Analysis of Traffic Jam from New Market to Dhanmondi 27 and Findings Its Possible Solution

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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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January, 2022

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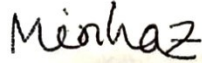
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Dedicated

to

"This thesis work is dedicated to our supervisor,AsmaUlHosna madam, Lecturer, who has been a constant source of support and encouragement during the challenges of graduate school and life. We are really grateful to have her as our supervisor. She has always helped us unselfishly. She has taught us much technical and nontechnical knowledge that we want to achieve. Special thanks to all the members of our group who worked together, to bring the successful outcome of this research work.''

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ABSTRACT

Dhaka is the capital of Bangladesh, is the most densely populated city in the whole world. More than twelve million people lives in Dhaka city. Day by day the number is increasing and most part of Dhaka is badly affected by huge traffic jam.We have selected new market to Dhanmondi-27 roads because these roads are most of the busy and all-inclusive in Dhaka traffic system. These roads lead to schools, colleges, Universities, hospitals, and public and private workplaces. These roads are manually controlled by the police. Faulty traffic signaling systems, inadequate manpower, narrow road spaces and overtaking tendency of drivers create pro-longed traffic congestions. There is no emergency road system in all these roads. For which many bus,cars and ambulance are stuck in traffic jams and many patients fall in the lap of death. Due to the manual controlling, it takes almost 45 minutes to 1hour in this distance.

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CHAPTER 1

INTRODUCTION

1. Introduction

Dhaka is the capital of Bangladesh with over 20 million people (BBS 2019). This is the most industrialized and overcrowded city of Bangladesh. However, the infrastructure of the city has not been developed with proper planning (Hossain et. al., 2017). Economies Intelligence Unit's livability Survey (2013) suggests that Dhaka is the second most un-livable city in the world. The population density in this city is as high as 46.997 per square kilometer (BBS, 2019). Yang, Purevjav, and Li (2019) argue that in most developing and middle-income country there is the rapid increase of personal vehicles as well as inadequate infrastructure development. The living conditions have been worsening everyday especially due to traffic congestion in Dhaka city. Therefore, it is very crucial to find some solutions to reduce the traffic congestion so as to enhance the sustainable development of the city. According to Yang and colleagues (2019), using road pricing as **the first-best policy to address congestion has been drawing increased attention from the** policy makers. Other alter-natives include traffic demand control, use of ITS, developing public transportation facilities and developing expressways (Khan and Chowdhury, 2014). This study focused primarily on traffic jams in Dhaka city and an overview of the overall transportation challenges in Bangladesh, which was also linked to traffic jams all over the country. The primary data was collected from the Bangladesh government web-sites and other statistical data sources related to transportation in Bangladesh. The data was analyzed in a qualitative descriptive manner.

1.1   Background of the study

During the last few decades, the world has witnessed that urbanization has been in-creasing dramatically as automobiles have been affecting the personal, social and economic lifeofcountries as well as theirenvironments.In the developing countries, the situation is more acute. Due to the rapid growth ofthe number of automobiles, the cities have been experiencing multiple transport action related challenges including traffic jams, pollution, accidents, public transportation de-cline, environmental degradation and lack of accessibility for the poor (Pojani and Stead, 2015). As a result, sustainable urban development needs to include proper transportation systems, which has a great impact on economy. Bangladesh is one of the fastest growing economies in the world. In 2016, the country experience 7.1 GDP growths, which was the second fastest growing economy (IMF, 2017). Economically, these accidents cause BDT a 40 billion loss, which is over 2% of Bangladesh's GDP. Along with other transportation

challenges, traffic jams in big cities, especially in Dhaka, cause unbearable difficulties for the residents and those who visit the city for various purposes. People have to spend their valuable time on the street sitting in vehicles for long hours due to the heavy traffic jams. Students, officials and daily workers cannot reach their destinations timely. Moreover, very limited research has been conducted on transportation challenges and traffic jams by the government, third sec-tor and academics.

1.1.1 Study objectives

The main aim of the study is to-
1.Find out all the possible causes of traffic jam in a specific area.
2.Find out the all-possible solution of traffic jam.

1.1.2 Study method and data analysis

The citizens of Bangladesh have to face diversified transportation challenges every day in their life. This is not only causing serious economic damages for the country but also raising troubles in the social and personal domains. Among transportation challenges, traffic jams are on the top especially in the big cities like the capital, Dhaka. The inhabitants of Dhaka city routinely face traffic jams while going out for daily work. Following the research objectives, this study primarily investigated the following research questions:

Question 1: What are the main challenges of urban road transportation?

Question 2: What are the primary causes of traffic jams?

Question 3: To what extent is it possible to reduce traffic jams in Dhaka City?

One of the major challenges of research is choosing the right method to conduct their search. Punch (2005) categorizes six factors to consider when conduct research. The first one is the research question which can guide the method, or the method can guide the research question. The second one is choosing the research approach, forexample,systematic statistical research or an explorative study of a phenomenon. The third and fourth factor involves availability of literature and feasibility to carry out the research. The fifth and sixth factor includes the outcome and the style that the re-searcher prefers. The transportation and traffic jam situation has been prevailing as a great problem for the citizens of Bangladesh. Therefore, the phenomenon demands explanation for the situation rather than a statistical data presentation. However, the author decided to collect all statistical data from various data sources from the Bangladesh government's website to demonstrate to them with explanations of the situation and its impacts. The following chapters describe the rationale for selecting the study area and methods.

