages of 45.45%, 41-50 ages of 15.58% and 51-50+ ages respondent 3.90% old in found respectively.

Figure 4.3: Distribution of educational qualification
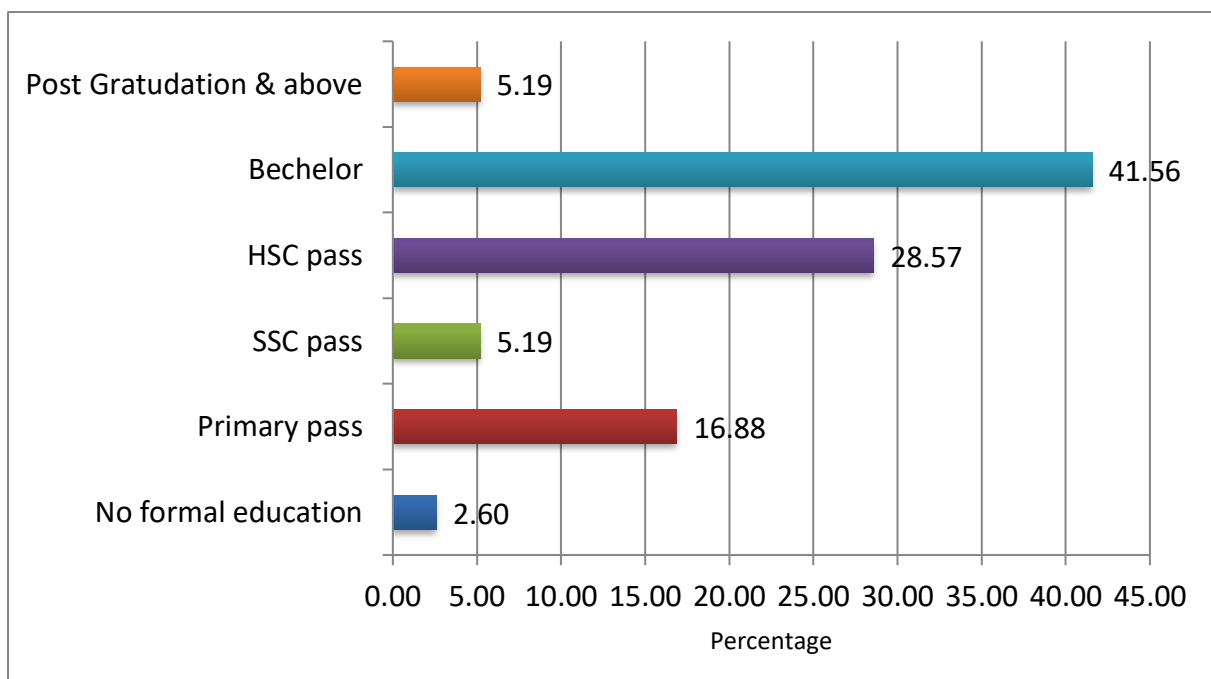
4.5 Monsoon season flooding of roads

Table 4.4: Monsoon season flooding of roads

Categories	Percent	Cum. Percent
Very Large Influence	18.18	18.18
Large Influence	32.47	50.65
Moderate Influence	19.48	70.13
Low Influence	19.48	89.61
No Influence	10.39	100.00
Total	100	

Table 4.4 reveal that 18.18% respondent think are very large influence, 32.47% respondent are 32.47%, moderate influence and low influence are 19.48% and no influence are 10.39% for monsoon season flooding of roads in survey result found respectively.

Figure 4.4: Monsoon season flooding of roads
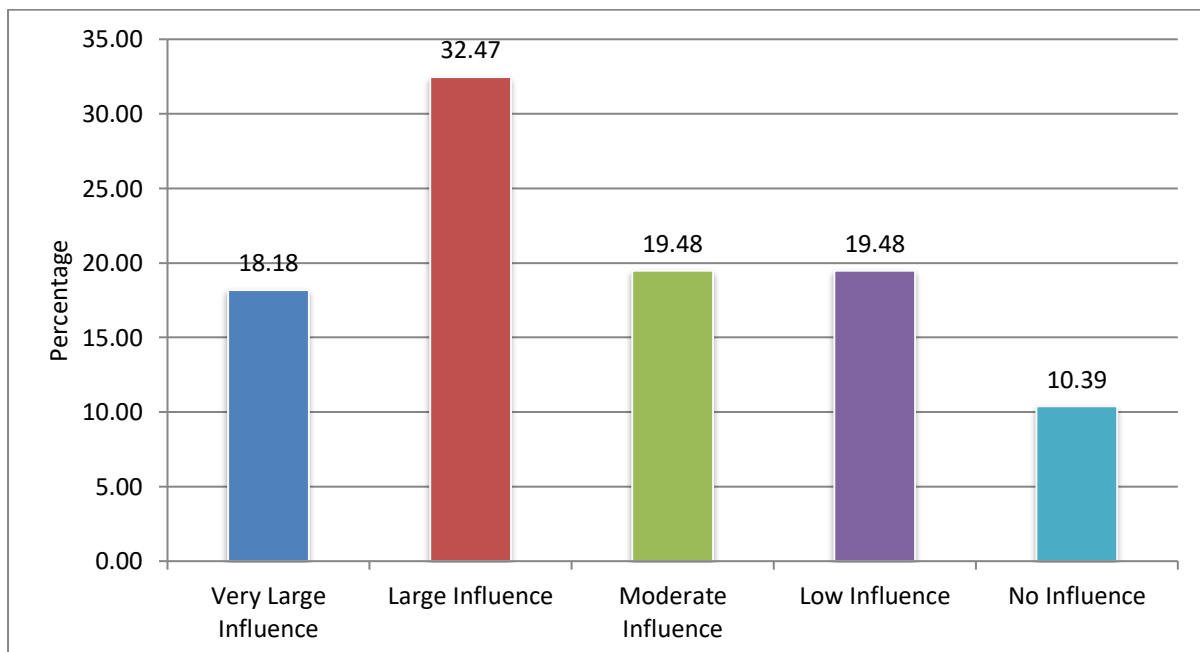
4.6   Land scarcity for acquisition of road construction

Table 4.5: Land scarcity for acquisition of road construction

Categories	Percent	Cum. Percent
Very Large Influence	24.68	24.68
Large Influence	18.18	42.86
Moderate Influence	28.57	71.43
Low Influence	18.18	89.61
No Influence	10.39	100.00
Total	100	

Table 4.5 reveal that 24.68% respondent think are very large influence, 28.57% are respondent think moderately, 18.18% are imagine low influence and 19.48% are no influence of land scarcity for acquisition of road construction in survey result found respectively.

