Proposing a Grade Separation on Dhaka to Bogra Highway to Reduce the Accident Rate and Traffic Congestion

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A thesis submitted to the Department of Civil Engineering in partial fulfillment for the degree of Bachelor of Science in Civil Engineering

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Sonargaon University
147/I, Green Road, Dhaka-1215, Bangladesh
Section: 13B (Aster)
Semester Year: Summer-2021

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DEDICATION

Dedicated

to

“Our parents

&

Respectable Supervisor”

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ABSTRACT

Bangladesh is said to have a very high accident rate with almost 60 deaths per 10,000 every day. Within this rate, a large amount of accident takes place on the road of Dhaka-Bogra highway. The pinpointed reasons of the high rate of accident on this highway are tumor fallen of road side, uneven mounds over road, restlessness of drivers on a long journey. Statistics says, accidents take place on this highway in both night and day time. From the recorded accident data, it has been explored that, maximum of the accident occurs near to the Dhankundi food village, that is located 152 km away from Dhaka Gabtali bus stand. This place is always congested with vehicles, only two lanes' highways and most accident-prone site. The field survey report shows that, almost all vehicles except the local public buses and heavily loaded trucks do make a transit at this food village during the travel. Among the vehicles, almost 20% are local public bus and 40% of those are trucks. As these two categories of vehicle just passes away the Dhankundi food village, and the road has no bus bay to enter and exit the food village for other transiting vehicles, it has been observed that, most of the accident related to food village are caused due to the exit of vehicles from food village with heavily loaded, full speed trucks, either overtaking or head-to-head accident. If a grade separation can be proposed and designed in front of the food village, segregating the trucks and other vehicles that do not transit their travel to this food court, may reduce the possibility of accident in near the Dhankundi food village. This research work focuses on the proposal of grade separation for non-transiting vehicles from the transiting one.

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CHAPTER 1

Introduction

1.1 General

Bangladesh has a very high road accident fatality rate with official figures indicating more than 60 deaths per 10,000 motor vehicles. Everyday around eight persons die in road accidents. The actual rate of fatality is likely to be even higher. The problems related to the accident reporting system and the data derived from it, as reported by Quium1, have not been resolved and official statistics are prone to under reporting. The number of ac-cedants has increased by 67% between 2015 and 2020, while the number of fatalities has increased by around 400% within the same period2. This indicates that not only the occurrence of accidents is on the rise, the severity of accidents is also increasing. As the population, total road length and modal share of road transport continue to grow in the country, the number of casualties from road accidents is expected to maintain its rising trend.

The year 2020 saw 21% fewer accidents and 18% fewer deaths compared to 2019, which can be mostly attributed to the Covid-19 pandemic and the transportation restrictions imposed because of it.

1.2 Accident study (Dhaka to North Bangla)

Locals and transport workers have named this portion of the road the ‘highway tumour’ Both sides of the Dhaka-Bogra highway have fallen in, with some parts remaining elevated, which is causing traffic blockades and road accidents in the area. Different places over a span of a 9.5km stretch of the highway, from the Banani intersection of Bogra's Shajahanpur upazila into Jamalpur, had small uneven mounds on the side of the road due to this problem. Locals and transport workers have named this portion of the road the "highway tumour".They have asked for the intervention of the concerned governmental departments to take immediate action in this regard so that any imminent road accidents can be avoided. Confirming the matter to the
Dhaka Tribune, Bogra Roads and Highways Department Executive Engineer Md Ashrafuzzaman said: "The highway will soon be repaired by razing the elevated portion via milling machines."As the roads are uneven, all transport that operate on district and interdistrict routes have been experiencing tremendous jolts, causing great suffering for passengers on long-distance journeys.

Sometimes drivers even lose control of their vehicles, resulting in accidents. Driver Abdus Sattar of Karatoa Gate Lock Paribahan on the Bogra-Sherpur route, CNG-run auto-rickshaw driver Abdul Based, truck driver Rostam Ali, businessman Shajahan Ali and many more have said they have to use this highway for their livelihood needs.They stated that the stones and pitch on both sides of the highway had crumbled, and a portion of it remained elevated up to two to five inches.
Accidents occur on this road when heavy vehicles try to overtake smaller cars, causing them to bump on the mound on the side of the road. A few days earlier, a motorcyclist was a victim

of a road accident here.Shajahanpur Majhira B Block area's private car driver Mahmud Hasan Murad said: "Sometimes drivers might lose control of their steering if they drive over that mound, as the tires are clutching on hollow space."He blamed the condition of the highway as a major cause for road accidents in the area. Executive Engineer Md Ashrafuzzaman said the sides of the roads had given away due to overloaded heavy vehicles. This problem occurred because large amount of small pebbles and bitumen's were used to construct the road.

1. Bus-truck collision leaves 10 dead, 18 injured in Bangladesh

03, 2016 04:30 PM JUN

The accident happened at around 6am in front of a hotel in Dhankundi area of Sherpur, said the officer in charge of Sherpur police station, Khan Erfan.The accident happened at around 6am in front of a hotel in Dhankundi area of Sherpur, when the Bogura-bound bus collided with a Sirajganj-bound truck, said the officer-in-charge of Sherpur police station, Khan Erfan.

The injured have been admitted to hospitals in the area.The crash briefly halted traffic flow on the road. Seven people, including the drivers of the both vehicles, died on the spot. Three of the injured later died while undergoing treatment at the hospitals, Erfan added.Ismail Hawlader, superintendent of Bogra highway police, said they suspected the accident occurred as the driver dozed off while driving. [1]

2. 5 policemen among 7 killed in Bogra road accident

Nov 13,2016

Dhaka – Five policemen and two civilians were killed in a fatal road accident in northern Bangladeshi district of Bogra on Sunday, police said.

The accident occurred when two trucks collided head-on early hours of the day on Dhaka-Bogra highway in Sherpur sub - district, some 150 kilometers north-west of the capital Dhaka.Police officer Mohammad Erfan Khan said that five other people were injured in the incident in Mohipur area around 1:00am.The policemen were identified as Shajahan, 35, Pronob, 32, Alamgir, 33, Shamsul, 30, Shohel, 32. Nine policemen were travelling by a truck to Kurigram.One of the two other deceased was Shymol Roy, sweeper of the police department. The identity of the truck driver could not be known.The injured were brought to Dhaka for better treatment.Police and fire fighters rushed to the spot and rescued six injured persons.