1.1.3 Selection and data collection method

*What do think about the causes of traffic jam from New Market to Dhanmondi-27?

*About how much time do you waste sitting and traffic jam?

*How can we get rid of the problem?

There are many different methods to conduct research. Qualitative and quantitative are the most common types of research methods. Quantitative research is a structured way of collecting and analyzing data obtained from different sources. Quantitative re-search involves the use of computational, statistical and mathematical tools for deriving results. The most common approach to quantitative research is a survey or questionnaire. A literature review refines and redefines the research questions and related tentative hypotheses by embedding those questions in large empirical tradition." Books, journals, government reports, scientific journals, articles, research documents and the World Wide Web were used for analyzing the key concepts such as transportation, traffic jam, management, Dhaka city and Bangladesh.

1.1.4 Selection of study area

Both Qualitative and Quantities data are collected for analysis. The study is covered to Dhaka city one of the most traffic jammed area (New Market to Dhanmondi-27).

With a vast population, the capital of Bangladesh has been struggling to serve its residents in many ways. However, traffic jams can be regarded as one of the top-most difficulties for all residents. A number of factors, including overpopulation, excessive vehicles, unfit vehicles, unqualified drivers, poor road conditions and other such factors primarily cause this unbearable traffic jam condition. However, very few studies have been conducted to explore the phenomena. Therefore, the author chose this city as a study area. In addition, literature suggests that there is a great number of big cities around the world facing traffic jam challenges. Therefore, the study carried out on Dhaka city might provide useful information for further research in the international arena.

1.1.5 Timetable of the study

This study was carried out between June 2021 and July 2021. This study initially developed theoretical knowledge concerning the issues of transportation, Bangladesh, traffic jams and Dhaka city. In addition, the right method was sought for collecting the data in order to conduct this study scientifically. Finally, the last two months were spent in analyzing the data and finalizing the thesis. All efforts took around five months to accomplish the study.

1.1.6 Limitations of the study

The limitations of this study can be identified both theoretically and methodologically. Theoretically, this study deals with transportation challenges and traffic jams in Dhaka city. However, both the transportation challenges and traffic jams are caused in different locations for different reasons. However, in this study, it was not possible to deal with all of them. Therefore, this study was determined to focus specifically on Dhaka city. Methodologically, this study was carried out by using the qualitative approach based on statistical data from different sources. However, due to background knowledge of the study area, statistical data could be verified with practical knowledge.

CHAPTER 2

LITERATURE REVIEW

2.1 Bangladesh transport system overview

Transportation is needed for moving of goods, animals and persons from one place to another. The common forms of transportation are bus, truck, plane, automobile, ship and two wheelers like bike or motorbike. Due to technological advancement, all kinds of transportation system have become very modern and comfortable around the world. However, transportation system in Bangladesh especially road transportation is still far behind the standard level due to poor infrastructure, mismanagement andlimited resources.

2.1.1 Road transportation

Although Bangladesh is called as a river in country, road transportation is still the primary mode of transportation and to some extent rail transportation. Rail transportation is not available all over the country. However, Bangladesh has good road transportation network. Road transportation is very effective and easy form of transportation in Bangladesh because it connects all the parts. The country's economy largely depends on road transportation. Bangladesh road network is made of three kinds of road categories: National highways, regional highways, Zillah Road. Bangladesh has total 21,302.08 km road.

Although Bangladesh has made some roads for transportation, the size of the roads is not good enough, which often cause accidents? Most of the roads are two lanes and tiny. In addition, the road conditions are very poor in most places. The conditions worsen especially in the rainy seasons. According to BRTA (Bangladesh Road Transportation Authority) Bangladesh has total 3419884 vehicles (BRTA 2019). However, literature suggest that a big portion of vehicles are technically fault to drive (Rahman &Nahrin, 2012). However, due to mismanagement, these cars are somehow permitted to drive on the road which often causes accidents.

2.1.2 Waterways

Bangladesh, is a country of thousands of rivers, water transport is a major mode of transportation of goods and people especially for certain regions due to a number of big rivers connected to these areas. It is also the cheapest mode of transportation compared to rail and road transportation. Bangladesh total inland length of water ways is 24000 km. However, 6,000km are navigable during monsoon and 3,900 km during dry periods. There are over 22,300 registered vessels engaged in trade (Chowdhury et al.,

2017). 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 other facilities include 11 major inland ports, 23 coastal island ports, 133 launch stations and more than 1,000 minor landing points located in rural areas. Bangladesh In-land Water Transport Authority (BIWTA) is the authority who controls the inland water transport in Bangladesh. However, the infrastructure problems on the inland waterway system are poorly ad-dressed (Chowdhury et al.,2016). As a result, the inland waterway system is not used to its full potential, to some extent due to inadequate dredging and shortage of berthing facilities. By improving waterways, it can have the potential to reduce transport costs for bulk cargo and provide better access to areas, such as in the North-West part of Bangladesh, where road access is compared to another region limited. Sea transportation is crucial for Bangladeshi trade and commerce.