Figure 4.5: Land scarcity for acquisition of road construction
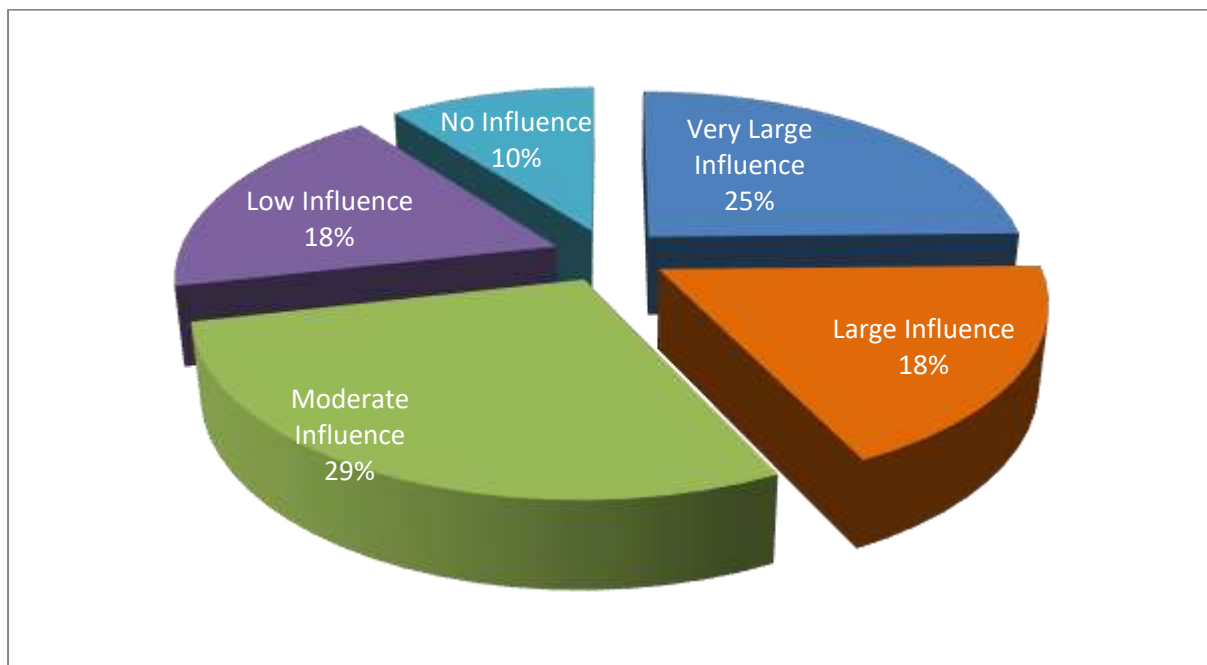
4.7 Geographical difficulty of road network expansion due to rivers and water bodies

Table 4.6: Geographical difficulty of road network expansion due to rivers and water bodies

Categories	Percent	Cum. Percent
Very Large Influence	20.78	20.78
Large Influence	35.06	55.84
Moderate Influence	20.78	76.62
Low Influence	10.39	87.01
No Influence	12.99	100.00
Total	100	

Table 4.6 exposed that very Large Influence are 20.78%, large influence are 35.06%, moderate influence are 20.78%, low influence are 10.39 and 12.99% are no influence found on geographical difficulty of road network expansion due to rivers and water bodies in survey respectively.

Figure 4.6: Geographical difficulty of road network expansion due to rivers and water bodies
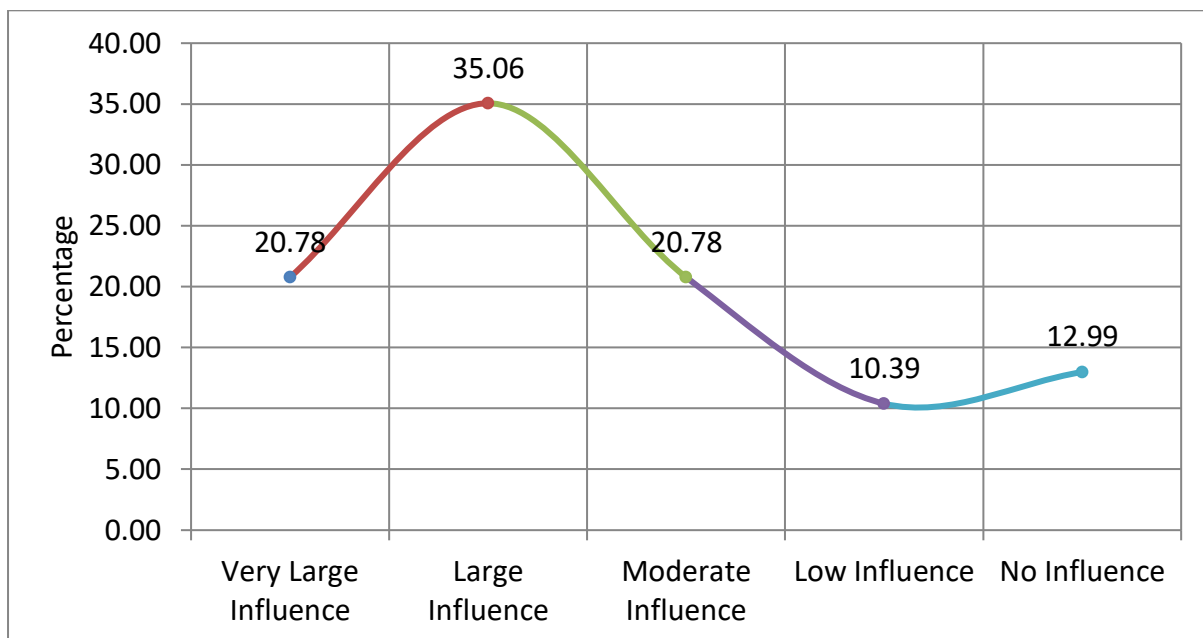
4.8   Lack of adequate budget and fund for road construction

Table 4.7: Lack of adequate budget and fund for road construction

Categories	Percent	Cum. Percent
Very Large Influence	31.17	31.17
Large Influence	22.08	53.25
Moderate Influence	19.48	72.73
Low Influence	18.18	90.91
No Influence	9.09	100.00
Total	100	

Table 4.7 presented that very Large Influence are 31.17%, large influence are 22.08%, moderate influence are 19.48%, low influence are 18.18% and 9.09% are no influence found adequate budget and fund for road construction in survey respectively.

Figure 4.7: Lack of adequate budget and fund for road construction
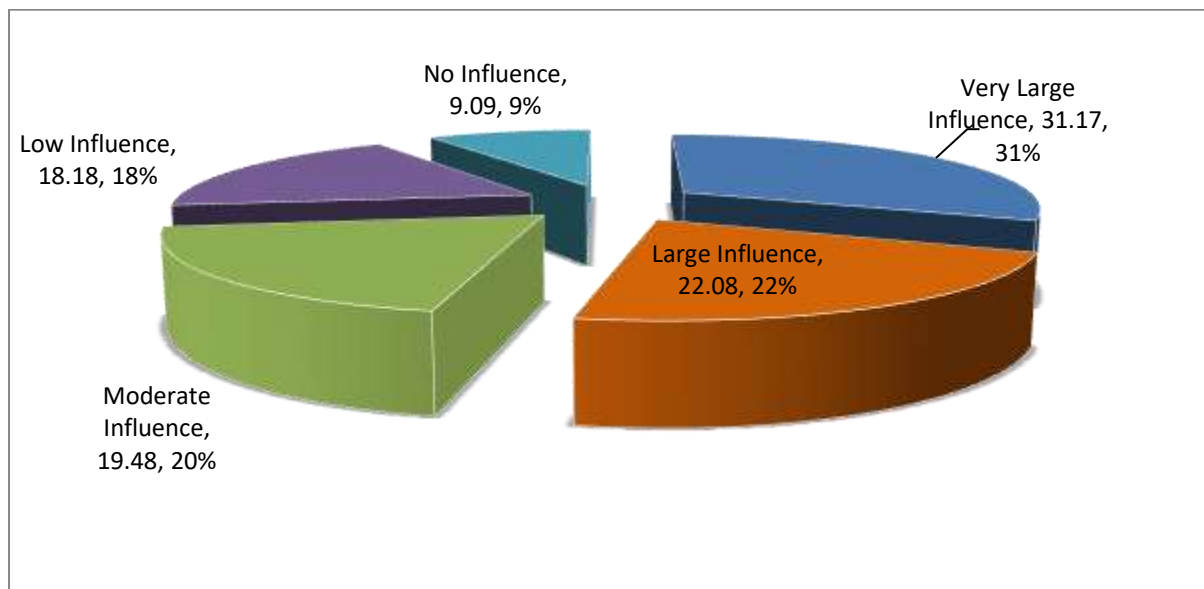
4.9   Effective allocation of funds for road infrastructure

Table 4.8: Effective allocation of funds for road infrastructure

Categories	Percent	Cum. Percent
Very Large Influence	20.78	20.78
Large Influence	32.47	53.25
Moderate Influence	19.48	72.73
Low Influence	18.18	90.91
No Influence	9.09	100.00
Total	100	

Table 4.8 reveals that very large influence are 20.78%, large influence are 32.47%, moderate influence are 19.48%, low influence are 18.18% and 9.09% are no influence of effective allocation of funds for road infrastructure in survey respectively.