3. Army man, son killed in Bogura road accident

2017-11-04 09:15:41

BOGRA: A soldier of Bangladesh army along with his son was killed and wife injured as a bus crushed his motorbike at Shajahanpur upazila in Bogra on Saturday (November 4).

The deceased were identified as Nazrul Islam, son of late Nokib Uddin, hailed from Ghior upazila in Manikganj and his son Rafiul Islam Nafis, aged three and half years old.On the other hand, wife of the soldier, identified as Nigar Sultana Hira, 24, is undergoing treatment at the ICU of Combined Military Hospital in Bogra.Shahjahanpur Police Station Sub-Inspector (SI) Humayun Rashid Chowdhury told Bangla news that the tragic accident occurred at the TMSSS Filling Station area of Dhaka-Bogra Highway in Shahjahanpur upazila.An air-conditioned bus of SR Travels crushed the soldier's motorbike when he was going towards Bogra town, leaving the father and son dead on the spot at around 2:30 pm.Following the accident, police seized accused bus from Sherpur area of the Highway.However, the SI could not give information about the driver and the helper.

4. Bike rider killed in Bogra road accident

03:32 PM, 4 March 2018

A bike rider was killed as a bus knocked down his motorcycle in Phultala area under Shajahanpur Upazila of Bogra district on Sunday morning. The deceased was identified as Yasir Arafat Mukul, 33, son of Yasin Ali, a resident of Khalisakandi village of the Upazila.Police said the accident took place on the Dhaka-Bogra highway when a bus hit the motorbike in the area at about 7.30 am, leaving the bike rider Mukul injured.Later, Mukul was sent to Shaheed Ziaur Rahman Medical College Hospital where doctor declared him dead.Daily Bangladesh/Nishi. [2]

5. Four killed in 2 Bogra road accidents

10:31, Sep 05, 2019

At least 4 people were killed and others were injured in separate road accidents in Bogura on Thursday (Sept 5). Of the deceased, three were killed in a road accident in Sherpur. Police said the head-on collision between two trucks took place on the Dhaka-Bogura Highway at College

Road area. “Three people were killed on the spot,” said Gaziur Rahman, additional superintendent of (Dhunat-Sherpur) police circle. One of the victims was identified as trucker

Hafizul Islam, 32.The injured were taken to Shaheed Ziaur Rahman Medical College Hospital.The other incident took place on the Dhaka-Bogura Highway at the Hajipur area. A woman was run over by a Bogura bound Shyamali Paribahan Bus. The victim was identified as Amena Khatun, 55. She hailed from Ulipur village of Sherpur.Amena Khatun went to Hajipur to send off her child to school, police said. Kajol Nondi, sub-inspector of the Kundarhat Highway police outpost, confirmed her death. [3]

6. 3 killed in Bogra road accident

Date: 12/01/2020

At least three people have been killed and three others injured in a road accident in Sherpur upazila, Bogra. The accident took place on the DhakaBogra Highway's Collage Road bus stand area on Sunday afternoon. The deceased were identified as Abdul Hye Pramanik, (60), Al Amin Pramanik, (28), Shah Sultan, (9). A Dhaka bound bus of Al Riyad Transport lost its control on the road and crashed into a three-wheeler carrying the six passengers, said Inspector Rafiqul Islam of Silimpur Medical Hospital police outpost. The high speeding bus collided head-on with the three-wheeler killing three people on the spot and critically injuring three more people, added the inspector.

7. 6 killed, multiple injured as bus, truck collide head-on in Bogra

Date: 28/02/2020

The bus was recklessly overtaking another vehicle and ended up colliding with the truck At least six people have been killed and over a dozen others injured after a bus and a truck collided head-on in Sherpur upazila, Bogra. The incident took place on Dhaka-Rangpur Highway in the College Road area early Sunday, said witnesses and officials of Fire Service and police. Officials said the accident took place around 4:45am when the Bogra-bound SR Travels bus collided with the truck, carrying stones, coming from the opposite direction. The six deceased, who died on the spot after the collision, include two drivers of the vehicles and a woman. Identities of the victims could not be known immediately. The injured were taken to Shaheed Ziaur Rahman Medical College and Hospital and other local health complexes. Sherpur highway police outpost In-Charge Inspector Banjul Annam told reporters that the bus was recklessly overtaking another vehicle and ended up colliding with the truck.

Following the accident, traffic on the highway was halted for an hour until police brought the situation under control, he added. According to the Road Safety Foundation (RSF), the accident rate jumped by 25.58% and fatalities by 8.76% last month compared to the same

period last year. At least 445 lives were lost in 340 road accidents in January 2020. Data gathered by Bangladesh Passengers Welfare Association also says that at least 6,686 people lost their lives and 8,600 were injured in a total of 4,891 road accidents in 2020. [4]

8. Four killed in Bogra bus accident

20 Mar 2021, 09:50 pm

Dhaka, March 20: Four people were killed in a head-on collision between two passenger buses at Bogra's Sherpur. At least 10 other passengers were injured in the incident. They were rescued in critical condition and sent to Shaheed Ziaur Rahman Medical College Hospital in Bogra.

The accident took place on the Dhaka-Bogra highway at Dashmile in Garidaha union of the upazila on Friday (March 19) at around 2am. However, the immediate names of the victims were not known. Ratan Hossain, station officer of Sherpur Fire Service and Civil Defense, confirmed the information. Two passengers were killed on the spot. Ten to 12 people seriously injured in the accident were rescued and sent to Shaheed Ziaur Rahman Medical College Hospital in Bogra. Two of them died before reaching the hospital, the station official said. Meanwhile, the two buses involved in the accident fell horizontally on the highway and the traffic was stopped. During this time, there was a severe traffic jam on both sides of the highway for an area of about two kilometers. After about two hours the traffic is normal. Baniul Alam Anam, in-charge of Sherpur Highway Police's Ten Mile Camp, said they were trying to find out the names of the victims. After the accident, the traffic was stopped but after some

time their intervention became normal. Two of the buses have been seized

9. Two lives were lost on the Dhaka-Bogura highway

September 5, 2021 11:03

Two people, including the driver, were killed in an accident at Dubail on the Dhaka-Bogura highway. The identity of the truck driver Mamtaz Miah (50) was confirmed but the helper could not be identified. Mamtaz Mia is the son of Akbar Ali of Chaprampur village in Dinajpur Sadar. The accident took place at Dubail upazila of Delduar upazila around 8:15 am on Sunday.