2.2 Road traffic and transport network

Road traffic and transport network means the system in which different roads are connected each other for smooth transporting system. Due to technological advancement and industrialization much more people have been moving to urban areas (Andrew et al., 2005). Due to this demographic transformation number of vehicles and freights are also increasing (Rahman et al., 2012). Depending on the situation, developed countries adapt with transportation networking system by initiating many alternatives for example metro rail, tramline, road expansion, alternatives to avoid intersection and using Intelligent Transportation System (ITS) (Basu et al., 2006). However, for the developing countries it is difficult to man-age the situation due to lack of resources, experts and traditional transport system. As a result, traffic congestion becomes a common phenomenon for poor and developing countries like Bangladesh.

2.3 Congestion

Congestion involves excessive cars in the road, inadequate transportation networking, traffic mismanagement and lack of awareness. Although many believe that more roads can reduce traffic jam, study suggests that more roads could not reduce traffic jam. Arkatkar (2011) argued that non-priced added capacity might not effect on traffic congestion. Therefore, pricing for driving can significantly reduce cars in the road, which in turn reduce traffic congestion (Satyanarayana et al., 2012).

2.4 Impacts of congestion to economy and wellbeing

Traffic jam has diverse negative impact on people, economy and environment. In open eyes we can see that, traffic jam effects on valuable time and energy, decrease productivity, environmental degradation, carbon emissions and many other consequences. According to Parker (1996), traffic congestion wasted $63.2 billion in 70

metropolitan areas in 2002 for spending extra hours in the street. This author further added that every individual loses around $829 dollar for loss of time in the traffic congestion. Along with economic loses, traffic jam causes serious environment pollution. Pojani and Stead (2015)stated that in developed countries especially in Northern Europe, some cities have been trying to make cities especially downtown areas car free. A number of studies suggest that, public transport improvement, non-motorized modes, limiting the private car use, pedestrian zone and such environment friendly transportation sys- tem could have significant impact on traffic congestion reduction.

2.5 Transport network in Dhaka city and challenges

The only transportation means in Dhaka city is road transportation. However, recently the government of Bangladesh has been planning to initiate alternative means for ex-ample tramline and metro rail system with road transportation network. The city is built during the British colonization period of 200 years and ends in1947. The then government built most important road. However, after that, there were no significant improvements happen in Dhaka city road transportation network. However, last few decades the population has increased dramatically. Therefore, vehicles especially private cars have been boomed since last decade. To adapt with the demand of traffic, the road transportation network has not been developed accordingly (Chowdhury et al., 2017).There are diverse road transportation challenges exist in the country. Therefore, focusing on a single problem would not solve the problem. The responsible departments and stakeholders need to address the core reasons and act accordingly. Literature suggest that among other reasons, there are some key factors for example mismanagement, poor infrastructure and traffic control system cause road transportation challenges (Rahman, 2012; Chowdhury et al., 2017).Mismanagement in road transportation involve inefficiency, limited resources and training. Some daily newspaper and Transparency International report suggest that a number of traffic police are corrupted. According to these reports, despite knowing the fact that a number of drivers drive the vehicles without license, the authority do little action to prevent them from driving. In addition, duty officers are not active enough to monitor and control traffics on the road. As a result, very often drivers do not follow traffic rules, which cause accidents and unbearable traffic jam. Those who are involved in planning and designing transportation system have lack of knowledge. According to the data of Roads and Transportation 2018, there are over 3.419.884 vehicles in different roads in Bangladesh. However, there are about 488.730 vehicles without technical approve from the authority. Report suggest that these technically faults vehicles often cause accidents in the street. In addition to sup-port the statement, statistical data suggest that there are only 200.000 drivers who has licenses, which indicate that remain vehicles are driven by the drivers without li- cense or have a fake license. According to ARI (2019), 47% vehicles are driven by fake drivers. According to Roads and highways department of the country,62 percent of national and regional highways do not have proper junction arrangements (Prothom-alo, 2019).Although Bangladesh has been developing in many