Figure 4.8: Effective allocation of funds for road infrastructure
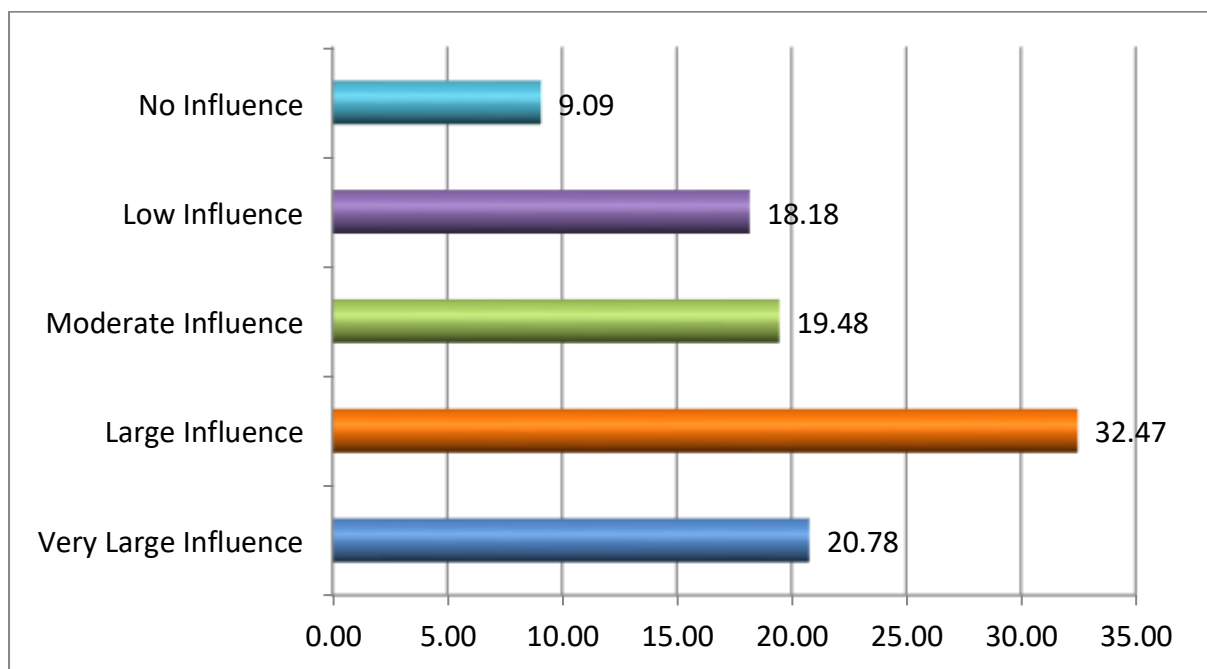
4.10 High cost of building road infrastructure

Table 4.9: High cost of building road infrastructure

Categories	Percent	Cum. Percent
Very Large Influence	28.57	28.57
Large Influence	31.17	59.74
Moderate Influence	18.18	77.92
Low Influence	16.88	94.81
No Influence	5.19	100.00
Total	100	

Table 4.9 presented that very large influence are 28.57%, large influence are 31.17%, moderate influence are 18.18%, low influence are 16.88% and 5.19% are no influence on high cost of building road infrastructure in survey respectively.

Figure 4.9: High cost of building road infrastructure
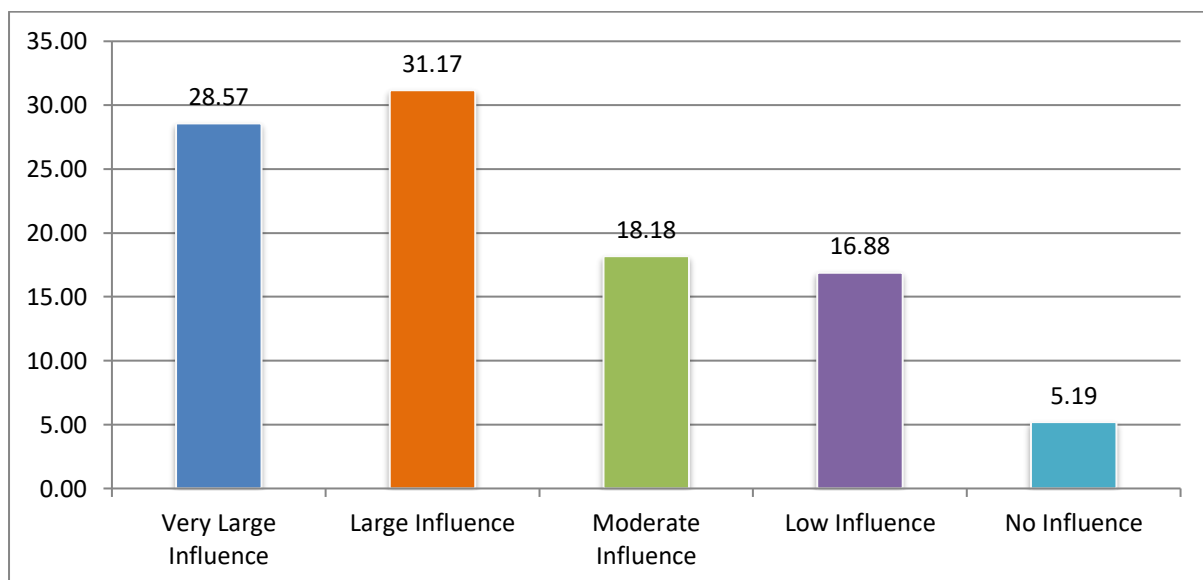
4.11 Traffic congestion in highways

Table 4.10: Traffic congestion in highways

Categories	Percent	Cum. Percent
Very Large Influence	32.47	32.47
Large Influence	19.48	51.95
Moderate Influence	24.68	76.62
Low Influence	16.88	93.51
No Influence	6.49	100.00
Total	100	

Table 4.10 presented that very large influence are 28.57%, large influence are 31.17%, moderate influence are 18.18%, low influence are 16.88% and 5.19% are no influence on high cost of building road infrastructure in survey respectively.

Figure 4.10: Traffic congestion in highways
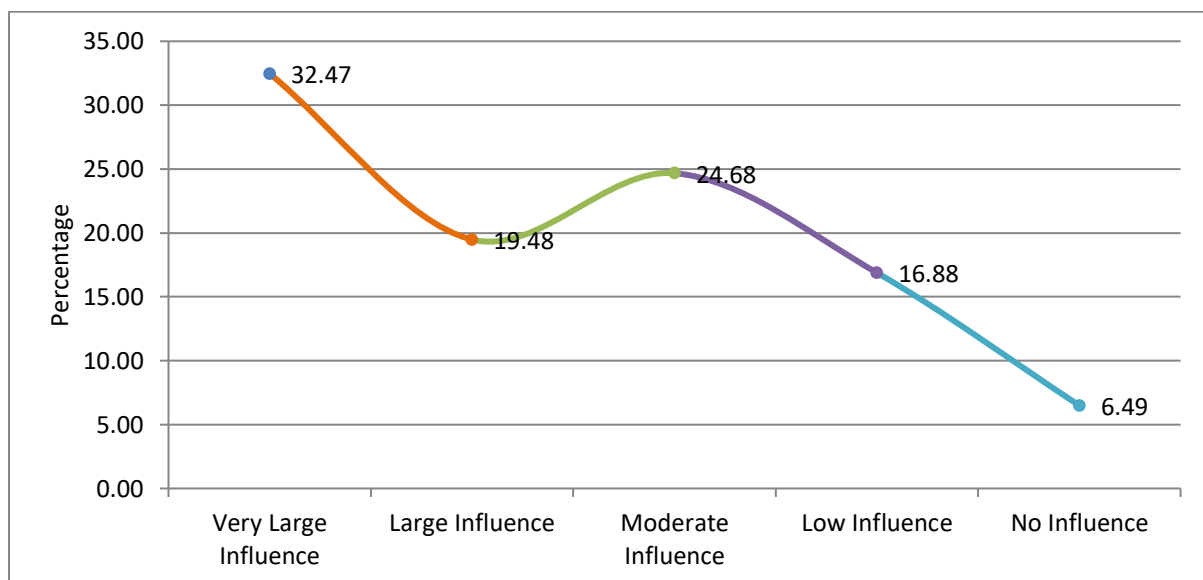
4.12 Level of safety of the highway in present situation

Table 4.11: Level of safety of the highway in present situation

Categories	Percent	Cum. Percent
Very Large Influence	11.69	11.69
Large Influence	2.60	14.29
Moderate Influence	14.29	28.57
Low Influence	37.66	66.23
No Influence	33.77	100.00
Total	100	

Table 4.11 presented that very large influence are 11.69%, large influence are 2.60%, moderate influence are 14.29%, low influence are 37.66% and 33.77% are no influence on safety of the highway in present situation in survey respectively.