Police said two trucks laden with corrugated iron were heading towards Tangail. This morning at around 8:15 am, when he reached Dubail (Dhaka-Metro-T-22-9634) on the highway, the truck behind him hit the front (Dhaka-Metro-T-24-5056). The truck in front lost control and hit a microbus (Dhaka-Metre-C-15-3410) in front of it and overturned on the road.Mumtaz Mia, the driver of the rear truck, and the helper died on the spot. The microbus also twisted. Upon receiving the news, Gorai Highway Police went to the spot and recovered the bodies of the deceased.

The two trucks involved in the accident have been removed from the highway. Gorai Highway Police Officer in Charge. Azizul Haque said the bodies of the deceased would be handed over to their families after the legal process was completed after the identity of the deceased helper was confirmed. He said the two trucks and the microbus involved in the accident were in police custody.

1.3 Solution to reduce accident

Around 3,000 accidents happen every year in Bangladesh, killing around 2,700 people and injuring around 2,400. As per the plan, a speed monitoring camera will be installed every two kilometers on the 2,000km national highways, connected with optical fiber to the OCC. The highways will be divided into 40km segments. Each segment will have a station where a fully equipped Highway Police team and a Fire Service and Civil Defense team will be based. Speeding vehicles will be tracked and their locations sent to a central server or control room installed at the ARI and to a law enforcement team to track them down and take action. The

central control room (OCC) will remain active at all times and deliver real-time information to the respective authorities to perform their jobs.

"The OCC will be established in the ARI at BUET. If there is any incident like speeding, dangerous overtaking, law violation or sign or signal violation, the related information will be sent to the lab which will constantly monitor the information.

The Fire Service is currently engaged in rescue efforts to provide 24-hour service at 89 highway points in the country. Accident recovery and emergency medicare is provided by the Fire Service in such we by implementing these projects, we will be able to reduce road congestion and accidents on the North Bengal Highway from Dhaka to North Bengal

1. The introduction of regular driver awareness sessions by the government and related private bodies
2. Pedestrians need to be fined, and perhaps even detained for at least 12 hours to 2 days, for crossing roads indiscriminately
3. Rule of law must be ensured
4. Increase Road coverage areas, clean up footpaths so people do not need to walk on the streets inviting more accidents
5. Car fitness standards must be maintained and monitored and the appropriate fines and punitive actions must be taken against motorists who do not abide by the standards
6. Introduce road safety awareness and effective driver awareness campaigns. The task of maintaining safe roads is not of the government's alone, it is everyone's

1.4 Scope of work

A multitude of factors imping upon the issue of road safety. Key issues covered in the study include:
- Engineering aspects of road safety.
- Road and traffic laws.
- Traffic management and enforcement.
- Vehicle management (separate lane for bus, truck, Car etc.) - Road users: drivers and pedestrians.
- Accident trends and accident investigation.
- Victim care and support.
- Governance and political economy of the road transport sector.
- Advocacy challenges.
- Increasing highway police monitoring.
- making foot over bridge in busy area.
-speed controlling.

Metrorail: A milestone in communication

Although various measures have been taken at different times to ease traffic congestion in Dhaka city, they have not been very effective but this metro rail will definitely play an effective role in reducing traffic congestion.

Residents of Dhaka City have to bear the brunt of traffic jams every day but they will not have to endure that bustle for a long time. In a few days they are on the way to fulfilling their dreams.
[5]

Figure: Metro Rail

Padma Bridge will transform the fate of 21 districts

Figure: Padma Bridge

The Padma Multipurpose Bridge Project will change the economic landscape of southwestern Bangladesh if its opening is matched with improvements to energy security and other infrastructure, politicians and industrialists have said. Bagerhat-3 lawmaker Talukder Abdul Khaleque, a former state minister, believes that with the right planning, the bridge will initiate an "industrial revolution" in the 21 southwestern districts of the country. [6]

1.5 Objective of Work

The issue of road safety has long been a national priority. With rapid urbanization, spread of transport networks and accidents frequenting headlines, greater attention to the issue has arguably become a key national priority. This, however, appears unlikely to happen without a strong effort at policy advocacy.

1.5.1 General objective:

1. To propose a most suitable solution to reduce the rate of accident at Dhaka Bogra highway.

1.5.2 Specific objectives:

1. To identify the location site of most accident-prone area. 2. To point out the specified case of accident
3. To propose a grade separation at site.
4. To segregate the vehicle as per requirement.

CHAPTER 2

2.1 Literature Review

Road accident is an incisive problem in highway transportation system which directly sentenced to death, injury and property damage. Rajshahi is one of the most crucial cities in Bangladesh where road accident frequently occurs. Many people die and seriously injured every year in Rajshahi city due to accident. The statistical data of road accident of Rajshahi city is presented in this paper. Data of accidents for three years (2011, 2012 & 2013) were collected from four Police Stations which are situated in Rajshahi city. It is observed that, 51 accidents occur in this time span. It has been found that six intersections and four mid-blocks are the most hazardous, where the rate of accident frequency is high. These intersections and mid-blocks were located by GPS technology and finally a map is drawn by GIS to indicate these locations. The analysis shows that 41.67% victims were between ages 20 to 35 years old. The vehicles are mostly responsible for accidents that are trucks (26%) and buses (23%). Truck accidents caused in city road accidents contribute 32.56% of total deaths while other vehicles such as Bus 23.26%, Private Car 4.65%, Auto Rickshaw 9.30%, Bike 11.63%, Vutvuti 11.63%, Rickshaw/Van 2.33%, Emma 2.33% and Micro bus 2.33% of total fatalities. [7]

Road accident is an exquisite problem in highway transportation system which consistently related to a lot of deaths, injuries and property damages. Approximately 1.3 million individuals die in road fatalities each year, every day around 3,287 deaths occur all over the world. Further, even 20-50 million are injured or disabled. Low and middle-income countries are the main victim of this problem. The rate of an accident in Bangladesh is 13.6 per 100,000 people. With respect to road accidents Rajshahi, a northern city of Bangladesh is in very severe condition. In last 7 years, about 200 people died, and more than 100 People injured very utterly. This research work presents an overview of the accident rates, involved vehicles, type of collisions, time of the accident, and age of the victims of the accidents in the highways, regional roads and city roads of Rajshahi city. The detail of the accident data was collected from, a popular local newspaper (Sonali Sangbad). Some additional data was collected from the metropolitan police station. The analysis shows that Natore-Rajshahi-Nawabganj highway (N6) is the most hazardous road in Rajshahi city and head on collision is the leading reason for accident in this road. The rate of death is also very high on city roads. About 46% of the total victims were between ages 21 to 30 years old. In more than one third of the total analyzed accidents pedestrians are the victims including deaths and fatalities. About 50 % of the total casualties occurred, either motorcycle or truck are involved.