different sectors, the roads and infrastructure are still underdeveloped. Most of the roads even the high ways congested. In addition, all types of vehicles are driven in the same street for example,bicycle, CNG, easy bike, rickshaw, bus, truck, motorcycle, cars etc. (Hossain et al., 2017). Many roads in Dhaka city, there is no separate lane for bicycle or slow-moving vehicles (Hossain et al., 2017). Even, hawkers occupy the footpaths made for the pedestrians illegally (Khan et al. 2018). Consequently, accidents and traffic jamis very common scenario in most of the densely areas of urban and suburban areas. Addition to this, drivers in Bangladesh use to work low paid and long hours(Khan et al. 2018). They usually do not get proper rest. Therefore, they have to drive in spite of tiredness, which cause accidents.Another crucial problem causes road damages is natural disaster and long rainy season(Razzaque, 1997). Natural calamities are very common in Bangladesh. There are arguments that most of the road builders do not put proper materials to make the street strong enough. Therefore, while heavy rainfall or floods,most of the roads damage. The government has to struggle to repair the roads every year. Therefore, many roads remain damaged, which cause accidents while driving on theseroads. One another significant problem is traffic-controlling system. In Bangladesh, only big cities have traffic lights, which often either not working or drivers are not following(Rahman, 2012). As a result, traffic jam occurs in every crossroads for longhours. Additionally, there is no traffic light system in district or sub-urban roads. Pedestrians as well contribute to traffic jam as they do not follow traffic lights and pass across the roads neglecting zebra crossing sign nearby. These risky passing very oftencause accidents and most cases end up by loss of lives. In Bangladesh, the roads are not monitored with automatic cameras. As a result, drivers often drive reckless andmake accidents. The figure created by the author below shows the causes of trafficjam for diverse road transportation challenges.Figure 3.2 Traffic jam by diverse road transportation challenges. The figure 3.1 shows that road transportation challenges primarily cause by poor infra-structure, inefficient management and traffic control system. Poor infrastructure contributes to hazardous and congested road conditions. In addition, lack of traffic control system makes transportations more challenging. Since this study primarily focusing ontraffic jam and its effect on economy and social life, following paragraphs will specifically focus on traffic jam and its consequences on the residents of Dhaka city in Bangladesh.

2.6 The impact of traffic jam

Traffic jam in Dhaka city has already become unendurable (Khan et al., 2018). Almost in every road, a huge traffic jam especially in the peak hours, when everyone rushes to reach their working place need to stay remain in the street standstill for many hours. It is not only causing individual mental stress and environmental damage but also contribute a large number of economic loss for the country (Hossain et al., 2017). These losses occur in many ways for example, unproductive hours spent on the street, vehicles fuel cost during traffic jam, environmental and sound pollution, mental and health problems and so on (Chowdhury et al., 2017). The economic impact of traffic jam is huge. According toHossain et al., (2017) the residents of Dhaka city loss around

Euro 4600 per hour for working hour loss in the street and around five Euro for vehicle operating cost per half-kilometer road. This study suggests that people of Dhaka city loss around five million working hours each year only for traffic jam, which cause Euro 3700 million loss per year. According to Chowdhury et al., (2017), with proper traffic management and efficient public transportation could save at least 60% of the losses amounting to Euro 2220 million. Due to traffic jam, fuel costs and vehicle damages supplement the losses.Due to traffic jam, the social and personal life has also been affected negatively in many ways. Bangladesh is a tropical country. Thus, most of the time the temperature is over 30 degree Celsius except around two-month winter time. Therefore, while staying in the road, often people have sickness in various forms- dizziness, headache, vomiting, high blood pressure and such problems. When they reachworking place, they become tired (Chowdhury et al., 2017). Consequently, to some extent they loss their concentration to work. Finally, when they reach home after jobs,they are completely exhausted, which affect their family and social life. Addition to this, the employees are always under threat to loss their job due to the delay in the office caused by traffic jam. It also affects their productivity and job satisfaction (Hossain et al., 2017).Another major consequence of traffic jam in Dhaka city is environmental damage due to air and sound pollution (Hossain et al., 2017). Most of the people do not follow traffic rules. The drivers use to give horns continuously. Sometimes even without any reasons, they give horns and drive fast. The city corporation does not clean the city properly. The people also throw their waste on the street or sides of the road instead of placing them in trashcan In addition to these thousands of vehicles have been burning fuels as they standstill for many hours in the traffic jam. It causes air pollution (Hossain et al., 2017). Because of this hazardous air pollution, many people have been dying every year or have beensuffering from many diseases (Chowdhury et al., 2017).

2.7 Policies initiated to tackle the issues in Dhaka City

In the capital city around 20 million people have been living, which is over 8% of the total population. Inside Dhaka Metropolitan Area (DMA) the only means of transportation is road transport (Raafat, 2010). All types of vehicles like bus, truck, engine- led three wheelers; motorbikes and manual rickshaw are coexistent in the street. Bangladesh government initiated 'Strategic Transportation Plan (STP) in 2005 in cooperation with the World Bank. The project is for 2004-2024 period named as'Urban Transportation Policy' under Dhaka Transportation Coordination Board (DTCB) under the Department of Ministry and Cooperation (MOC). Among the proposals, the committee recommended to decentralize population and employment opportunities in nearby areas that Dhaka city can relieve from over population (Raafat, 2010). The nearest towns and district are economically very integrated with Dhaka metropolitan area. Therefore, this committee recommended de-centralizing number of government establishments and private properties. According to the plan, the future development of the city will be distributed from urban center to nearest district include, Manikgonj, Savar and Narayanganj. See the map of Dhaka and nearest areas.The committee also identified core transportation problem as- Heavy and chronic traffic congestion-

Concentration of population in urban areas- Poor road transportation system without fulfilling traffic demand- No proper traffic management and traffic awareness (Raafat, 2010).Following the problems, the committee set their vision as- to achieve a sustainable social and economic growth- to ensure social equity- to ensure a healthy and secure urban environment In order to achieve these missions, the committee set three mission in terms to develop Dhaka urban transportation system. They are-equitable mobility for people- safe and environment-friendly transport system (Raafat, 2010). Following the missions, the committee recommended to introduce innovative transportation system following other Asian countries how they have improved their transportation system to alleviate traffic jam from urban area. Along with other decisions, the committee primarily emphasizes on conventional public transportation improvement, road network, proper traffic management, travel style and behavior of people,increasing mobility, accessibility and shortening travel time.