Figure 4.11: Level of safety of the highway in present situation
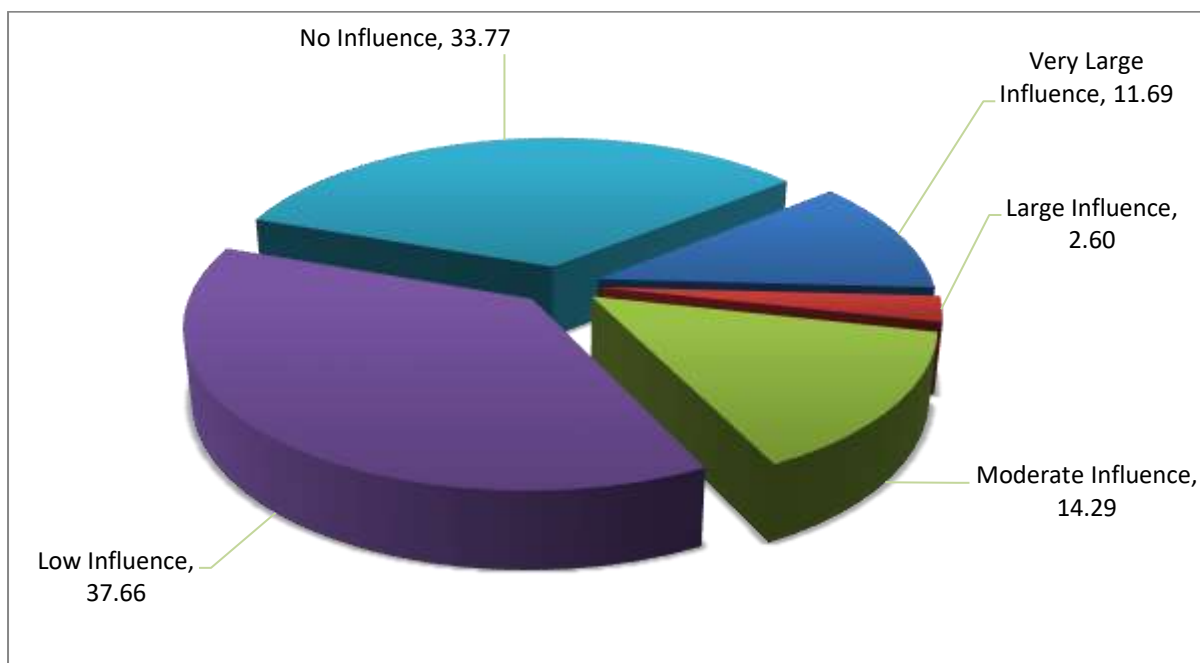
4.13 Construction of highways aided by technological advancements

Table 4.12: Construction of highways aided by technological advancements

Categories	Percent	Cum. Percent
Excellent	3.90	3.90
Good	11.69	15.58
Poor	58.44	74.03
Bad	25.97	100.00
Total	100	

Table 4.12 presented that very large influence are 3.90%, large influence are 11.69%, moderate influence are 58.44%, low influence are 58.44% and 25.97% are no influence on construction of highways aided by technological advancements in survey respectively.

Figure 4.12: Construction of highways aided by technological advancements
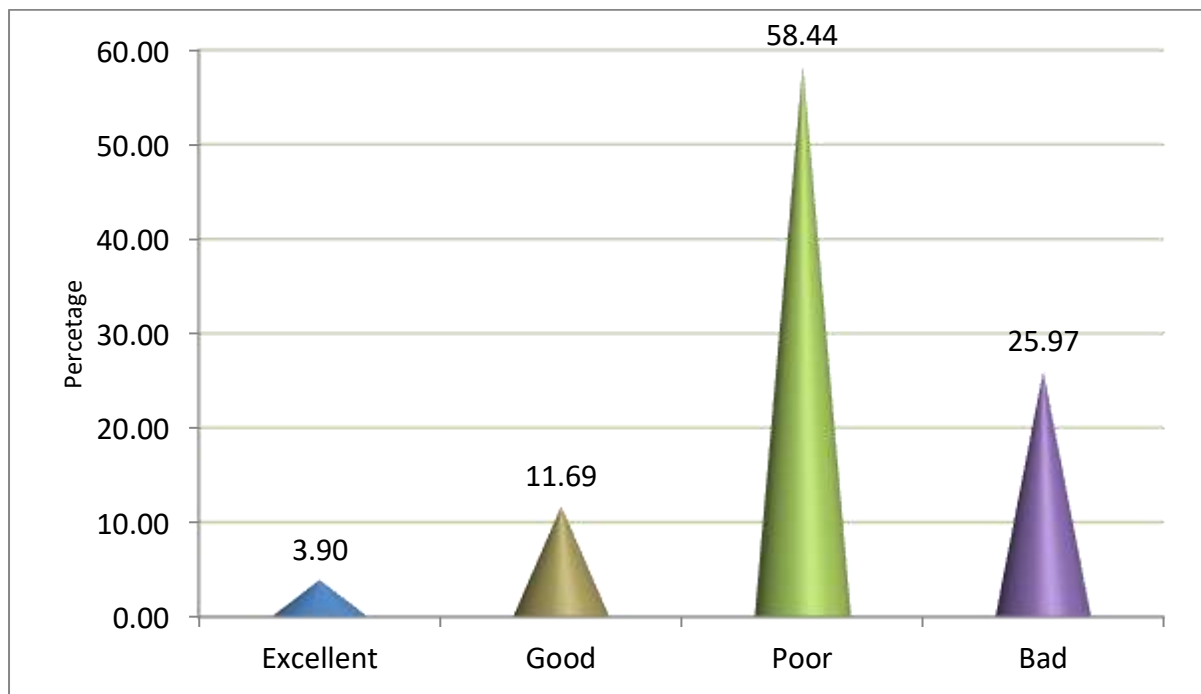
4.14 Impact on development of transpiration system on existing highway

Table 4.13: Impact on development of transpiration system on existing highway

Categories	Percent	Cum. Percent
Very Large Influence	16.88	16.88
Large Influence	35.06	51.95
Moderate Influence	18.18	70.13
Low Influence	23.38	93.51
No Influence	6.49	100.00
Total	100	

Table 4.13 reveal that very large influence are 16.88%, large influence are 35.06%, moderate influence are 18.18%, low influence are 23.38% and 6.49% are no influence on development of transpiration system on existing highway in survey respectively.