Keywords: Traffic, road accident rate, head on collision, pedestrian, death.

[8]

Roads, highways and streets are fundamental infrastructure facilities to provide the transportation for passenger travel and goods movement from one place to another in Sylhet, north–eastern division of Bangladesh with rapid growth of road vehicle, being comparatively developed economic tourist prone area faces severe road traffic accident. Such severe road accidents cause harsh safety hazards on the roads of Sylhet area. This research work presents an overview of the road traffic accident and degraded road safety situation in Sylhet zone which in particular, discusses the key road accident problem characteristics identifying the hazardous roads and spots, most responsible vehicles and related components, conditions of

drivers and pedestrians, most victims of accident, effects of accident on society, safety priorities and options available in Sylhet. In this regard, a comprehensive questionnaire survey was conducted on the concerned groups of transportation and detailed accident data was collected from a popular local newspaper. Analysis of the study reveals that Dhaka Sylhet highway is the most hazardous in road basis and Sylhet Sador thana is the most vulnerable in thana basis in Sylhet region.

Keywords: Traffic, Casualty, Fatality, Severity, Collision, Vehicle, Pedestrian.

[8]

Purpose: The study aimed to identify the characteristics of road traffic accident (RTA) and to determine the role of different socioeconomic and demographic factors on the knowledge and awareness about traffic rules among people in Bangladesh.

Study Design:

This was a cross-sectional study.

Methods: To conduct this study, 700 primary data were collected from respondents who were involved in RTA by interviewing in medical college hospitals and several private clinics of Dhaka, Rajshahi, and Khulna division in Bangladesh. For the achievement of the objective, the Chi-square test, Cramer's V correlation, and the logistic regression model have been applied in this study.

Results: Traffic rules violation was identified as the second-most important reason behind RTA. Respondent's age, gender, residence, education, occupation, awareness about RTA, etc., were significantly associated with having knowledge and awareness about traffic rules. The result of multivariate analysis showed that respondent's age (<30: odds ratio [OR] = 2.019, confidence interval [CI]: 1.377–2.960); residence (rural: OR = 0.288, CI: 0.193–0.431); education (literate: OR = 5.064, CI: 3.332–7.698); and categories of victims (driver: OR = 2.731, CI: 1.676–4.450 and passenger: 1.869, CI: 1.198–2.916) were the vital predictors of having knowledge and awareness about traffic rules. [9] **Conclusions:**

By imposing strict traffic act, increasing public awareness through various types of education and awareness/outreach about traffic rules-related program, especially in rural areas, by strictly prohibiting the license giving to unskilled drivers or unfit vehicles, RTA can be minimized. Key Words: Bangladesh, Chi-square test, injury, knowledge and awareness, logistic regression, road traffic accident, traffic rules.

The main aim of this research work is to be aware of the road traffic accident scenario, injurious effects and pattern in Bangladesh. Moreover, we are interested to forecast the magnitude of road traffic accidents for the future so that decision makers can make appropriate decision for precaution. This study also provides an assessment of road traffic accidents in Bangladesh and its impact based on data collected for the period of 1971 to 2017. In this study we have tried to pick up the main reasons of road accidents and to observe the tremendous situation. The study observed that the general trends of road traffic accident (RTA), deaths and injuries reveal that the number of RTA, deaths and injuries increased gradually with little fluctuations from 1971 to 2007 and after 2007 there is a slow decreasing trend. Although the number of RTA and deaths observed decreasing trend in recent years, the ratio of number of deaths to number of accidents increased significantly. The rate of register vehicles per 10,000 people increased moderately throughout the period but a sharp increment is exhibited from 2009. Highest percentage of RTA (34%) and deaths is due to RTA (32%) in

Dhaka division while the lowest percentage of RTA (4%) in Barisal and Sylhet divisions and deaths is due to RTA (3%) in Barisal division. It is noticed that the maximum number of injuries occurred between ages 21 and 30 while the maximum number of deaths occurred between ages 11 and 30. Most of the RTA and deaths due to RTA are caused by run over by vehicles and head-to-head collision. The severity of occurring road accident and number of deaths is higher during the festive periods because of involving higher frequency of traveling than usual. The time plot shows that the graph maintains a decreasing movement from 2012 to 2015 but increases from 2015 to 2017. In the research an additive time series model approach is applied. It included the estimation of trend, seasonal variation and random variation using triple exponential smoothing method. We performed forecasting of RTA eliminating seasonal impact for the next three consecutive years (2018-2020) with 95% confidence interval using Holt-Winters exponential technique. [13]

As a serious man-made epidemic and distressing occurrence in the community is known road accident, which is affected though personally but afterwards harsh impact goes to social and economies field Major concern is road traffic accidents and picture of injuries have now emerged as outrageously or tremendously. The alarming rate of dreadful road traffic accidents may have increased due to certain reasons: lack of political concern, lack of accountability of the principal category of law-abiding citizens, incompetent drivers, inadequate punishment etc. In a country with limited resources, like Bangladesh it considered as hinders of all development and caused worst impact on GDP. This study focused on observing the behavior of law-abiding pedestrians and drivers; and try to relation under the obligation of Law as the sole identity of citizenship. Also, the road safety situation how developed and some contemporary issues and priorities are briefly discus in this dissertation. Keywords: Safety, Transport, Traffic, Accident, Injure, Problem, Punishment. [14]

This research identifies roadway, traffic, and environmental factors that influence the injury severity of road traffic crashes in Dhaka, Bangladesh. Dhaka provides a rather unusual drivingrisk environment to study because virtually anyone in Dhaka can obtain a driver's license, traffic enforcement is lax, and few fines are given when drivers violate traffic rules. To examine this city with presumed heightened crash severity risk, the authors collected police-reported crash data from 2007 to 2011 containing about 2,714 road traffic crashes. The injury severity of traffic crashes—recorded as fatal injury, serious injury, or property damage only—was modeled with an ordered probit model. Significant factors increasing the probability of fatal injuries included crashes along highways (65%), absence of a road divider (80%), crashes during night time (54%), and vehicle–pedestrian collisions (367%); two-way traffic configuration (21%) and traffic police–controlled schemes (41%) decreased the probability of fatalities. Both similarities and differences of the findings between crash risk in Dhaka and that in developed countries are discussed in policy-relevant terms. [15]

This paper presents the various aspects of traffic accidents in Khulna city in Bangladesh. Data on accidents were collected from different police stations in the city for two years. It was found that a total 157 accidents occurred during this period. Almost 25% victims were between ages 30 to 39 years. Pedestrians are the worst victims of road accidents and

accounted for 33% deceased and 34% injured. The vehicles liable for accidents are trucks (26%) and buses (23%). About 19% of fatalities are among the people who died in rickshaw accidents while 11% are among those using other non-motorized transports. Bus and truck accidents comprise 30% of deaths caused by city road accidents. The analysis results also show that four intersections and five mid-blocks are most hazardous locations where accidents occurred most frequently. Therefore, some safety measures and long term recommendations are made to improve the situation of Khulna city. Key Words: traffic accidents, pedestrians, fatalities, hazardous intersections, hazardous mid-blocks.