2.8 Traffic congestion and initiatives taken in other countries

In Dhaka city, the only transportation system is road transport? Therefore, the policy of Bangladesh government is to improve road transportation sys- tem following other developed and developing countries as example. This study has taken Beijing, China, Jakarta, Indonesia and Tokyo, Japan as case cities to understand how these countries have initiated their transportation management to resolve the problem. At the same time, to understand how the policies affect those cities traffic congestion problem.

2.8.1 Traffic congestion: The case of Beijing, China

Traffic congestion has become one of the most challenges in China cities especially in Beijing. The country has experienced steady and significant economic growth last few decades, which has boomed household car increase in big cities. In Beijing, since 2001 to 2015 the population has increased 55% and vehicle stock from one million to around six million (Tanaboriboon et al., 1996). Transportation Demand Management (TDM) greatly affects congestion of traffic. For example, after Olympic Games in 2008, Beijing witnessed household car booming. According to data, around 500,000 new vehicles were registered, which is approximately 15% increase per year. By 2010, 800,000 new cars added to the road, which causes severe traffic congestion in Beijing. However, during this time only 2% road mileage has been increased. These dramatic increases of population and vehicle ownership have been overwhelming the provision of public transits resulting serious traffic congestions. Data suggests that average traffic speed in congested road is only around 15 miles per hour in the pick hours (Yang et al., 2019). Along with TDM theory (Wen et al., 2014), the causes of traffic jam in urban areas are diversified due to different conditions. Yang et al. (2019) argue that, urban traffic congestion primarily occurs due to the background reasons for example going to work and school in peak hours. In holidays, people use to travel a lot. Therefore, morning peak is a predictable scenario. For same reason, in September when primary

and middle level school term starts have intensified traffic congestion than the summer vacation time. Going out for work or other purposes is obvious for residents. However, if they know the road situation, they might think of available alternatives for example going later or changing route to reach the destination. The new generation technologies for example floating car traffic information collection technology provide such information. Traffic congestion is a situation that can be seen in urban roads and highways. The traffic congestion phenomena in big cities in China and all over the world have become a burning issue concerning, urban livelihood, social and economic development. In addition, vehicles not only generate congestion but also air pollution, carbon Dioxide emissions, and accidents.There was a survey in 2016 in 390 cities from 48 countries that were conducted based on real time data suggest that, among top 20 most congested cities with population of over 0.8 million, one are from developing countries and eight from China (Yang et al., 2019). The top in the list, Mexico City drivers spent 66% more travelling time (227 hours per year) than they would have been driving in free flow condition. Beijing, in this list numbered 10 spent 46% extra time, which is 179 hours extra commuting time per year. In 2011, China started using Traffic Performance Index (TPI) to measure traffic congestion conditions (Wen et al., 2014). Using clustering method based on TPI China has developed a dynamic macroscopic index to show congestion intensity in major cities of the country in 2007. However, they argued that evaluation of traffic congestion by TPI is only a first step. Understanding traffic congestion needs more re-search concerning why it happen, factors contributing more and such influencing factors. The quantitative data of TPI can describe qualitatively the traffic congestions. It can identify the congestion pattern by accumulating large amount of data. Therefore, it can be understandable to finding out the corresponding factors, which influence traffic congestion. They have also established a floating car traffic and congestion evaluation system in real time. This system obtains GPS location data every minute of nearly 40,000 cars in Beijing in real time. At the same time GPS data has been process in every five minutes to obtain the speed (Ahmed et al., 2005, 40). Following the congested mileage of per link calculated by VMT, in every 15 minutes dynamic TPI of main areas of Beijing city is calculated. For traffic congestion evaluation system, TPI is the main index in Beijing city. Study suggests that congestion in Beijing city varied upon days and time (Wen et al. 2014). For example, working days traffic congestion is much higher than the holidays. In addition, peak hours for example office time in the morning 7:00 to 9:00 and return time from office 17:00 to 19:00 are the most traffic congested than other time. Based on the conditions and influencing factors, the government of China has made several decisions to reduce traffic congestion from Beijing. For example, banning private cars following odd and even license plate during Olympic games, banning car for one day in a week etc. (Wen et al., 2014). Yang et al. (2019) argue that in most developing and middle-income countries severe traffic congestion is a universal problem in big cities. One top reason for that is rapid increase of personal vehicles but in-adequate infrastructure development. According to Yang et al. (2019), using road pricing as the first-best policy to address congestion has been drawing increased at- tension from

policy makers. In addition, the authority took actions, which include lot- trey system to reduce cars limiting to 240,000 per year in 2014 (Yang et al., 2019).