Figure 4.13: Impact on development of transpiration system on existing highway
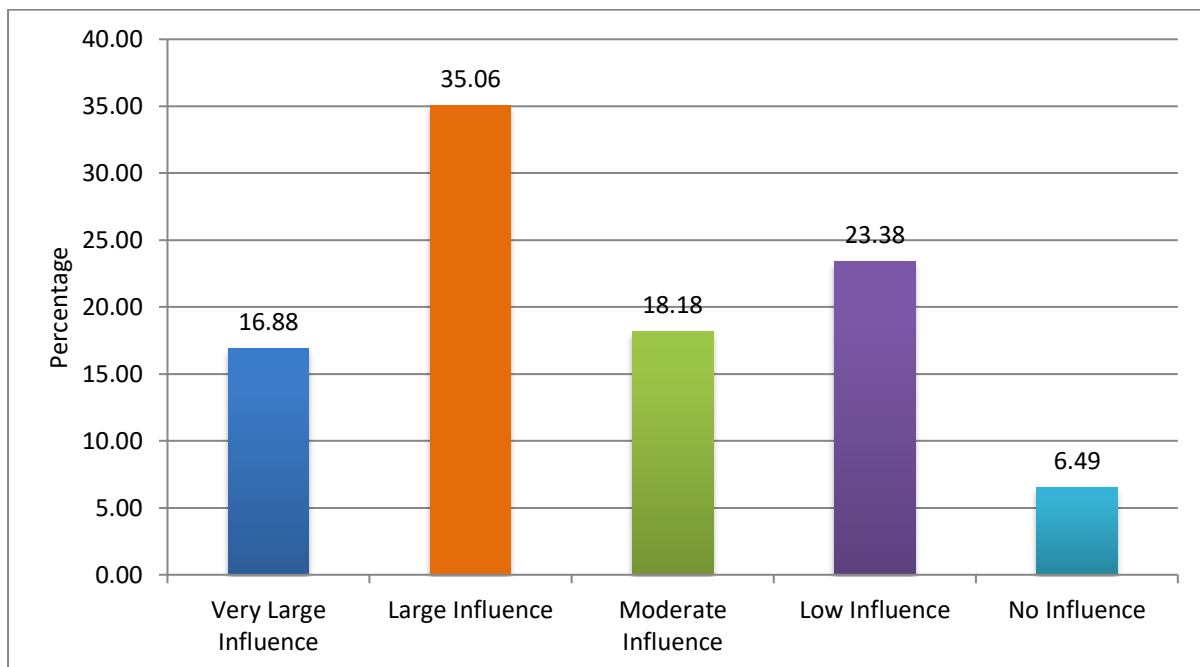
4.15   Traffic congestion problem in the Dhaka city

Table 4.14: Traffic congestion problem in the Dhaka city

Categories	Percent	Cum. Percent
Very Large Influence	38.96	38.96
Large Influence	27.27	66.23
Moderate Influence	14.29	80.52
Low Influence	14.29	94.81
No Influence	5.19	100.00
Total	100	

Table 4.14 reveal that very large influence are 38.96%, large influence are 27.27%, moderate influence and low influence are 14.29%, finally 5.19% are no influence on traffic congestion problem in the Dhaka city in survey respectively.

Figure 4.14: Traffic congestion problem in the Dhaka city
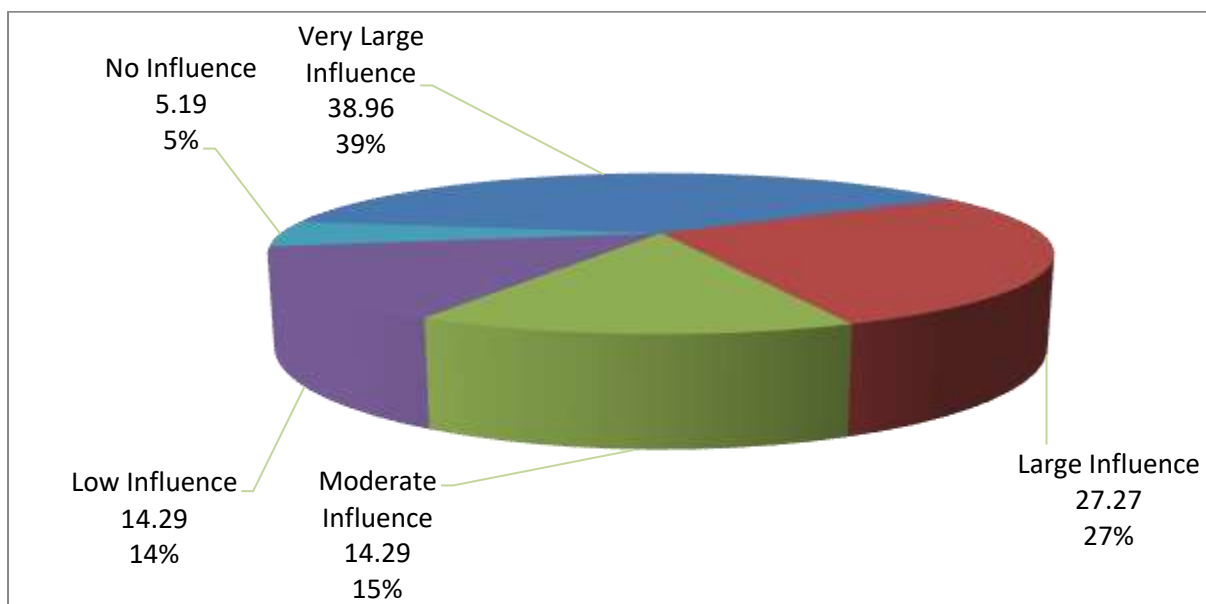
4.16 Utilities have a significant influence on the construction efforts of urban area

Table 4.15: Utilities have a significant influence on the construction efforts of urban area

Categories	Percent	Cum. Percent
Very Large Influence	11.69	11.69
Large Influence	12.99	24.68
Moderate Influence	18.18	42.86
Low Influence	38.96	81.82
No Influence	18.18	100.00
Total	100	

Table 4.15 reveal that very large influence are 11.69%, large influence are 12.99%, moderate influence are 18.18%, low influence are 38.96% and 18.18% are no influence on utilities have a significant influence on the construction efforts of urban area in survey respectively.

Figure 4.15: Utilities have a significant influence on the construction efforts of urban area
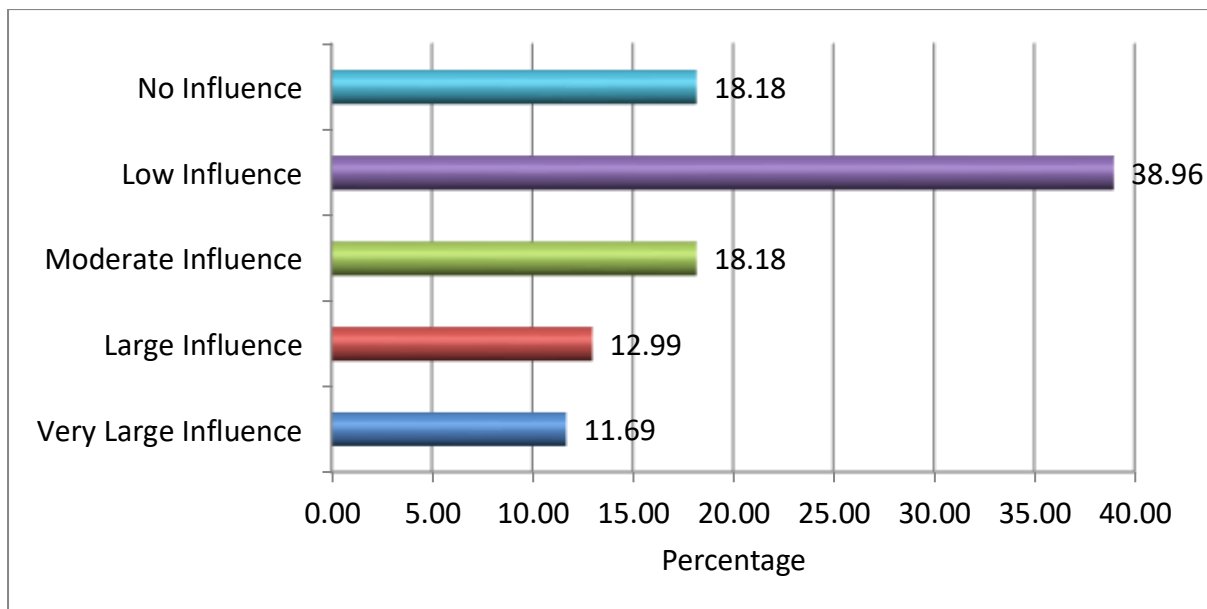
4.17 Other modes (pedestrian, transport, bicycle) current congested in urban development project

Table 4.16: Other modes of current congested in urban development project

Categories	Percent	Cum. Percent
Very Large Influence	36.36	36.36
Large Influence	27.27	63.64
Moderate Influence	14.29	77.92
Low Influence	10.39	88.31
No Influence	11.69	100.00
Total	100	

Table 4.16 reveal that very large influence are 36.36%, large influence are 27.27%, moderate influence are 14.29%, low influence are 10.39% and 11.69% are no influence on Other modes of current congested in survey respectively.