[16]

National Highways of Bangladesh, where majority of fatal accident takes place, are considered as the accident-prone location. Statistics revealed that despite some major initiatives undertaken to improve road safety, death rate at National Highways of Bangladesh is quite high compared to other developed as well as developing nations. To understand the relationship between injury severity and accident factors, investigation concentrate on different influential factors are responsible for injury severity. Micro Computer Accident Analysis Packages (MAAP5), data of Bangladesh Police from 2004-2015, is used in this investigation to identify the probability of fatal and grievous injury. Preliminary analysis revealed that almost 80% accident recorded as fatal accident and majority of the accidents occurred in fair-weather condition, at straight portion of the road, in non-rush hour and in broad daylight. Conversely, three level of injury severity (dependent variables) was considered in the econometric analysis namely, fatal, grievous and simple injury. Ordered Probit Model examined the dependent variables based on several explanatory variables such as time factors, road geometry, environmental conditions, vehicle categories, driver attitudes, passenger and pedestrian behavior. Considering different level of independent variables, it is found that under the heading of "collision type", "hit Pedestrian" is the statistically significant variable that creates severe injury. Considering vehicle characteristics, non-motorized vehicle, bus and motorcycle was found to be the most vulnerable group of road users in Bangladesh and the probability of fatal injury is much higher for vehicle with multiple defects. This investigation also pointed on some remedial measures that will help the decision maker to set up long as well as short term strategies. For instance, installation of physical barrier at the accident-prone location will minimize the pedestrian fatalities and isolation of non-motorized vehicle and motorcyclist from main carriageway, which would dramatically reduce injury severity on highways. Finally, this investigation also provides some specific guideline for future steps on injury severity analysis in Highways of Bangladesh.

Key words: National Highway, Fatal Accident, Ordered Probit Model, Variables

[17]

Dhaka is the capital and one of the oldest cities of Bangladesh. The history of Dhaka begins with urbanized settlements in the area that is now Dhaka since the 7th century. Dhaka is the heart of Bangladesh as the capital city as well as an economic & business hub of the economy. Bangladesh would enjoy the benefits of a huge economic boost by alleviating traffic congestion in the capital, the share of which alone in the country's GDP is 35%. In this study total congestion cost (TCC) consists of 5(five) components. These are TTC (Travel time cost), DWL (Dead-weight loss which is avoidable Social Cost), EC (Travel delay

externality cost), VOC (Vehicle operating cost or excess fuel cost due to congestion), EC (Environmental externality cost or air/noise pollution) and RTAC (Road Traffic Accident Cost). The Total GDP of Bangladesh (in current value) is 173.8189 Billion USD in 2014 (WB Data-bank), while according to this study, it is estimated that the total economic loss of the traffic congestion is 12.561 Billion USD, which is around 7%. Certainly, this amount of congestion cost for the lower-middle of Bangladesh is very much higher compared to any other country of the world. If, there is no traffic congestion in Dhaka city, and if we calculate this economic loss from 1971, the GDP of Bangladesh might be much more larger than the present amount.

[18]

CHAPTER 3

Methodology

3.1 Site selection

Our chosen place is 152 km away from Dhaka Gabtali bus stand. This place is always congested with roads, two lanes, highways and accidents. This is the only standard food village in from North Bengal to Dhaka and from Dhaka to North Bengal, all buses and private cars stop at it, so there is always a traffic jam due to vehicles entering and leaving the Food Village. In this Infront of this food village, it is important to provide an interchange.

There is no settlement on the cultivable land in the area of 3 to 4 km around the food village

So, giving an interchange in place is easy and affordable in many parts.

As the road from Dhaka to North Bengal is the only highway in the area, it is a congested and accident-prone highway