2.8.2 Intelligent Transport System (ITS) in Japan

In recent time, most of the Asian cities along with other part of the world have been experiencing increasing urbanization and private car ownership, which have been causing increased number of car accidents, endurable traffic congestion and environmental damages (Lam et al. 1998). However, introduction of Intelligent Transport System (ITS) has brought revolutionary positive effects on various traffic issues. It is kind of system that use information communication technology to solve different kind of road problems. Although many countries have been introducing the system, there are still many challenges to implement them due to lack of know-how the technical issues by specific country's staffs, lack of coordination, lack of resources and management.Therefore, it is important for specific countries to adapt the system according to their existing capacity and transportation system. Japan has been implementing the ITS system practically to reduce traffic congestions and accidents. They have used the practical application of Vehicle Information Communication Service (VICS) and Electric Toll Correction (ETC) in the whole country based on the concept of Cooperative Vehicle Infrastructure System (V2I) (Makino et al., 2018). In 2011, Japan launched a project named "ETC 2.0. This project combines vehicle information communication service (VICS) and electric toll correction (ETC) functions on a single On-Board Unit (OBU) together with many new functions (Makino et al. 2018). This project, ET C 2.0 is easy to use since the system OBUs communicate with a Road-Side-Unit (RSU) in certain areas. The OBU system consistsbasic application interface functions that enable multiple ITS services through a combination of those common functions (Makino et al., 2018). This system is also very cost effective since any new function can be added just by developing RSU with new applications. ETC 2.0 systems also support privacy and security of the people uses private and rental cars (Makino et al. 2018). In addition, it may help to install compatible functions for safe driving and dynamic route guiding through advanced navigation system. The DSRC at 5.8 GHz enables to get information to control safe driving and traffic jam within an approximate area of 1000 kilometers. International Telecommunication Union certifies this system as ISO 14906 (Makino et al., 2018).Japan started expressway by getting a loan from World Bank after Second World War. Since then, they also started construction under toll system for all constructed roads. First, they started national longitudinal expressway which connect major cities and then developed crossing expressway to connect local cities and the expressway (Makino et al., 2018). Most importantly, they developed ring expressway to reduce urban transportation problem. Here, it is mentionable that, ETC played a key role to develop expressway in many ways. For example, ETC is an advance technology that helps to collect tolls securely with low cost (Makino et al. 2018). The system also enables to offer various motivational offers for example tool discounts in different times of the can detect if

there is any car stopped on the blind carve with image processing. Besides, the sensor in vehicle can detect the condition of road surface, any objects on the road or any other elements, which can cause danger for the vehicle and cause accidents. Another function of ETC 2.0 is detecting heavy load vehicles. This is universally accepted that heavy vehicles cause road deterioration. Therefore, if ETC is able to identify them, transportation authority can charge extra for road usage.

CHAPTER 3

METHODOLOGY

3.1 Selection of Study Area:

We have chosen this place as New Market to Dhanmondi-27. This is the best place in Dhaka city; traffic jams here have a detrimental effect on people. Traffic Jams can be regarded as one of the top most difficulties for all residents. A number of factors, including over population, excessive vehicles, unfit vehicles, Unqualified drivers, Poor road conditions and other such factors primarily causes this unbearable traffic jam conditions.