Figure 4.16: Other modes of current congested in urban development project
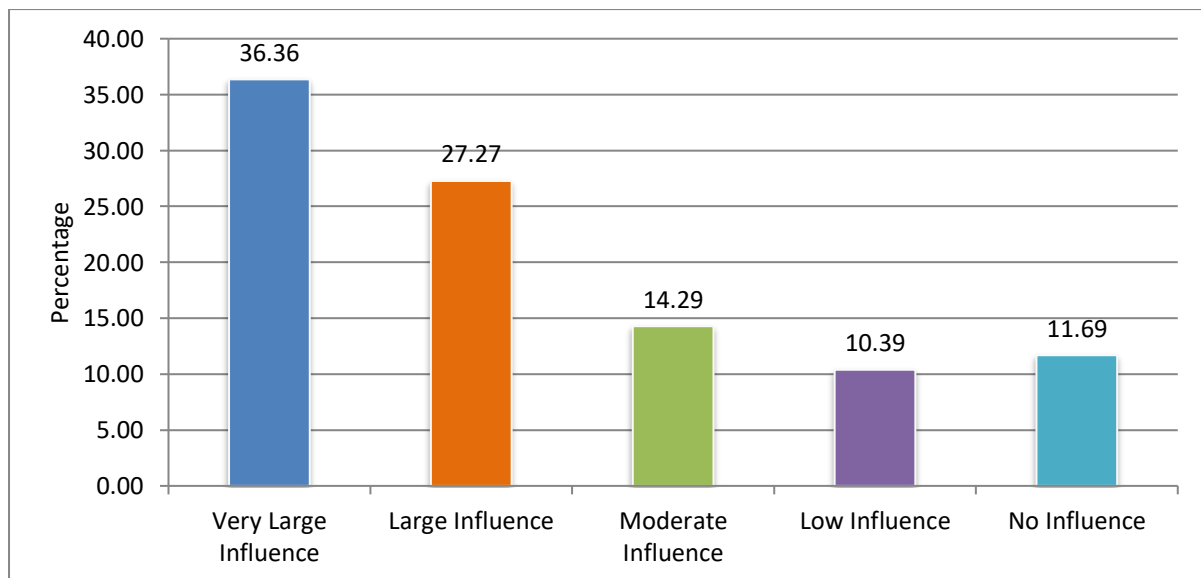
4.18 Alternative options can reduce traffic and congestion during construction

Table 4.17: Alternative options can reduce traffic and congestion during construction

Categories	Percent	Cum. Percent
Very Large Influence	5.19	5.19
Large Influence	2.60	7.79
Moderate Influence	9.09	16.88
Low Influence	57.14	74.03
No Influence	25.97	100.00
Total	100	

Table 4.16 reveal that very large influence are 5.19%, large influence are 2.60%, moderate influence are 9.09%, low influence are 57.14% and 25.97% are no influence on alternative options can reduce traffic and congestion during construction in survey respectively.

Figure 4.17: Alternative options can reduce traffic and congestion during construction
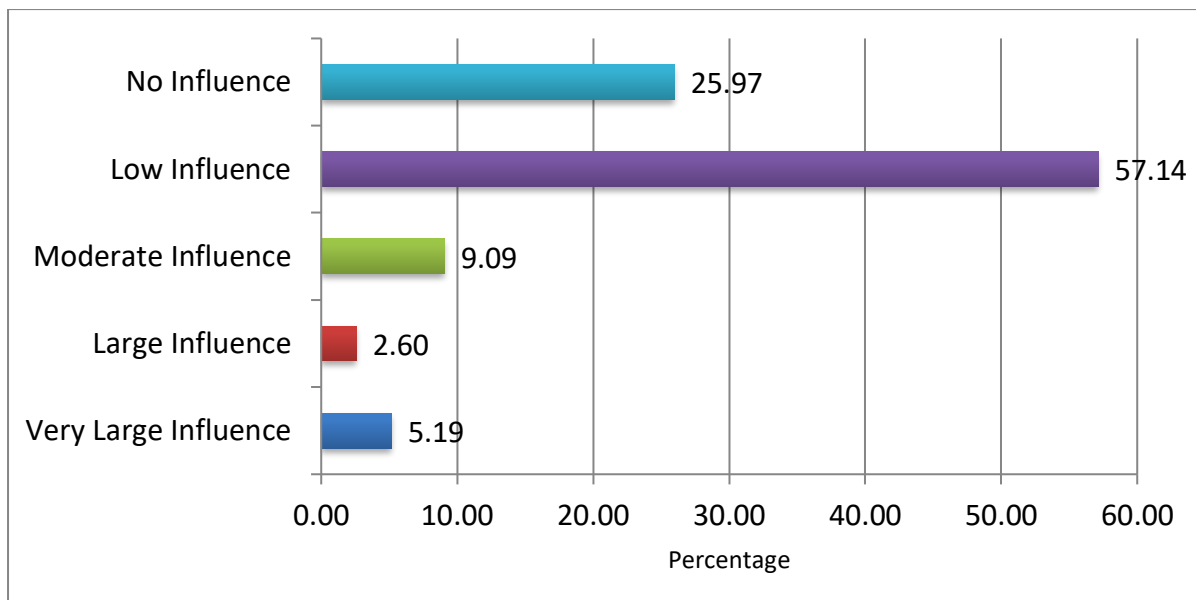
4.19 Discussion and Findings

1. **Development and Impact:** Urban land use planning and policy, integrated and coordinated transport network development, and environmental protection are only discussed in seminars and research papers, but few practical steps have been taken to provide integrated and efficient transportation facilities, protect ecologically vulnerable areas, and manage mega city growth. As a result, the city is expanding uncontrollably

as a result of haphazard land development, causing damage to natural flood plains, depression zones for storm water drainage routes, and even the river. Inequality in land use mirrors social inequality. When a large number of city residents stay in multistory slums and shantytowns, the severity of these problems is compounded.

2. **Management:** Despite the fact that numerous planning documents have been created to govern and control growth, the implementation and execution of the suggested restrictions are unimpressive. Government inactivity has resulted in the uncontrollable conversion of wetlands into cities. Another difficulty is that the system fails if a city grows without a plan. Political participation occurs everywhere, but here it is motivated by profit. This is undesirable, but true and irreversible for the entire city.

3. **Edges:** Without planning or regulations, private companies are expanding in the majority of peripheral regions. State sector provided infrastructure and services, while private sector prevailed.

4. **Development Road Network:** The road network of Bangladesh evolved over time due to a range of activities and inactions. Unfortunately, the army government developed a significant portion of the city's main roadways and road infrastructure by executive order as a piecemeal solution, without a long-term plan. Even highways constructed by executive order are badly maintained. So, the city's development and transit network went awry, and the city has reached a stage where correction is practically impossible.

5. **Very Developable Land:** Based on the historical satellite image, general observation, and master plan, this topography was not ideal for a capital city, particularly in light of the current circumstances.