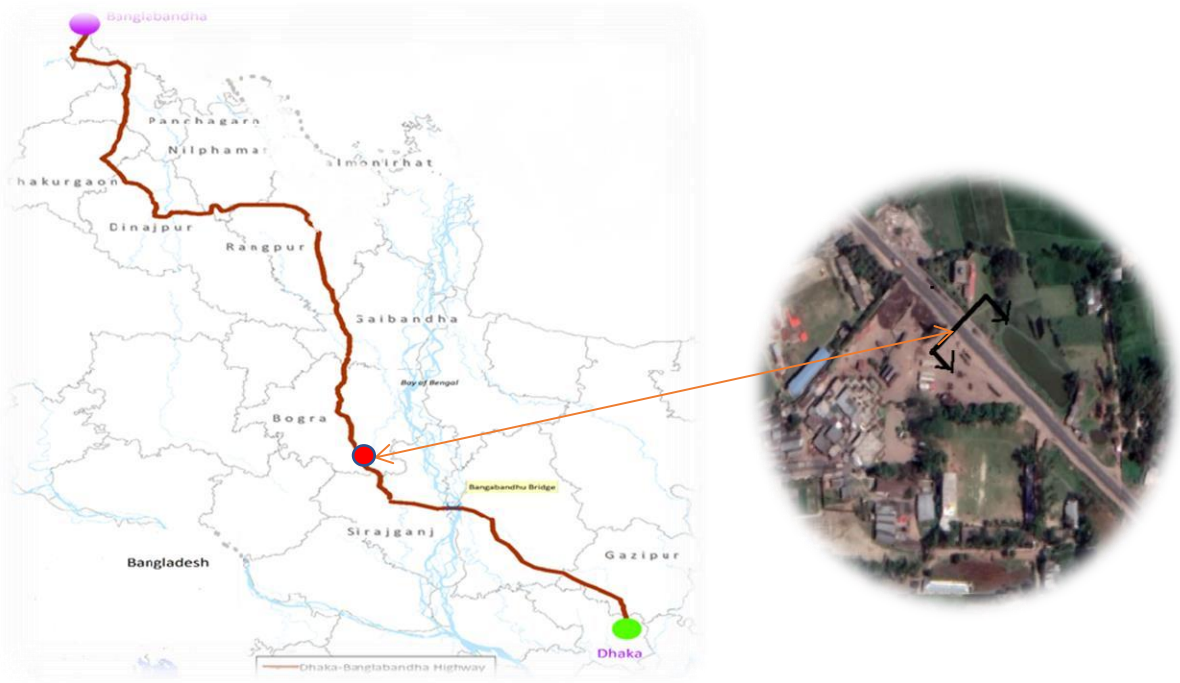


Figure: Existing Plan

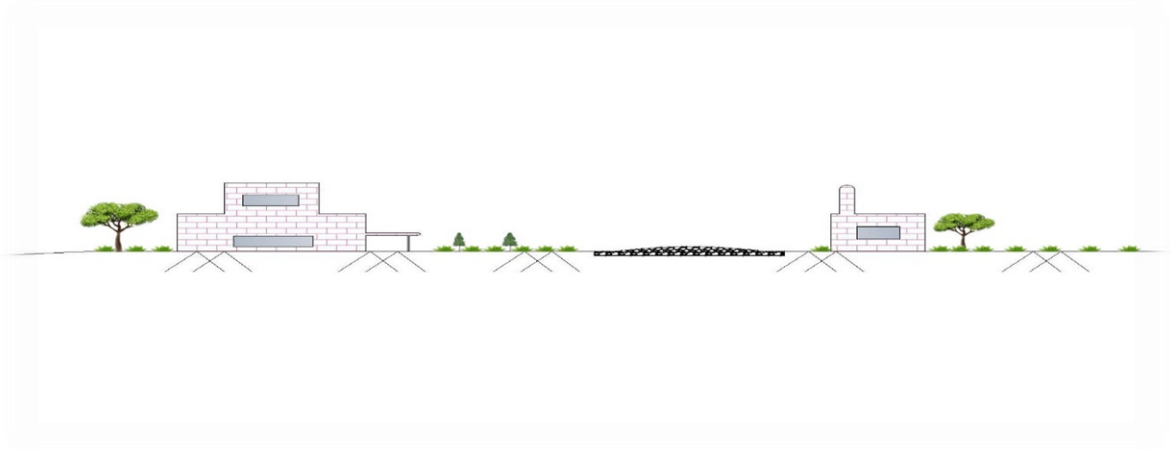


Figure: Existing section

3.2 Topography

A topographic survey (or land survey) is an exercise undertaken by land surveyors. Using highly specialized survey equipment and skills, we measure the position and height of both the artificial and natural topographic features on the site.

Examples of natural topographic features

- Slopes, natural banks and depressions in the land
- Watercourses and the extents of ponds and lakes
- Isolated trees
- Areas of woodland, vegetation and bushes

Examples of artificial topographic features

- Boundary treatments including walls, fences and hedges
- Roads including top and bottom of Krebs, road crown lines and white line markings
- Foot & cycle paths, rough tracks and grass verges
- Street furniture such as signage, litter bins, benches etc.
- Drainage information such as manhole covers & gullies etc.
- Other visible services and apparatus such as BT, CATV, electric, gas, water & traffic signals
- Building footprints
- Bridges, ramps, steps & canopies etc.
- Surfacing such as tarmac, concrete, gravel & grass etc.
- Shrubs and gardens
- Bunds and drainage ditches

These features are typically shown as lines and points on a drawing. Ground levels are included at regular intervals along features while spot levels provide level information in open areas. Other important levels such as threshold levels, ridge and eaves levels, tree canopy levels, overhead cable heights and contour labels are included and displayed on the drawing. A professional drawing will be thoroughly annotated including surface types, boundary types and height and any other findings specific to the site. On very small/flat domestic projects such as home extensions, an architect may be able to achieve successful designs and planning consents without a specialist land surveyor being required. For anything larger or more complex, topographic surveys form one of the key starting points whenever land is to be developed or redeveloped. Topographical surveys are used by development consultants, architects, designers and engineers. They are used throughout the lifecycle of a project. Having a thorough survey of the development site carried out at an early stage of a project is recommended to mitigate risk and reduce the chance of costly mistakes. Typical examples where a topographical survey would be used, are to: -

- Satisfy the requirements of planning authorities Design a site layout for multiple houses, including the new roads and drainage runs.
- Design any site layout whether this be offices, industrial, residential or mixed use.

- Design a house extension or single new build within the site boundaries - taking into account the lay of the land and the position and heights of surrounding trees and buildings.
- Model earthworks and plan cut and fill, calculating how to move existing soil around a site to minimize the cost of bringing material in or taking it away.
- Model flooding of watercourses and their flood plains to assess a sites viability or challenge the flood map.
- Design new accesses and realignments and tie into existing highways, junctions and roundabouts.
- Resurfacing and redesigning of car parks.
- Investigating pooling/standing water issues on areas of hard standing or low-lying land.
- Route planning for new buried services.
- Plot the findings of environmental studies such as ecology surveys and tree/arboricultural surveys.
- Plan geo-technical site investigations.
- Provide context to underground utility mapping survey results.
- Measure land areas accurately.
- Set out the position of successfully designed and consented developments, for contractors to start building.
- Resurvey and produce as-built drawings of the finished project.
- Register and transfer land and easements with Land Registry through the creation of title and transfer plans

Depending on the size of the area of land to be surveyed, a single land surveyor or several teams will physically visit the site. After setting up their total stations, reflective prisms and gps units on metal nails hammered into the ground (control stations), they begin to measured the land, one point at a time. The nails (or their coordinates) are used to check the accuracy of the measurements throughout the day and they also allow extra survey works to be added easily. These control stations will also be used to accurately set out (mark on the ground) the positions of new buildings, roads and boundaries etc. - after the new land use has been designed. These are the standard "boots on the ground" approaches to topographical land surveying.