3.1.1 Map Details:
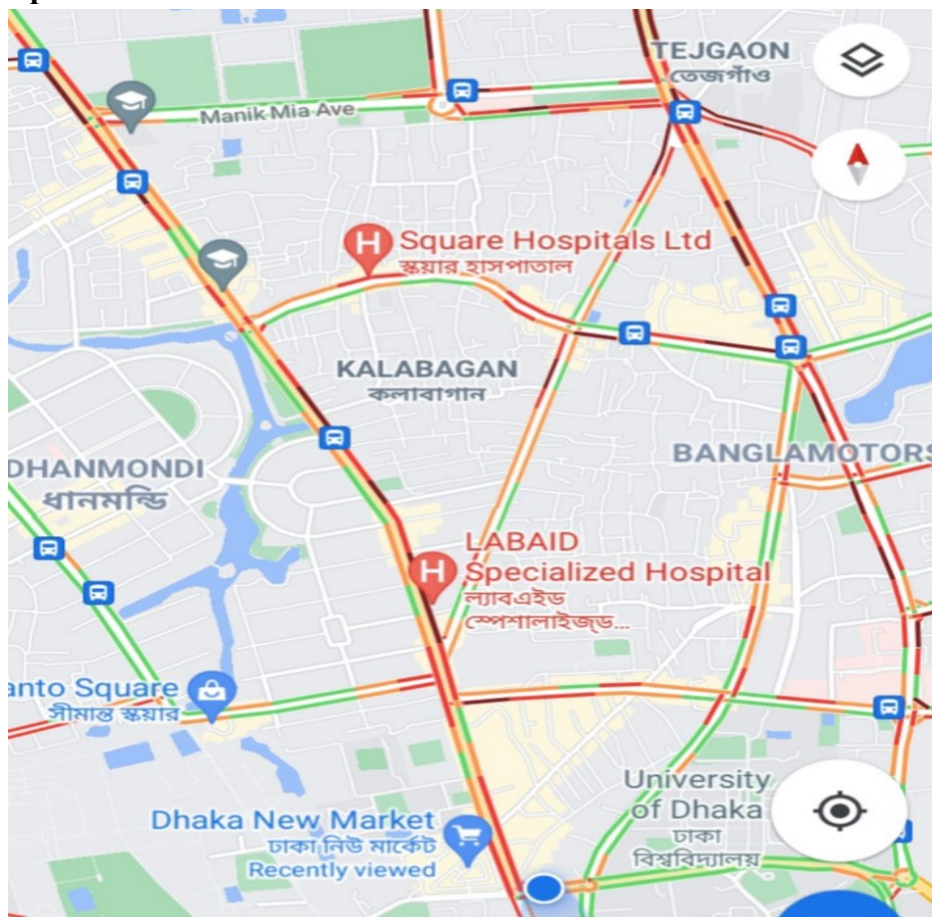
Fig3.1: New Market to Dhanmondi-27 Google Map

- ➢ Location: New Market to Dhanmondi-27
- ➢ Length of Road: 2.7 km
- ➢ Time of Study: 3.30 pm
- ➢ Date of Study: 13/07/2021 (Monday)

3.1.2 Reason to choose this place:

This road is very busy. Many School, College and Hospital have road connections with this road. There is a lot of VIP traffic on this road. Basically we are facing a lot of losses due to traffic jams in this place. So the main reason for choosing this place.

3.1.3 Observation of Study Area:

From New market to Dhanmondi27, the following causes of traffic congestion are observed:

1. The main causes of traffic jams.
2. How traffic congestion is prevented.
3. The issue of awareness in car parking.
4. The occupation of hawkers on the sidewalk.
5. People are unconsciously crossing the road.
6. People do not use foot over bridges.

3.1.4 Questionnaire Survey:

New market to Dhanmondi-27 has been visited.Some questions about traffic jams with some types of local people, employees, shopkeepers, and traffic police have been asked. The following questions are given below:

1. What do you think about the causes of traffic jam from new market to dhanmondi-27?
2. About how much time do you waste sitting in traffic jam road?
3. How we can get rid of this problem?

CHAPTER 4

FINDINGS AND SUSTAINABLE SOLUTION

4.1 Findings after survey:

The following findings are listed after the survey of study area:

- ➢ So many School and Hospital are connected to the road.
- ➢ When it rains, there is no proper drainage system on both sides of theroad, so during raining, both sides of the road get flooded.
- ➢ Lack of adequate foot over-Bridges.
- ➢ Passenger lifts and drops here and there.
- ➢ Lack of awareness of passengers while using road.
- ➢ Blindness of government and authority.

4.1.1 General Causes of Traffic Congestion on the Study Road:

The common causes of traffic jams are mentioned below.

1. Insufficient amounts of lanes
2. On-Street Parking.
3. Hawker problem
4. Noalternative of buses.
5. Useless vehicles.
6. Parking cars everywhere.

Fig4.1: Insufficient amounts of lanes

The number of vehicles on the inspected road is much more than the number of roads in takes and there is no separate road for different vehicles, which causes traffic jams very quickly.

Fig4.2: On-Street Parking

There are no special facilities for car parking on the road, so in many cases the sidewalks are parked on the road, so there is not much facility for driving, which causes traffic jams.

Fig4.3: Traffic jams problem

The hawkers did not choose a place to shop, so they set up shop on the street or the sidewalk, but this can be considered as the main cause of traffic congestion.

Fig 4.5:BesideDhaka Collage

On running road, ordinary people do not use the foot over bridge and cross the road in an unconscious manner.

Fig 4.6: Unauthorized U-Turn

Bicycles or motorcycles or small vehicles in the U-Turn system try to cross the road divisions in the middle of the road without following the proper rules and regulations, which is one of the causes of traffic congestion.

4.1.2 Possible solutions for minimizing the problem:

The common solutions of traffic jams are mentioned below.

1. Systematic parking.
2. Hawker less and Roads.
3. Separate Lanes.
4. Proper Surveillance.
5. Carpooling.

Details:
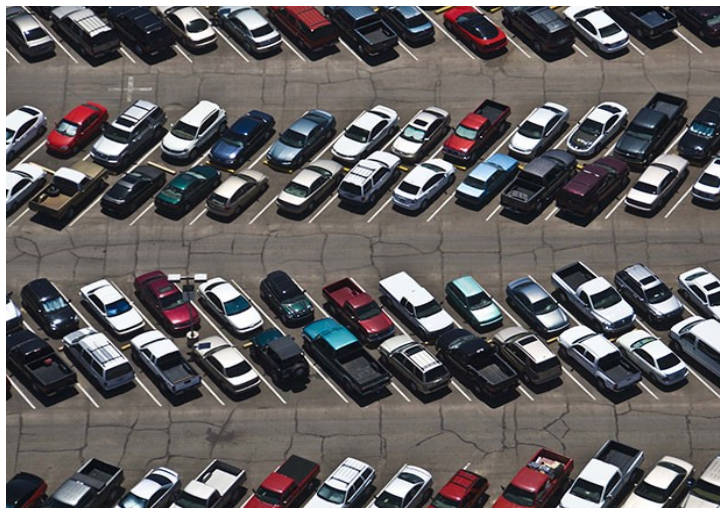
Fig 4.7: Systematic parking

Specific parking plays a big role in reducing traffic congestion. Specific parking arrangements have to be made at specific places. There are different types of parking such as, Angle Parking, Parallel Parking; Vertical Parking; Angle parking is especially widespread in parking lots.