6. **Location and Impact:** Since the majority of the region is below the natural water level, preplanning and managing urbanization is impracticable, leading to unplanned, ad hoc growth with small, zigzag road networks on donated land and disparate city sizes. In addition, the rainwater cannot discharge smoothly to the lakes, khals, retention areas, and surrounding rivers, and the accumulated runoff remains stagnant in low-lying areas within the city, causing serious flooding and a severe water logging problem that disrupts traffic movement, normal life, road infrastructure, structures, huge water pollution, an increase in water-borne diseases, a breeding ground for mosquitoes, and damage to crops.

7. **Strategy and Results:** Deficient development pattern causes unplanned and haphazard road network, uncontrolled changes of land use pattern with different time, conversion of planned residential area, death of Bangladesh urban posh spots, indiscriminate and unexpected road side garments industries, loses of wet land of the city, losses of open space, greeneries in city areas, disturbance of ecology and biodiversity, disappearance of natural drainage system, encroachment of dr. These catastrophes make the city's living and working environment unsuitable and degrade transport, causing random traffic.

8. **Access:** Direct access to different road classes is unregulated in metropolitan areas. Direct access roads often connect buildings/abating properties to the main road, especially the main arterial route. After independence, most multi-storey buildings violate setback requirements. Several buildings protrude over the streets and are erected right up to the wayside. Although without frontage, many multi-stored commercial buildings provide enough setback for strolling, parking, etc.

9. **Roadside:** City development is mostly roadside. Since there is no regulation to control road access, most plots adjacent the road were developed without considering access facilities for rear side properties, and a huge number of multi-stored buildings, markets, and shopping centers have been built near the roadside without considering the road's functionality. Every bustling street in the capital metropolis of over 10 million people has a comparable problem. These multistory shopping malls are turning the city into a market.

10. **Crossroads:** The road network's most complicated junction corner point is created without turning space or grade separated facility growth. Even if many roads are ended or changed direction for the building of multistored build ahead of its alignment, the junction's capacity is lowered and future improvement possibilities are forever constrained.

11. **Crossings:** Unacceptable railway level crossings in Dhaka disrupt train passage on both sides of rail gates for four hours a day. Closed rail gates suspend traffic movement, adding to the mayhem.

12. **Movement Alternative:** Road bias has developed due to city topography, technical advantage, network growth trend, foreign help, etc. Road-based network systems have crippled rail and water transportation systems.

13. **City Sustainability:** With so much trash, a city couldn't function. The flow of the city is obstructed on every side of different land areas in different parts and becoming blue/pale face as a part of a human body whose blood circulation has been blocked and sensitivity has been lost and once damaged the entire body. Hence, the city is becoming an anemic patient who will die. Hence, the only solution is city abandonment.

14. **Road Alignment:** Besides this huge road network scarcity, the existing roads are not properly functioned due to enormous alignment weakness, such as no road network pattern, default road orientation at micro/local level, un-organization and non-integration of road network, no bypass, ring, or functional arterial road, no alternative corridor to connect the other part of the city, no east-west continuous road, huge missing link, staggered & T-junction, no classical.

15. **Schematic:** Primary, secondary, and tertiary roadways are not straight, diagonal, grid, or orthogonal. Primary, secondary, and tertiary roadways are scattered and unconnected. Main roads finish in T-junctions or staggered junctions with tertiary roads, creating a constant bottleneck on the enter city road network.

16. **Network-Oriented:** Due to poor road network direction, planned residential neighborhoods became commercial or mixed sectors. That area's planning included this conversion issue. This area would remain residential forever if its road network was discontinuous instead of continuous grid.

17. **Localities Road:** Local community-donated land has been built haphazardly with a poor road network. These road networks mostly overlay built-in land. The scariest part is that there is no universal solution. Most of these densely built-up areas cannot be renewed.

18. **Connectivity:** To accommodate the city's abrupt shift from provincial town to sovereign nation's capital, major road development has occurred over the past twenty to thirty years. Most transit advancements have been driven by ad hoc factors without

formal demand or future requirements assessments. Hence, the city's road network lacks connectivity.

19. **Main Road:** The city lacks primary and arterial roads. From the overall observation, in-depth examination on geometrical, operational, and functional characteristics, it is almost difficult for the city government to provide a fully functional primary road in the future on the present city regions for city people. The city's main road's service ranges from D to F.

20. **Low-Cost Management:** Transportation System Management (TSM) uses short-term strategies to maximize the efficiency and cost-effectiveness of current transportation assets, services, and modes.

21. **Pumps Station:** In the city, filling stations breach minimum distance from the road, between stations, and traffic obstacle safety standards. Another issue is BPC-RPGCL miscommunication. Several CNG stations in the city were built by filling marsh 12 feet below the road, breaking the rules. Unplanned city development and station placement are hampered by gas delivery. Apart under the major road, provident gas lines have little space due to development. Most stations supplied gas by cutting the main road and drilling under the rails.

22. **Separation:** Potholes are common on highways without regular maintenance. Fast and slow moving vehicles share a carriageway without segmentation.

23. **Footpaths:** Home interview and O-D (origin-destination) surveys show pedestrians are the largest identified group. So, in urban Bangladesh, pedestrians make the most trips. During one-mile journeys, around 65% do this. All age groups and income sectors prefer walking.

CHAPTER 5: RECOMMENDATION AND CONCLUSION

5.1 Recommendation

- Bangladesh's current transportation business is in dire need of a separate and powerful entity that is solely responsible for the transportation system. This single organization, which will be controlled with regulatory authority to carry out all necessary measures for the transit system, will have various stakeholders and responsibilities.

- This study identifies consolidated bus service as a viable solution to the problem of fragmented ownership. The term "ecosystem" refers to a group of people who work in the construction sector.

- Exclusive bus lanes are the answer to meeting the infrastructure requirements of the modern transit business, as determined by stakeholder interviews. According to the literature, a similar situation existed in Bogota, where dedicated bus lanes were built to rearrange the bus transit system and allow it to move more quickly aside from mixed traffic.

- The strategic transport plan for Bangladesh identified all the advantages and disadvantages of the current system and made recommendations appropriately. However, the Strategic Transport Plan (STP) will only be successful if those proposals are implemented in a phased, timely manner. Another significant disadvantage of the transportation business is the lack of a mass transit system, although STP addressed all of these problems as well.

5.2 Conclusion

Understanding the transportation system for examining the difficulties associated with infrastructure development and identifying countermeasures for susceptibility are the most important components of the study. The objectives of an effective transportation system must include fostering economic development, enhancing the quality of the environment, reducing energy consumption, promoting transportation-friendly development patterns, and promoting fair and equitable access and safe mobility to residents of different socioeconomic groups. Existing institutions should identify their tasks and prepare for the new environment. An integrated and comprehensive approach will ensure with all stakeholders. As the city's road network system was not designed or constructed to meet the needs of the present and future, it is difficult to update highways in major cities by realigning or enlarging them. Because a significant section of the roadways now run through highly inhabited areas and a large number of permanent residential and commercial multi-story structures have been developed on both sides of the highways, and because the city is expanding in a decant fashion. For the causes of such decant growth, what we have we are loosing day by day. The majority of cells have already been impacted and have become progressively larger as time passes; eventually, they will die. So, the purpose of all short-term investments to ensure the survival of this species is just to postpone its demise, not to ensure its full recovery.