3.3 Traffic Condition

Road is one of the means of transportation from Dhaka to North Bengal. Among the vehicles traveling on the Dhaka-North Bengal highway, we conducted a survey where we found 50 per cent buses, 40 per cent trucks and 10 per cent private cars. As the highway has two lanes, the amount of traffic is very high and accidents happen regularly. Due to the fact that the highway is 15 km long on both sides of the village and the regional hat-bazaar, the vehicles are often stuck in a traffic jam and get into an accident. We conducted a survey of road vehicles in front of Food Village at Bogra Point on the Dhaka-North Bengal Highway on 30/09/2021. According to the survey, 9360 vehicles pass through North Bengal every hour for 12 hours for other departments including Dhaka. And 8920 vehicles crossed for North Bengal in 12 hours. Of these vehicles, 60 percent are home buses and private cars stop at the

Food Village. In this food village, except for the bus-private car, no small or big truck stops, so there are big traffic jams on both sides of the road in front of the Food Village and small and big accidents happen. For all these reasons, that part of the road has become more prone to accidents

3.4 Traffic segregation

Due to the traffic on the highway in front of the Food Village, we thought we could think of a separate bypass for the trucks

3.5 Proposing Grade separation

In civil engineering (more specifically highway engineering), grade separation is a method of aligning a junction of two or more surface transport axes at different heights (grades) so that they will not disrupt the traffic flow on other transit routes when they cross each other. The composition of such transport axes does not have to be uniform; it can consist of a mixture of roads, footpaths, railways, canals, or airport runways. Bridges (or overpasses, also called flyovers), tunnels (or underpasses), or a combination of both can be built at a junction to achieve the needed grade separation.

3.5.1 Side selection for grade separation

We have chosen to give an interchange of half a kilometer from the front of Dhankundi Cemetery to the front of Food Village.

It is a bridge that eliminates crossing conflicts at intersections by vertical separation of roadways in space. Grade separated intersection are otherwise known as Interchanges. Grade separated intersections cause less hazard and delay than grade intersections. Route transfer at grade separations is accommodated by interchange facilities consisting of ramps. Interchange ramps are classified as Direct, Semi-Direct and Indirect. Interchanges are described by the patterns of the various turning roadways or ramps.

3.5.2 Land requisition

Requisitioned property is property that is involuntarily seized by a governmental authority for any reason. Requisitioned property can be taken for a number of reasons relating to the furtherance of the public good. It can be of any type, including real estate, vehicles, machinery, office equipment, or even personal property.

3.5.3 Linear type of Grade separation

Typically, large freeways, highways, motorways, or dual carriageways are chosen to be grade separated, through their entire length or for part of it. Grade separation drastically increases the capacity of a road compared to an identical road with at-grade junctions.

If traffic can traverse the junction from any direction without being forced to come to a halt, then the junction is described as fully grade separated or free-flowing.

CHAPTER 4
Data and Information

4.1 Traffic volume study

Food Village is known as one of the stopping places for passengers traveling from Dhaka to Rangpur highway. Here all buses, private cars are doing his journey breaks on this highway.

For our information, we have compiled statistics of vehicles stopping at Food Village.

Vehicle Name	Time	Number of vehicles	Per hr. vehicle	Stope at food village
Long distance bus	10:00am to 01:00pm	980 nos	326 nos	90%
Public Bus	10:00am to 01:00pm	320 nos	106 nos	10%
Truck	10:00am to 01:00pm	640 nos	213 nos	0%
Private Car	10:00am to 01:00pm	210 nos	70 nos	60%
Motorbike	10:00am to 01:00pm	150 nos	50 nos	35%

Vehicle Name	Time	Number of vehicles	Per hr. vehicle	Stope at food village
Long distance bus	01:00am to 03:00am	1950 nos	650 nos	90%
Public Bus	01:00am to 03:00am	0%	0%	0%
Truck	01:00am to 03:00am	1740 nos	580 nos	0%
Private Car	01:00am to 03:00am	375 nos	125 nos	60%
Motorbike	01:00am to 03:00am	12 nos	4 nos	35%

We have seen statistics from 10:00 am to 1:00 pm that, 90% of long-distance buses in Food Village stop here. In addition, 60% of private cars, 10% of public transport, and 35% of motorcycles stop here and doing his journey breaks.

As we have seen, 90% of long-distance buses stop at this place from 1:00 am to 3:00am. Apart from that, 60% of private cars and 35% of motorcycles stop here and doing his journey breaks. **4.2 Topography.**

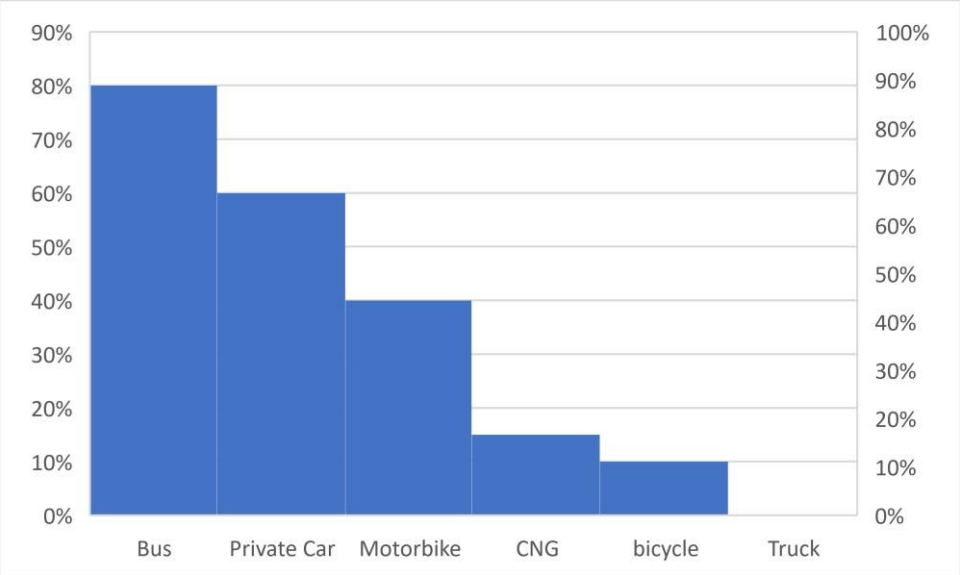
Food Village Restaurant is located in Sherpur, Bogra District. There is a SR filling station 1000 feet away from the restaurant. There is a Dutch-Bangla ATM booth 120 feet away on the west side. There is a tea shop on the north side 120 feet away from the Food Village

restaurant and a mosque on the opposite side of the road on the east side 1200 feet away from the Food Village.
Arable land, food-village and rural areas around the Dhaka-North Bengal Highway where we plan to reduce traffic congestion and road accidents and prevent road accidents

4.3 Behavior of Vehicle with food-village.

Our selected Food Village Area is one of the highways leading to North Bengal from other sections including Dhaka.