Fig 4.8: Hawker less and Roads

Hawkers will have to set aside a separate area for shopping so that they do not occupy the sidewalk, which will reduce traffic congestion.


Fig 4.9: Separate Lanes

Separate lanes need to be arranged for different vehicles depending on the speed of the vehicle. Dividing into low speed, medium speed, and high speed will make it much easier to reduce traffic congestion.

Fig 4.10: Proper Surveillance

CCTV cameras should be set up at every station on the road for proper surveillance, adequate laws should be put in place so that no one can commit irregularities, proper punishment or fines should be taken for breaking the law so that traffic congestion can be resolved.
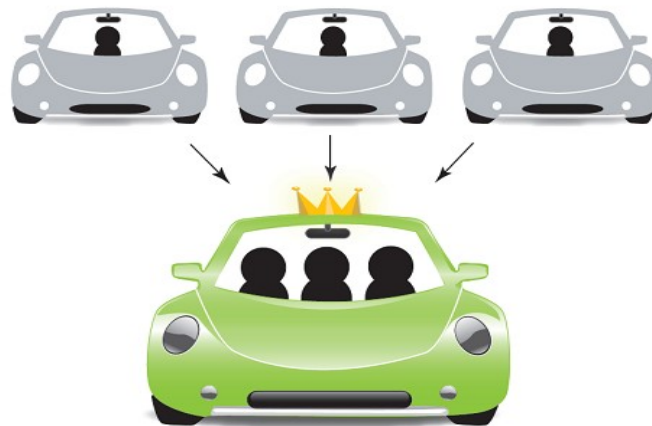
Fig 4.11: Carpooling

If 3 to 4 people use a car that will go to the same route or destination without one person in a car, then the number of cars on the road will be less and the traffic congestion will be less. Companies like Uber, Pathao can also play a role in this.

4.1.3 Government Responsibilities:

- Government should build up over bridge, introduce separate vehicle lane and more U-loop system.

- Good car parking system and hard rules against those people who keep their vehicles besides the road and other public places should be ensured by government.

- Hawkers who build up their business spot beside important places should be removed

- Fitness test must be ensured before plying vehicle on road.

- Old or expired vehicles should be removed.

- Government can order to transfer some of school and collage which are nearly situated beside the road.

CHAPTER 5

DISCUSSION AND CONCLUSION

5.1 Discussion

The data suggests that the transportation authorities in Dhaka 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 automobiles for their convenience. However, due to these dramatically increased numbers of automobiles in Dhaka 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 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. For example, using advanced ITS all over the city is not practically possible due to the lack of resources, such as skilled manpower and a functional infrastructure. Some alternative solutions are discussed below.

5.1.1 Conclusion

Finally, the world has been witnessed significant technological development since last few decades. Therefore, using technology in transportation network is an inevitable demand for efficient transport system. Many developed countries have already adopted Intelligent Transport System (ITS) to manage their transportation system. Alt- hough Bangladesh needs more time to adapt high technological system with current setting, they can start using ITS gradually. For example, using digitalized cameras to monitor and control driving behavior, smart card payment in public buses, collecting tolls and driver's information and smart phone application to get emergency information concerning accidents and hazards. The government and other stakeholders need to implement ITS in transportation system gradually along with other initiatives for example, traffic demand control policy, incentives, wide roads and providing affordable and sufficient public transportation facilities. Besides this, extensive research from both government and academics are needed.

5.1.2   Recommendations

1. Optimum vehicle composition of a traffic flow consists of 40% public transport or BUS while there was only 27% public transport in our study road.
2. The buses we observed on the road were too much old that they could not maneuver easily although the maneuverability of buses is originally low. So, replacing these old buses with new ones is highly recommended.
3. Bicycle should have specific lanes of their own which typically is placed beside the footpath/shoulder. But there was not any specific lane in the road we studied. So, it is recommended that a lane system should be introduced to increase efficiency of the road at the same time there should be a bicycle specific lane.
4. NMT or electrical low speed vehicles should not be permitted in this type of arterial road. Although they typically travel on the left lane but they create a drag force which slows down the high-speed vehicles which creates congestion.
5. There were some large container trucks observed on the road. Congestion can be slightly avoided if these vehicles were allowed only at off peak hours.

5.1.3   Limitations

1. The Study based on manual count that is irreversible.
2. The number of team members was less. If it was more, it gives more accurate result.
3. We counted vehicles at peak period, for one hour duration. If it becomes more, give more accurate result.

5.1.4 Recommendations for future work

1. The present study is focused mainly on traffic volume only. Speed-flow studies are useful to evaluate the more parameters. There is a scope on speed flow studies on urban road links for future work.
2. Sensor can be used to count Traffic.

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