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Appendix I: Descriptive Statistics

Table: Descriptive Statistics (mean, standard dilation, standard error)

Variable	Mean		Std. Deviation
	Statistic	Std. Error	Statistic
Sex distribution of respondent	1.1818	0.04424	0.38822
Age of respondent	1.8831	0.09239	0.81069
Educational qualification of respondent	4.0519	0.14426	1.26591
Monsoon season flooding of roads	2.7143	0.14422	1.26551
Land scarcity for acquisition of road construction	2.7143	0.14888	1.30643
Geographical difficulty of road network expansion due to rivers and water bodies	2.5974	0.14704	1.29024
Lack of adequate budget and fund for road construction	2.5195	0.15313	1.34370
Effective allocation of funds for road infrastructure	2.6234	0.14324	1.25697
High cost of building road infrastructure	2.3896	0.13854	1.21564
Traffic congestion in highways	2.4545	0.14620	1.28294
Level of safety of the highway in present situation	3.7922	0.14479	1.27049
Construction of highways aided by technological advancements	3.0649	0.08337	0.73157
Impact on development of transpiration system on existing highway	2.6753	0.13640	1.19694
Traffic congestion problem in the Dhaka city	2.1948	0.14205	1.24646
Utilities have a significant influence on the construction efforts of urban area	3.3896	0.14338	1.25819
Other modes (pedestrian, transport, bicycle) current congested in urban development project	2.3377	0.15644	1.37277

Alternative options can reduce traffic and congestion during construction	3.9610	0.11006	0.96575
N =77			

Source: Statistical Package for Social Science (SPSS)

Appendix II: Frequency Distribution

Table: Frequency of Survey Result

Frequency of Survey Result

Sex distribution of respondent

Categories	Frequency	Percent
Male	63	81.82
Female	14	18.18
Total	77	100

Age of respondent

Categories	Frequency	Percent
18-30 ages	27	35.06
31-40 ages	35	45.45
41-50 ages	12	15.58
51-60+ ages	3	3.90
Total	77	100

Educational qualification of respondent

Categories	Frequency	Percent
No formal education	2	2.60
Primary pass	13	16.88
SSC pass	4	5.19
HSC pass	22	28.57
Bachelor	32	41.56
Post Graduation & above	4	5.19
Total	77	100

Monsoon season flooding of roads

Categories	Frequency	Percent
Very Large Influence	14	18.18
Large Influence	25	32.47
Moderate Influence	15	19.48
Low Influence	15	19.48
No Influence	8	10.39
Total	77	100

Land scarcity for acquisition of road construction

Categories	Frequency	Percent
Very Large Influence	19	24.68
Large Influence	14	18.18
Moderate Influence	22	28.57
Low Influence	14	18.18
No Influence	8	10.39
Total	77	100

Geographical difficulty of road network expansion due to rivers and water bodies

Categories	Frequency	Percent
Very Large Influence	16	20.78
Large Influence	27	35.06
Moderate Influence	16	20.78
Low Influence	8	10.39
No Influence	10	12.99
Total	77	100

Lack of adequate budget and fund for road construction

Categories	Frequency	Percent
Very Large Influence	24	31.17

Categories	Frequency	Percent
Large Influence	17	22.08
Moderate Influence	15	19.48
Low Influence	14	18.18
No Influence	7	9.09
Total	77	100

Effective allocation of funds for road infrastructure

Categories	Frequency	Percent
Very Large Influence	16	20.78
Large Influence	25	32.47
Moderate Influence	15	19.48
Low Influence	14	18.18
No Influence	7	9.09
Total	77	100

High cost of building road infrastructure

Categories	Frequency	Percent
Very Large Influence	22	28.57
Large Influence	24	31.17
Moderate Influence	14	18.18
Low Influence	13	16.88
No Influence	4	5.19
Total	77	100

Traffic congestion in highways

Categories	Frequency	Percent
Very Large Influence	25	32.47
Large Influence	15	19.48
Moderate Influence	19	24.68
Low Influence	13	16.88
No Influence	5	6.49
Total	77	100

Level of safety of the highway in present situation

Categories	Frequency	Percent
Very Large Influence	9	11.69
Large Influence	2	2.60
Moderate Influence	11	14.29
Low Influence	29	37.66
No Influence	26	33.77
Total	77	100

Construction of highways aided by technological advancements

Categories	Frequency	Percent
Excellent	3	3.90
Good	9	11.69
Poor	45	58.44
Bad	20	25.97
Total	77	100

Impact on development of transpiration system on existing highway

Categories	Frequency	Percent
Very Large Influence	13	16.88
Large Influence	27	35.06
Moderate Influence	14	18.18
Low Influence	18	23.38
No Influence	5	6.49
Total	77	100

Traffic congestion problem in the Dhaka city

Categories	Frequency	Percent
Very Large Influence	30	38.96
Large Influence	21	27.27

Moderate Influence	11	14.29
Low Influence	11	14.29
No Influence	4	5.19
Total	77	100

Utilities have a significant influence on the construction efforts of urban area

Categories	Frequency	Percent
Very Large Influence	9	11.69
Large Influence	10	12.99
Moderate Influence	14	18.18
Low Influence	30	38.96
No Influence	14	18.18
Total	77	100

Other modes (pedestrian, transport, bicycle) current congested in urban development project

Categories	Frequency	Percent
Very Large Influence	28	36.36
Large Influence	21	27.27
Moderate Influence	11	14.29
Low Influence	8	10.39
No Influence	9	11.69
Total	77	100

Alternative options can reduce traffic and congestion during construction

Categories	Frequency	Percent
Very Large Influence	4	5.19
Large Influence	2	2.60
Moderate Influence	7	9.09
Low Influence	44	57.14
No Influence	20	25.97

Total	77	100

Appendix III: Survey Questionnaire

Challenges of Transportation Infrastructure in Bangladesh

01. Sex distribution?
    (a) Male   (b) Female

02. Age ?
    (a) 18-30   (b) 31-40
    (c) 41-50   (d) 51-60

03. Educational qualification?
    (a) No formal education   (b) Primary pass
    (c) SSC pass   (d) HSC pass
    (e) Bachelor   (f) Post Graduation & above

04. Monsoon season flooding of roads?
    (a) Very Large Influence   (b) Large Influence
    (c) Moderate Influence   (d) Low Influence
    (e) No Influence

05. Land scarcity for acquisition of road construction?
    (a) Very Large Influence   (b) Large Influence
    (c) Moderate Influence   (d) Low Influence
    (e) No Influence

06. Geographical difficulty of road network expansion due to rivers and water bodies ?
    (a) Very Large Influence   (b) Large Influence
    (c) Moderate Influence   (d) Low Influence
    (e) No Influence

07. Lack of adequate budget and fund for road construction ?
    (a) Very Large Influence   (b) Large Influence
    (c) Moderate Influence   (d) Low Influence
    (e) No Influence

08. High cost of building road infrastructure ?
    (a) Very Large Influence   (b) Large Influence
    (c) Moderate Influence   (d) Low Influence
    (e) No Influence

09. Traffic congestion in highways?
    (a) Very Large Influence   (b) Large Influence
    (c) Moderate Influence   (d) Low Influence
    (e) No Influence

10. Level of safety of the highway in present situation ?
    (a) Very Large Influence   (b) Large Influence
    (c) Moderate Influence   (d) Low Influence
    (e) No Influence

11. Construction of highways aided by technological advancements ?
    (a) Excellent   (b) good
    (c) poor   (d) bad

12. Impact on development of transpiration system on existing highway?
    (a) Very Large Influence   (b) Large Influence
    (c) Moderate Influence   (d) Low Influence
    (e) No Influence

13. Traffic congestion problem in the Dhaka city ?
    (a) Very Large Influence   (b) Large Influence
    (c) Moderate Influence   (d) Low Influence
    (e) No Influence

14. Utilities have a significant influence on the construction efforts of urban area ?
    (a) Very Large Influence   (b) Large Influence
    (c) Moderate Influence   (d) Low Influence
    (e) No Influence

15. Other modes (pedestrian, transport, bicycle) current congested in urban development project ?
    (a) Very Large Influence   (b) Large Influence
    (c) Moderate Influence   (d) Low Influence
    (e) No Influence

16. Alternative options can reduce traffic and congestion during construction ?
    (a) Very Large Influence   (b) Large Influence
    (c) Moderate Influence   (d) Low Influence
    (e) No Influence

Appendix IV: Survey Photograph