As our chosen destination from Dhaka to North Bengal is a popular and standard food village, about 90% of other buses, including long-distance buses, stop here, and 60% of other small and large vehicles, including private cars, stop here.



CHAPTER 5

A Proposal and Discussion.

5.1 Proposed Design and Discussion.

The data suggests that the transportation authorities in Dhaka to rangpur city have to struggle continuously to adjust the ever-increasing traffic demand with limited resources. It is a usual trend of people in the urban areas in developing countries to use Vehicles for their convenience. However, due to this dramatically increased numbers of Vehicles in Dhaka to rangpur city, traffic congestion has become unmanageable. The primary reasons for the traffic congestion include unplanned infrastructure and congested road conditions, limited resources, lack of awareness, limited use of technology and poor public transportation facilities. As a result, in order to reduce traffic congestion and make the Dhaka to rangpur city transportation system sustainable, a number of initiatives need to be taken. However, it is imperative to consider that Bangladesh is a developing country with a number of other challenges that they have to address at the same time. Therefore, all the initiatives need to be adjusted with the existing system with cost minimization.

We can reach our goal in our proposal to reduce the traffic congestion and accidents caused by Dhankundi Food Village. Our chosen place has been hit by more traffic jams and accidents twice a year. During those two times, more people go to North Bengal from different parts of the country for Eid-ul-Fitr and Eid-ul-Azha Eid holidays

Given an interchange of the area where we have proposed to reduce traffic congestion and accidents on the highway, we will be able to separate the trucks from a certain distance.

The proposal that we have made so that all the buses plying at Food Village do not have any traffic jams to get in and out of Food Village and the trucks can leave safely without any hindrance through interchange will greatly reduce traffic congestion and accidents at this place.
We think so

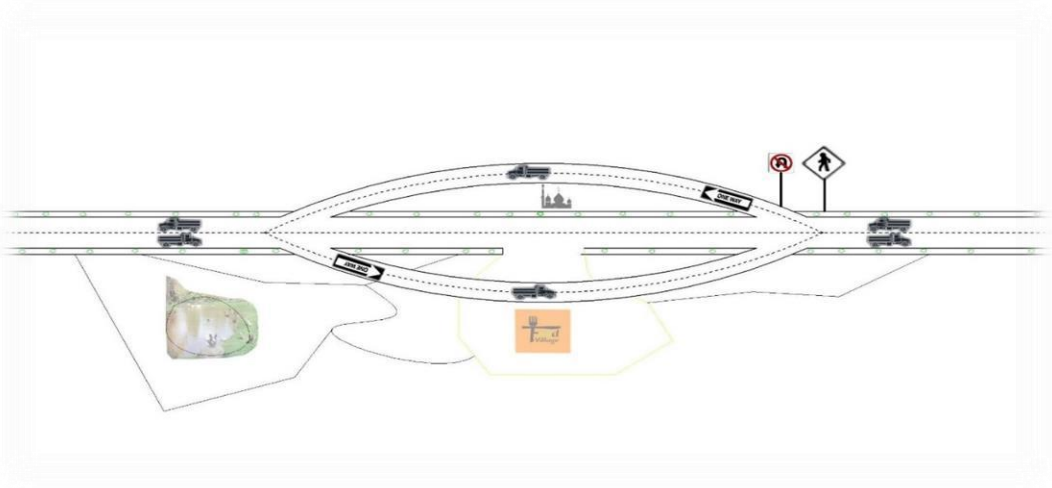


Figure: Proposed plan

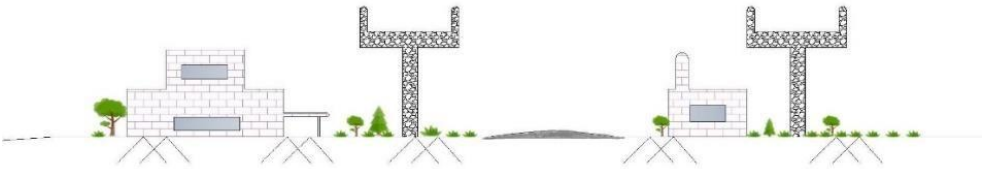


Figure: Proposed Section

CHAPTER 6

Conclusion and Recommendation.

6.1 Conclusion

As the Dhaka to Bogra highway is very long, many accidents happen in different places. The Dhaka-Bogra highway has two lanes in most places, leading to accidents and traffic jams due to reckless driving.
There is no bus bay or diverted lane for vehicles for entering or exiting the food court. This crisis causes a sharp turning of low-speed vehicles to a high-speed lane.
From our spot survey, it was observed that, almost no trucks stop the food village, but passes away in a full speed.
As maximum truck drivers are reckless and restless to driving, with a heavy loaded truck, it seems to be more risky for other vehicles to be in same lane with trucks.
Surveying at the Food Village, we find peak hours there from midnight to four and this is when most accidents happen.

6.2 Recommendation.

1 Economic study.

We can build a 1.5 km flyover in front of Food village. For which traffic congestion will be reduced and accidents will be reduced. For the construction of the flyover, we have to purchase 48 acres of agricultural land, the value of which is about 106 crore 67 lakh taka. And our construction cost to build the flyover will be around 470 crore takas. The total cost of constructing the flyover will be around 571 crore 67 lakh taka.

2 Public response study.

Talking to people living in the vicinity of our selected accident-prone area, we learned that if the interchange we proposed was done, it would be much better for them, they would not have to have an accident anymore, they would not be in traffic for a long time and their area would be risk free. They will be able to travel much safer **3 Structural study.**

The structure that we have proposed to give can be given in that place it does not have to face any major obstacles

4 Grade separation study.

Grade separation is a method of aligning a junction of two or more roadway axes at different heights (grades) so that they will not disrupt the traffic flow on other transit routes when they cross each other. The grade separation can consist of a mixture of roads, bridges (overpasses or flyovers). Three primary roadway improvement objectives are accomplished using grade separated intersections: 1) increased capacity and uninterrupted flow, 2) increased safety and 3) reduced vehicle conflicts and delay.

So, we can say that if the road is segregated at our chosen place, the trucks plying on the highway can be separated and better arrangements can be made.

5 Land requisition study.

The lands where we have proposed for interchange are cultivable lands and there are no dwellings there so we have to buy the places we need to do this work.

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